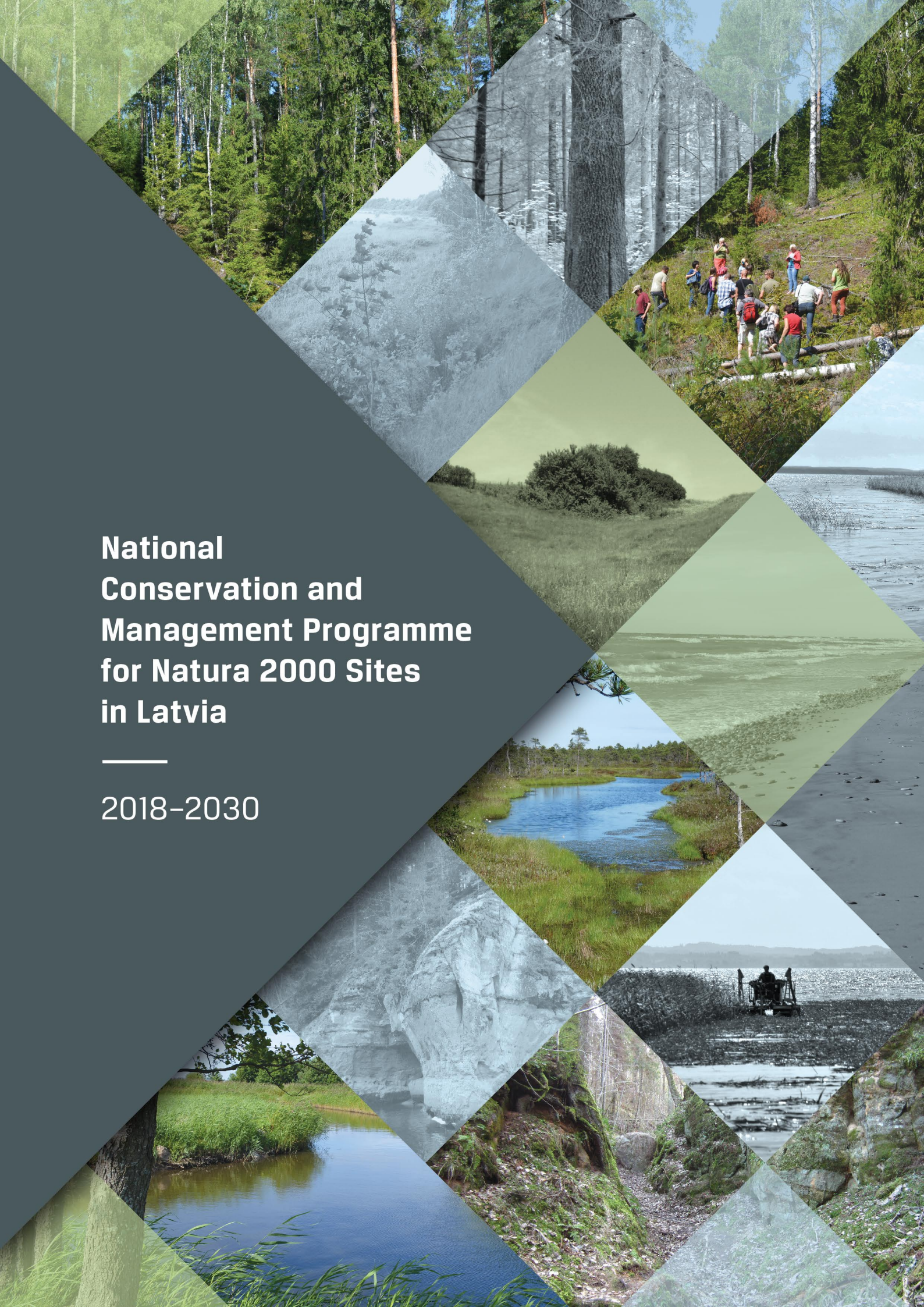

National Conservation and Management Programme for Natura 2000 Sites in Latvia

2018–2030

National Conservation and Management Programme for Natura 2000 Sites in Latvia (2018–2030)

Nature Conservation Agency
2017

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CONTENTS

Abbreviations used in the document

Birds Directive – Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
EC – European Commissions
EU – European Union
Habitats Directive – Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
JSC – joint stock company
Natura 2000 Programme – National Conservation and Management Programme for Natura 2000 sites in Latvia (2018–2030), developed within the LIFE+ project "National Conservation and Management Programme for Natura 2000 sites in Latvia" (LIFE11 NAT/LV/000371, NAT-PROGRAMME)
Nature Directives – Habitats Directive and Birds Directive
NAT-PROGRAMME Protected Habitat Management Guidelines – guidelines published in 2017, developed within the LIFE+ project "National Conservation and Management Programme for Natura 2000 sites in Latvia" (LIFE11 NAT/LV/000371, NAT-PROGRAMME): Čakare (ed.) 2017; Ikauniece (ed.) 2017; Laime (ed.) 2017; Priede (ed.) 2017; Rūsiņa (ed.) 2017; Urtāns (ed.) 2017.

6000 – Potential protected grassland habitat (see more in Chapter 7.5.)
9000 – Potential protected forest habitat (see more in Chapter 7.5.)

Abstract

National Conservation and Management Programme for Natura 2000 Sites in Latvia (2018–2030) was prepared within the LIFE+ project "National Conservation and Management Programme for Natura 2000 sites in Latvia" (LIFE11 NAT/LV/000371, NAT-PROGRAMME) in the period from 2013 to 2017. The aim of the Natura 2000 Programme was to promote coordinated action plan targeted at preserving habitats listed in the Annex I of the Habitats Directive in all terrestrial Natura 2000 sites in Latvia. The Natura 2000 Programme is part of the Strategy of Nature Conservation Agency.

In Latvia there are 61 protected habitat types of those listed in Annex I to the Habitats Directive, of which 19 are of priority importance. Out of these, there are 59 terrestrial habitat types and two marine habitat types. In accordance to the report required by the Article 17 of the Habitats Directive, in the period 2007–2012 only 11% of the habitat types of EU importance and 28% of the species in Latvia were in a favourable conservation status. It means that taking action is urgently needed to restore and maintain the habitats and species populations in good conservation status or, at least, to improve it.

Natura 2000 Programme is a document in which a consequent approach in planning the restoration and management was used for the first time in Latvia. When planning the tasks, the most recent data on the habitats, their distribution and quality were used. The Natura 2000 network was evaluated in a complex way, by estimating the role of each Natura 2000 site at national level. This document provides (1) the national habitat restoration and management priorities by selecting the habitat types and relevant Natura 2000 sites of highest priority, and (2) list of actions for improving the habitat condition or ensuring appropriate protection regime in each Natura 2000 site. The Natura 2000 Programme includes also cost estimation for all priority actions.

In comparison to nature conservation plans, the scope of Natura 2000 Programme goes beyond the local scale, and it highlights the priorities at national level. The top priority actions are selected based on a country-scale assessment of the conservation status of habitats, their distribution and trends. The Natura 2000 Programme should be used as a guideline when developing nature conservation plans for particular areas, taking into account the problematic questions highlighted in this document, which, at local scale, should be evaluated in depth.

Implementation of the Natura 2000 Programme may contribute not only to conservation of biodiversity, but also to mitigation of climate change by selecting priorities in peatland restoration which helps to increase their carbon sequestration capability. Similarly, the Natura 2000 Programme is a significant instrument that helps to achieve the aims defined in the Water Framework Directive in improving the condition of the water-dependent ecosystems.

Introduction

The National Programme for Conservation and Management of Natura 2000 Sites in Latvia (2018–2030) (hereinafter – Natura 2000 Programme) was developed in the period from 2013 to 2017 within the LIFE+ project "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371, abbreviated as NAT-PROGRAMME). Its aim is to promote the conservation of habitats which are protected under the Habitats Directive[1] in all terrestrial Natura 2000 sites in Latvia (excluding marine Natura 2000 sites). Natura 2000 Programme is a tool which might help implement coordinated restoration of habitats in Natura 2000 sites throughout Latvia.

According to the requirements of Article 17 of the Habitats Directive, each Member State of European Union has to prepare reports on the conservation status of species and habitats. The latest report for the period 2007–2012 concluded that in Latvia only 11% of the habitat types and 28% of the species are in a favourable conservation status. The status of the rest of the species and habitats was assessed as unfavourable-inadequate or unfavourable-bad. This means that taking urgent and proactive action is necessary, which also includes prioritization of actions and their systematic implementation.

The Natura 2000 Programme is a document in which the significance of each Natura 2000 site is assessed at national level. For the first time since establishment of Natura 2000 network in Latvia, a consistent approach was used using up-to-date information of habitats and their conservation status. In contrast to nature management plans which are local planning documents, Natura 2000 Programme provides an action plan for restoring the habitats considering the priorities at national level. Numerous Natura 2000 sites in Latvia do not have nature management plans; therefore Natura 2000 Programme is currently the only planning document that offers an assessment of the actual situation, the condition of habitats and the list of actions needed in these areas.

Until now nature conservation measures, including management, have been planned in particular protected nature areas (actions provided in the nature management plans). The measures proposed are local, rarely taking into account the country-scale habitat distribution and threats to certain habitat types at a larger scale. Exceptions are species protection plans that focus on conservation of a particular species or group of species dealing with the problems at a national scale. Until now, only one habitat protection plan (wooded meadows and pastures) which covers the entire territory of Latvia has been prepared. However, these plans focus on single species or a few of them or certain habitat types.

Due to lack of prioritisation and restoration planning on a national scale, the aims of restoration projects are mostly associated with research interests and competence of the project applicants, but do not necessarily cover the national priorities.

Since 2014, national priorities of conservation management and research in protected nature areas are being published on the website of Nature Conservation Agency (www.daba.gov.lv, only in Latvian), and are updated at least once a year. However, the Natura 2000 Programme offers a broader analysis and planning approach that has not been used in Latvia so far. It sets national habitat restoration and management[2] priorities, provides approximate management costs and identifies potential sources of funding. In this way, funding can be directed to the highest priorities. The Natura 2000 Programme is targeted at habitat conservation, however, most of the protected and habitat-specific species would benefit from the habitat restoration actions which are recommended in this document.

Although Natura 2000 Programme is aimed at the conservation of biodiversity and improvement of ecosystem condition, habitat restoration is an essential contribution to preserving and restoring ecosystem services, mitigating climate change, and helping maintain a diverse landscape. Thus, preserving and restoring of natural and semi-natural habitats is crucial also for the development of sustainable economy, wellbeing of people and healthy community.

The Natura 2000 Programme consists of two parts – the introductory part (Part I) and detailed action plan for all Natura 2000 sites (Part II). Part I explains the role of this document in planning of habitat conservation and restoration, the principles of prioritization, and the national priorities of habitat restoration, including costs and potential sources of funding. Recommendations on more effective management and nature conservation within the Natura 2000 network are provided. Part II includes short description of each Natura 2000 site, main threats, management priorities, and a list of necessary actions for each habitat type (in some cases also the key species if the actions for habitats are insufficient for their protection).

The Natura 2000 Programme was developed at a time when the information on the distribution of protected species and habitats, their conservation objectives, and, in many cases, on the ecological requirements of species and habitats was insufficient and incomplete (VARAM 2014). Therefore, the project "Preconditions for better biodiversity preservation and ecosystem protection in Latvia" was commenced in 2016 and it is planned to be implemented by 2020. It includes mapping of protected habitat types throughout Latvia. After summarizing the results, it will allow re-evaluation and updating the nature conservation priorities and priority restoration areas in the Natura 2000 Programme. This is an open document, in which the priorities and necessary actions should be periodically updated.

[1] Habitats listed in the Annex I of the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Throughout this document, the term "habitats" is used for the protected habitat types listed in this directive.

[2] In this document, the term "restoration" is being used for one-off actions (e.g. blocking the ditches to raise the water table a drained peatland), whereas "management" is used for re-current actions (e.g. regular mowing, pasturing).

PART I

1. Natura 2000 network and its importance in Latvia

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (hereinafter – Habitats Directive) states that the establishment of protected areas is one of the ways to preserve the habitats included in Annex I to this Directive and the species included in Annex II. Together with the protected nature areas established in accordance with Directive 2009/147/EC of 30 November 2009 of the European Parliament and of the Council on the conservation of wild birds (hereinafter – Birds Directive), they form a Natura 2000 network – the largest coordinated network of protected areas in the world. The establishment of protected areas is based on Articles 3 and 4 of the Habitats Directive and on the scientific criteria set out in Annex III to the Directive.

In Latvia, the Natura 2000 network was established in the period from 2000 to 2004, mainly on the basis of existing protected nature areas. Initially, 210 territories that were already protected before joining the European Union (hereinafter – EU), as well as 122 new ones were included in the Natura 2000 network. In 2013, one more Natura 2000 site was established. In 2017, there were 333 Natura 2000 sites in Latvia, including four strict nature reserves, four national parks, 239 nature reserves, 37 nature parks, nine protected landscape areas, seven protected marine areas and 24 micro-reserves. Not all of the protected nature areas in Latvia are included in the Natura 2000 network; it covers only territories where the composition and/or proportion of species and habitats are significant for the conservation of protected habitats and species of EU importance.

In total, terrestrial Natura 2000 sites cover around 11.5% of the country's territory (Figure 1). Proportionally, Latvia has the third smallest Nature 2000 area per country among 28 EU Member States (in comparison – Natura 2000 sites in ten EU Member States occupy more than 20% of the country's territory) (Figure 2).

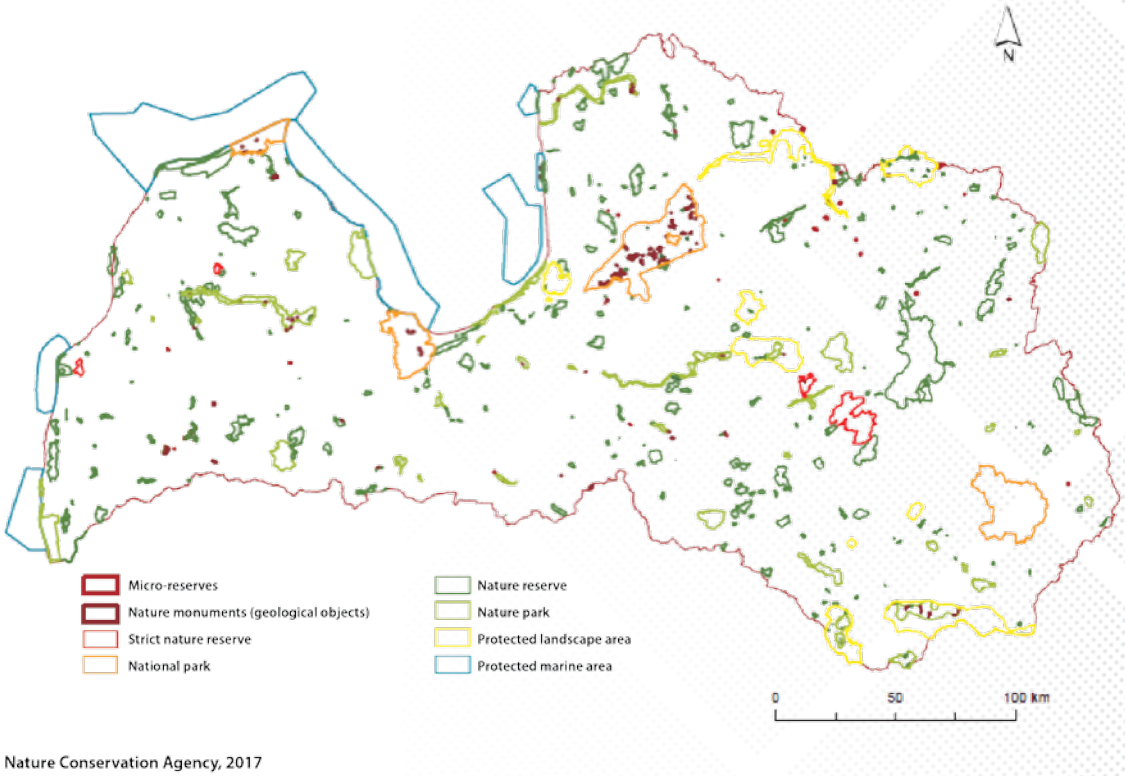


Figure 1. Natura 2000 sites in Latvia.

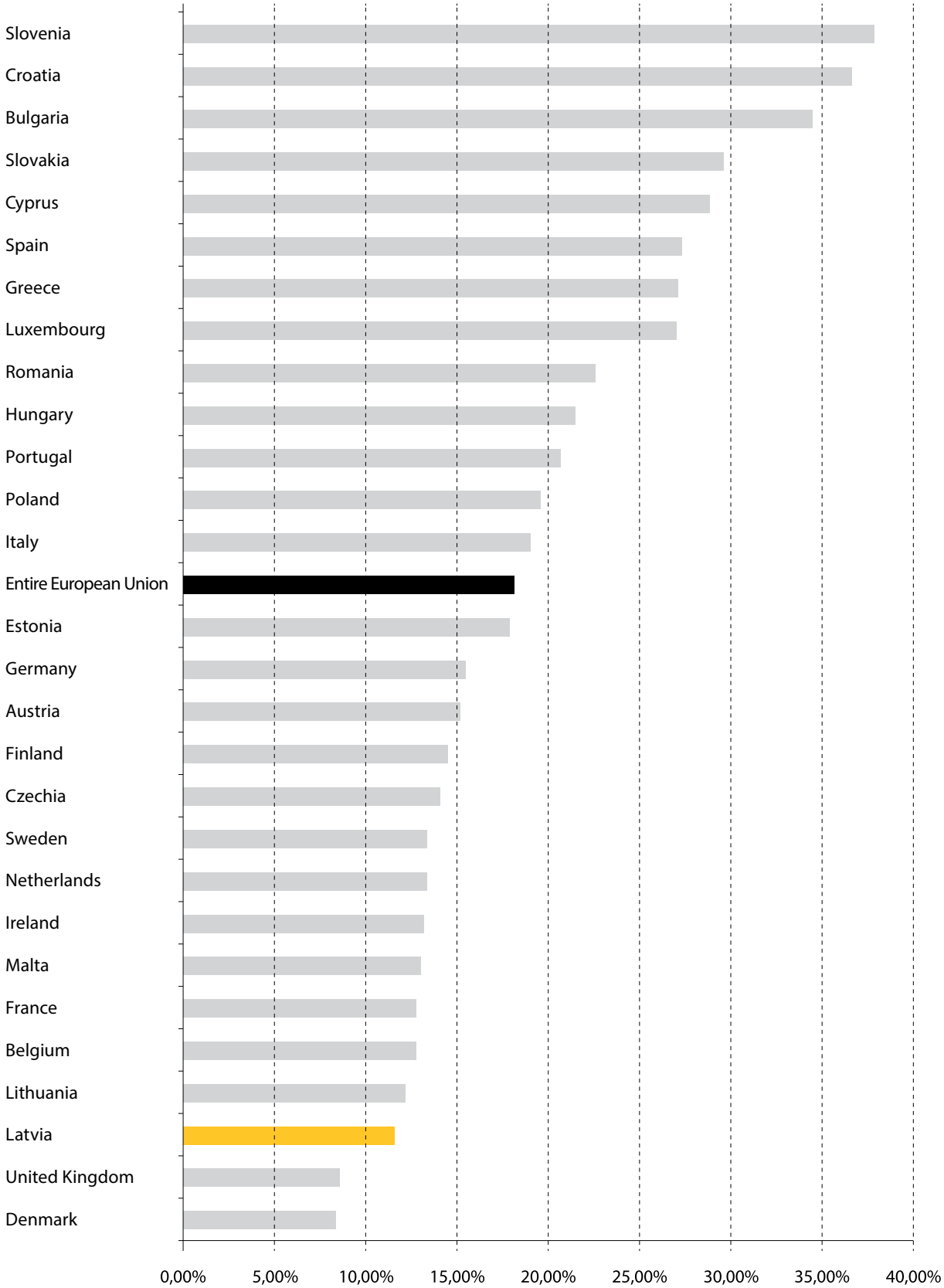
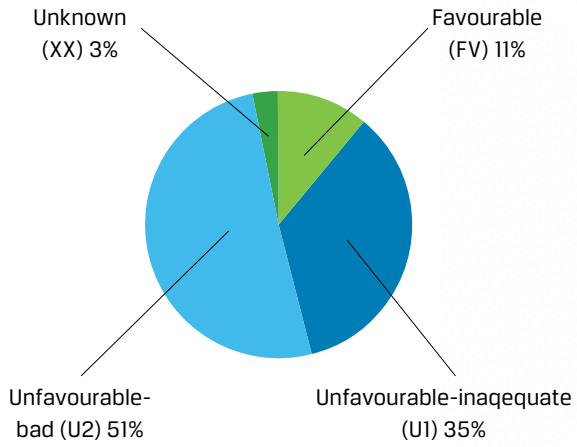


Figure 2. Natura 2000 coverage in percent in the EU countries. Data source: Eurobarometer (2016).

2. Conservation status of habitats of European Union importance in Latvia

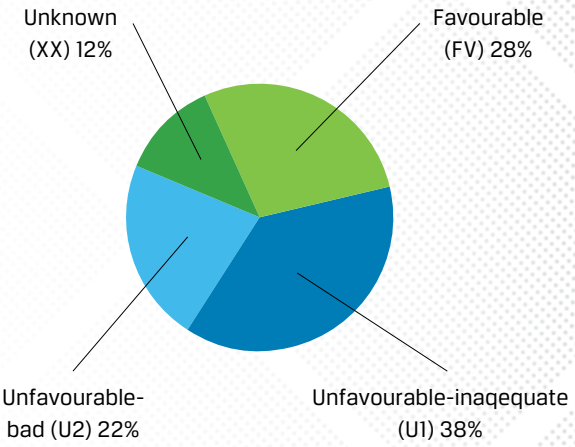
In Latvia there are 61 protected habitat types of those listed in Annex I to the Habitats Directive[3], of which 19 are of priority importance[4]. Out of these, 59 habitat types are terrestrial, and two habitat types are marine.

In accordance to the Article 17 of the Habitats Directive, the conservation status of species and habitats listed in the Habitats Directive is being reported to the European Commission (hereinafter – EC) every six years. The report is based on a common methodology which is binding for all Member States (Evans, Arvela 2011; EEA, ETCBD 2016), so the results are comparable across countries. In Latvia, the Article 17 report was prepared in 2007 (for the period up to 2006) and in 2013 (for the period from 2007 to 2012). According to the second report (Anon. 2013), only 11% of the habitat types of EU importance (Figure 3) and 28% of the species (Figure 4) in Latvia were in a favourable conservation status.



Conservation status		Number
Favourable (FV)		6
Unfavourable-inadequate (U1)		20
	U1-	5
	U1+	1
	U1=	9
	U1x	5
Unfavourable-bad (U2)		29
	U2-	22
	U2=	1
	U2x	6
Unknown (XX)		2

Figure 3. Conservation status of habitats listed in the Annex I of the Habitats Directive in the period 2007–2012 (data source: Anon. 2013).



Conservation status		Number
Favourable (FV)		32
Unfavourable-inadequate (U1)		43
	U1-	11
	U1+	2
	U1=	14
	U1x	16
Unfavourable-bad (U2)		25
	U2-	8
	U2+	1
	U2=	5
	U2x	1
Unknown (XX)		14

Figure 4. Conservation status of species listed in the Annex II and V of the Habitats Directive in the period 2007–2012 (data source: Anon. 2013).

[3] During the last years, three additional forest habitat types were found in Latvia, and their determination methods are described (Ikauniece at al. 2015; Lārmanis 2015; Rove 2015): 9050 *Fennoscandian herb-rich forests with Picea abies*, 9070 *Fennoscandian wooded pastures*, and 91T0 *Central European lichen Scots pine forests.*

[4] Cabinet Regulation No. 153 of 21 February 2006 Regulations of the List of Priority Species and Biotopes of the European Union Encountered in Latvia.

Nearly all types of semi-natural grasslands, including coastal grasslands and *Juniperus communis* formations, as well as all forest habitats, raised bogs, calcareous fens, heaths, white dunes, wooded dunes, oligo-mesotrophic lakes and natural eutrophic lakes are in unfavourable conservation status (Appendix 1). Many species become more endangered with the decrease of area and quality of suitable habitats. The deterioration of conditions suitable for species depending on protected habitats means not only local changes. For very rare species, it can lead to a reduction of their entire distribution range in Europe, and consequently at global scale.

According to the Article 17 report for the period 2007–2012, the conservation status of the protected habitats listed in the Annex I of the Habitats Directive and their major threats in Latvia are as follows.

Coastal, inland dune and heath habitats. The group includes 18 terrestrial habitat types (codes 1***, 2***, 4***). The conservation status of three habitat types was assessed as favourable (FV), but the conservation status of five habitat types – as unfavourable-bad (U2), whereas the other habitat types were assessed as unfavourable-inadequate (Appendix 1).

Almost all of these habitats in Latvia are rare or very rare, and their quality is declining. Lack of natural disturbances and traditional management has caused tree expansion on open grey dunes (fixed coastal dunes) and humid dune slacks; richness of their species decreases and characteristic processes are being deteriorated. In the coastal area, with growing impact of urbanization and recreation, the proportion of degraded habitats is increasing, as well as the area occupied by invasive plant species. Open grey dunes, humid dune slacks and coastal lagoons and associated species are among the most endangered as they depend on regular, moderate disturbances. In the absence of regular, moderate disturbances, the degradation is ongoing, and there is an increasing probability of local extinction of characteristic species, contributing to the reduction of their distribution range.

The conservation status of heaths is assessed as unfavourable-bad (U2) (Appendix 1). The main factors contributing to the degradation of the habitat type 4010 *Northern Atlantic wet heaths with* Erica tetralix are drainage and afforestation. The deterioration of habitat type 4030 *European dry heaths* is promoted by lack of appropriate management (historically it was grazing) and lack of disturbance (fires). Often, dry heaths have been afforested or overgrown naturally. To achieve good conservation status of heaths and health-related species, disturbances (fires, grazing, soil disturbances) are necessary.

Freshwater habitats. The group of freshwater habitats includes seven habitat types (codes 3***). None of these habitat types was assessed as being in favourable (FV) conservation status (Appendix 1). Conservation of habitat types 3130 *Oligotrophic to mesotrophic standing waters with vegetation of the* Littorelletea uniflorae *and/or* Isoeto-Nanojuncetea and 3150 *Natural eutrophic lakes with* Magnopotamion *or* Hydrocharition-*type vegetation* was assessed as unfavourable-bad.

Majority of the lakes in Latvia correspond to habitat type 3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation. Population size and/or vitality of typical species of habitat type 3130 have decreased due to eutrophication and high pressure caused by human activities including recreation. The distribution of typical species in this habitat type has decreased also due to insufficiently treated municipal wastewaters which have been discharged into the lakes during the previous decades, increase of diffuse runoff from arable lands and forest clearcuts, as well as by decline of the management on lakeshores.

Conservation status of habitat type 3140 *Hard oligo-mesotrophic waters with benthic vegetation of* Chara *spp.* was identified as unfavourable-inadequate (U1). Due to eutrophication, the lakes have overgrown, especially with emergent vegetation. The diversity of aquatic invertebrates decreases due to disappearance of open lake areas. Also the possibilities of spawning of fish and breeding and foraging of waterbirds have been significantly reduced.

The conservation status of the habitat type 3260 *Water courses of plain to montane levels with the* Ranunculion fluitantis *and* Callitricho-Batrachion *vegetation* is assessed as unfavourable-inadequate (U1). Inundations caused by beaver dams and clogging of large woody debris promote increased sedimentation and destroy the habitats suitable for *Unio crassus* and *Margaritifera margaritifera* as well as spawning grounds of salmonids.

Grassland habitats. The group of grassland habitats includes 11 habitat types (codes 5130, 6***). The condition of all the grassland habitats is unfavourable-bad (U2), except for habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels* whose conservation status was assessed as favourable (FV) (Appendix 1). Semi-natural grasslands in Latvia are critically endangered, and their existence depends on regular management. Up to 10% of the grassland habitats have been destroyed by the change in land use. Almost half of them are deteriorated due to various reasons, mainly due to lack of management. The connectivity of these habitats has decreased significantly due to changes in land use and following overgrowth leading to increased fragmentation of semi-natural grassland patches, especially in regions with intensive agriculture. The occurrence of species depending on semi-natural grasslands has decreased, and their risk of local extinction is high. In some places, rise of groundwater table and paludification of grasslands occur due to clogging of drainage systems. Also the grass shredding and leaving on field which was widespread during the last decade has worsened the habitat quality. Only ca. 50% of semi-natural grasslands are identified as land blocks and are eligible to agri-environmental payments and only ca. 15% of the grassland habitats that are managed using the agri-environmental payments are in good conservation status.

Mires and springs. There are seven habitat types included in the group of mire and spring habitats (codes 7***). The conservation status of habitat types 7110* *Active raised bogs*, 7120 *Degraded raised bogs still capable of natural regeneration*, and 7230 Alkaline fens is unfavourable-bad (U2) (Appendix 1), whereas the rest are assessed as unfavourable-inadequate (U1). Approximately 50% of the mires in Natura 2000 sites in Latvia are more or less affected by drainage. Out of them, ca. 10% are severely degraded. Alkaline fens are rare and threatened, and most of them are in unfavourable conservation status. The main adverse impacts for EU protected mire habitats are drainage, peat extraction (both bogs and fens), and lack of traditional management (fens). This has lead to enhanced peat decomposition, degradation of typical species composition, increasing coverage of trees and shrubs, spreading of atypical species. All mire habitats are also likely adversely influenced by climate change and eutrophication which promote their overgrowth, degradation of ecosystem functions, and reduction of open areas.

Outcrops and caves. This group includes three habitat types (codes 8***). The condition of all habitats of outcrops and caves is favourable (FV) (Appendix 1). However, the conservation status of bat species related to outcrops and caves has been assessed as unfavourable-inadequate (U1), except *Myotis dasycneme, M. nattereri, M. brandtii* and *M. mystacinus*, whose protection status is assessed as favourable (FV) or unknown (XX). Natural caves in Latvia are important for wintering of bats. Disturbances caused by visits to caves during bat hibernation (from October to April) pose the main threat to these species.

Forest habitats. This group includes 12 habitat types (codes 9***). Conservation status of all forest habitats was assessed as unfavourable-bad (U2), with a trend of further degradation (Appendix 1). Wet forests are adversely influenced by drainage. Permanent lack of natural disturbances (fires), mostly caused by effective prevention of fires, have caused lack of natural structural elements (snags, stumps, fallen logs, old trees, multi-aged stand structure), and contributed to eutrophication and disappearance of characteristic species.

The area of protected forest habitats outside of the protected nature areas is decreasing due to intense forestry. Forests located in protected nature areas are unfavourably affected also within the limits permitted by legislative provisions. The intense use of forests for commercial purposes has resulted in lack of structural elements characteristic to natural forests, and forest fragmentation, which are adversely affecting numerous rare, protected species. The decrease of broadleaved forest area is caused by forest regeneration with unsuitable species in regions of Latvia where the broadleaved tree species prevail. The quality of forest habitats is reduced by invasive plant species, especially in boreal coniferous forests (western taiga) and alluvial forests. Adverse consequences are caused also by eutrophication, especially in urban areas.

3. Natura 2000 Programme and its role in planning of habitat conservation

The Habitats Directive and the Birds Directive state that adequate protection of species and habitats of EU importance in all Member States must be ensured. Therefore, as an EU Member State, Latvia must also ensure the conservation of biodiversity in its territory in accordance with the requirements of both directives.

In 2011, EC adopted the Biodiversity Strategy (European Commission 2011a) which includes six targets and 20 actions to halt the loss of biodiversity and degradation of ecosystem services. It proposes long-term (until 2050) vision for biodiversity, providing that EU biodiversity and the ecosystem services must be protected, valued and appropriately restored, for their essential contribution to human wellbeing and economic prosperity, and so that dramatic changes caused by the loss of biodiversity are avoided. In shorter term, by 2020, the strategy proposes to halt the loss of biodiversity and the degradation of ecosystem services in the EU, and restore them as far as possible, while also increasing the EU contribution for the prevention of global biodiversity decrease.

The first objective of the strategy is to prevent the degradation of species and habitats included in the EU nature legislation. By 2020, the assessments of species and habitats protected by the EU nature laws must show better conservation or a secure status for 100% more habitats and 50% more species. The second objective of the strategy provides specific actions. By 2020, Member States must restore at least 15% of degraded ecosystems in their territories (European Commission 2011a). The result of the restoration does not only affect the area of the restored ecosystems, but the conservation status as a whole – the improvement of conditions of abiotic and biotic environment. In the light of the level of ecosystem degradation in modern Europe, it is not possible to prevent all adverse effects and completely "repair" their consequences – it would be too expensive and technically difficult, sometimes even impossible. The term "restored" means a condition where significant improvement has been achieved, at least recovering the main ecosystem functions, processes, structures, species composition and conditions suitable for characteristic species. A baseline/reference point is considered to be 2006, when the first reports by the Member States were prepared in accordance with the requirements of Article 17 of the Habitats Directive (Lammerant et al. 2013).

Article 6 of the Habitats Directive sets general requirements for protecting the Natura 2000 sites. It involves establishment of appropriate protection regime for species and habitats and taking of measures for their conservation. Also taking action to prevent degradation and adverse influences to habitats and species in case if non-intervention is not sufficient for the conservation of species and habitats is required; then habitat restoration and management are both necessary.

Ideally, degraded habitats should be restored and maintained in good conservation status in all Natura 2000 sites. However, one can not ignore the limited resources and the various circumstances that can make the restoration impossible or difficult to implement. Therefore, the prioritization of actions is necessary. In order to achieve a common goal of biodiversity conservation throughout the EU, in 2013 Latvia, the same as other EU Member States, has prepared the **Prioritised Action Framework for Natura 2000 for the period 2014–2020** (Anon. 2012), as it is required under Habitats Directive. The Prioritised Action Framework is a strategic document in which Latvia has declared its priorities for biodiversity conservation using the data provided by reports prepared according to the requirements of Article 17 of the Habitats Directive and Article 12 of the Birds Directive. The Prioritised Action Framework provides an estimate of costs, as well as identifies potential sources of funding.

From 2014 to 2016, EC carried out a comprehensive evaluation of the Habitats Directive and Bird Directive (Nature Directives), so called Fitness Check (European Commission 2016). Fitness Check has found that, as part of broader EU biodiversity policy, the Nature Directives are fit for purpose but that achieving their objectives and realising their full potential will depend upon substantially improving their implementation. The EC Mid-Term Review of 2015 estimated that progress towards achieving the goals and objectives of the Strategy is low (EC 2015), therefore actions at all levels, both within the EC and in the Member States, are necessary. Improvements are needed both in their effectiveness and efficiency of Directives by working in partnership with different stakeholder communities in the Member States and across the EU to deliver practical results on the ground. As a result of Fitness Check, in the first half of 2017, the EC published the Action Plan for Nature, People and the Economy (European Commission 2017). The Action Plan identifies four priority areas and 15 actions aimed at improving implementation of the Nature Directives, including strengthening investment in the Natura 2000 network and improving synergy with EU financial instruments (see *Chapter 8*). In Latvia, Natura 2000 Programme is considered as an instrument that will help eliminate the problems identified.

The need for inventory and analysis of nature resources (including habitats), their protection, management and sustainable management is indicated as one of the priorities in **Sustainable Development Strategy of Latvia until 2030 (Latvia 2030).** The strategy identifies the need for assessment and mapping of the capital of nature, as well as to identify the necessary active management actions.

The key issues of the nature conservation in Latvia are included in **Environmental Policy Strategy for the 2014–2020** (VARAM 2014). It identifies the goals to be achieved in the field of nature conservation, defines the actual problems and necessary actions. Some of the objectives to be achieved are conservation and restoration of native species richness, improvement of Natura 2000 network, as well as planning and implementation of management. The following issues are specified as the most significant problems: management measures necessary for species and habitat protection are being addressed separately from the economic development of the territory; the measures provided in the nature management plans are often not implemented or their implementation is not well coordinated; insufficient funding for ensuring favourable conservation status of protected species and habitats; innovative financing mechanisms for nature conservation measures are not available. The strategy offers concrete solutions and performance indicators.

The Natura 2000 Programme specifies the actions proposed in the Prioritised Action Framework by identifying the areas where they must be implemented, as well as by specifying areas of habitats which must be restored in each Natura 2000 site. Natura 2000 Programme covers only terrestrial Natura 2000 sites and terrestrial habitats, however marine Natura 2000 sites and marine habitats are excluded. Figure 5 shows the role of the Natura 2000 Programme in the current habitat conservation planning scheme.

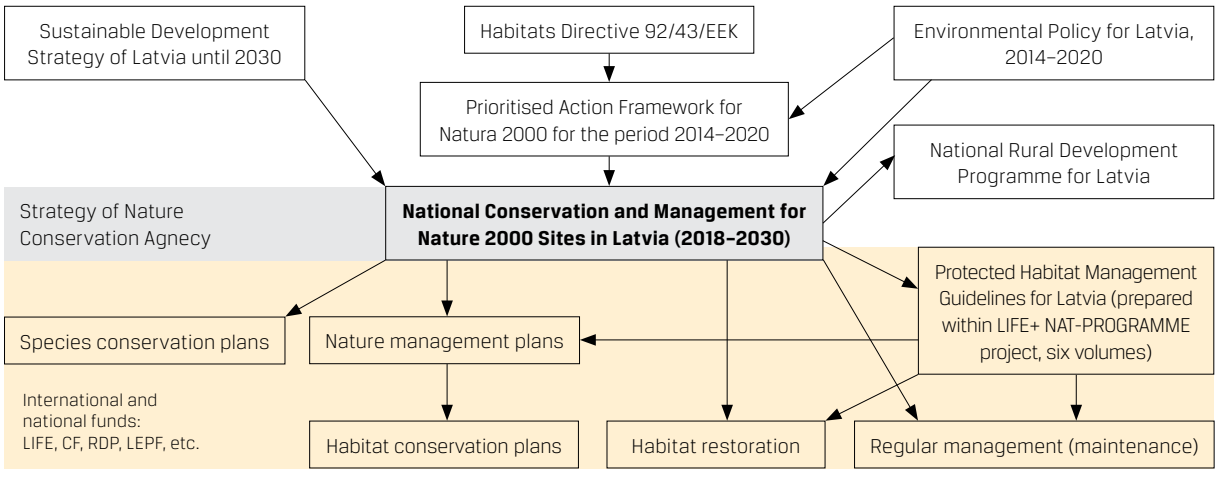


Figure 5. The role of the Natura 2000 Programme in the current habitat conservation planning.

Recent data on habitats and their conservation status were used when developing Natura 2000 Programme. When developing nature management plans of individual Natura 2000 sites, measures proposed in the Natura 2000 Programme should be repeatedly evaluated and included in the nature management plans, providing more details to facilitate their implementation.

The Natura 2000 Programme is an integral part of the strategy of the Nature Conservation Agency.

Within the LIFE+ NAT-PROGRAMME project, **Protected Habitat Management Guidelines for Latvia** were developed and published in 2017. Guidelines consist of six volumes (hereinafter – NAT-PROGRAMME Protected Habitat Management Guidelines) which provide habitat restoration and management methods applicable in Latvia. The guidelines might be used to implement the priorities set out in the Prioritised Action Framework and Natura 200 Programme. The guidelines outline methods that are suitable for specific cases, as well as address various management situations and examples.

Ideally, in order to ensure the conservation and management of all Natura 2000 sites in a planned manner, **nature management plans**[5] must be developed for all of them, providing comprehensive assessment of the situation and recommendations for the conservation and management in the area. By the second half of 2017, there were valid (not expired) nature management plans for 114 Natura 2000 sites. However, many Natura 2000 sites still do not have such plans.

A significant difference between the Natura 2000 Programme and nature management plan is that the nature management plan is a local planning document. In nature management plans, it is not required to analyse the particular Natura 2000 territory in a national context, at least concerning the priorities of actions. On the contrary, the aim of Natura 2000 Programme is to assess each Natura 2000 site in a national context and to identify species and habitat management priorities at national level. Concerning the necessary actions, the level of detail in the Natura 2000 Programme is lower than that of nature management plans, therefore the Natura 2000 Programme does not replace management plans. However, exceptions may refer to territories where non-intervention or relatively simple management must be ensured and it can be implemented without nature management plan, for example, by involving competent experts.

In Natura 2000 sites, especially if they are large or complicated due to the complexity of land use, land ownership, functionality, socio-economic conditions, e.g. national parks, protected landscape areas, large nature reserves (if there are many landowners or many conflicting interests and other circumstances, which make the conservation and restoration of species and habitats complicated), Natura 2000 Programme should be used as a guideline when developing the nature management plans. Unlike the Natura 2000 Programme, nature management plan (in addition to detailed study of the territory) serves also as means of public engagement, because during its drafting people are invited to express opinions and find compromises before the implementation of planned activities.

In most cases, the Natura 2000 Programme and nature management plans do not contradict and complement each other. Differences are mainly in territories where nature management plans are old, and opinions on necessity and possibilities on habitat restoration have changed significantly since the plans were developed.

The next step in the implementation of the Natura 2000 Programme is the development of **management plans for particular habitats or their groups**, and the development of **management plans for species.** These plans should contain more detailed descriptions of planned activities for the conservation of particular habitats at a national scale, and also specifying target areas and sites. In 2017, 16 species management plans and one habitat management plan were valid.

When developing the Natura 2000 Programme, conservation status of each protected habitat type in all Natura 2000 sites was evaluated and national restoration priorities selected. In some cases, also activities necessary for management of species were specified (in cases if habitat restoration and management alone could not ensure the appropriate conservation of these species). For more detailed plans, well-founded evaluation of the "needs" of particular species, high-quality data on the whole area of the country are necessary, which, in this case, were not available.

During the development of the Natura 2000 Programme, there were no data on distribution of species and habitats throughout the country, and the data were often insufficient and of varying, uneven quality. The mapping of habitats of EU importance throughout the country, including outside of the Natura 2000 sites, in the scope of EU funded project "Preconditions for better biodiversity preservation and ecosystem protection in Latvia" is an important step which will allow the re-evaluation of restoration priorities as well as revision of the priority habitat management sites.

At a national level, it would be also necessary to define **conservation targets** for all EU protected habitat types. This includes evaluation of the target area of every habitat type and planning of their optimal protection, taking into account the regional aspects and the distribution of habitat characteristic species, including rare species. Unless there are no full data on the actual habitat areas and their actual conservation status, based on recent inventories, the estimate of target areas can be only approximate.

[5] Nature management plans are developed in accordance to Cabinet Regulation No. 686 of 9 October 2007, Regulations on Drafting the Nature Protection Plans for Specially Protected Nature Territories.

The objectives of the Natura 2000 Programme did not include the evaluation and accounting of other activities important in the Nature 2000 sites, such as necessities to protect the cultural heritage and landscapes, although they are linked to the conservation of the overall nature heritage. For the protection of this heritage, the relevant sectoral guidelines must be taken in account, such as Landscape Policy Guidelines 2013–2019 (VARAM 2013) and the Strategy On Protection of Cultural Monuments (VKPAI 2015). These documents include action plans and analysis of potential funding.

4. Relation between Natura 2000 Programme and climate change mitigation

Drainage of peatlands (open mires, wet forests, floodplain grasslands, etc.) accelerates decomposition of peat, thus large amount of so-called greenhouse gases (predominantly carbon dioxide) is released into the atmosphere. Over longer term, degradation of peatlands leads to considerable emissions of carbon compounds, accounting for a significant proportion of total greenhouse gas emissions.

Latvia has ratified the United Nations Framework Convention on Climate Change (adopted on 9 May 1992) and the Annexes to the Convention – the Kyoto Protocol and the Paris Agreement, demonstrating commitment to improvements of adaptation to the adverse impacts of climate change, promoting climate-resilience, as well as promoting investments into low-emission and climate change resilient development.

Although the necessity to prevent increased carbon emissions from degraded peatlands is not emphasized in Environmental Policy Strategy for Latvia (2014–2020) or in other strategic documents in Latvia, one cannot ignore the fact that they account for a significant proportion of the total global emissions.

The implementation of Natura 2000 Programme can promote achieving the objectives of climate change mitigation. The most important benefit of the restoration of peatlands is restoring the functions of ecosystem – one of them is carbon sequestration. The restoration of degraded peatlands and their recovery to a functioning state can be a long process, but it is a significant contribution in order to decrease emissions. This also applies to grasslands on mineral soils, as the emissions of soil carbon dioxide are significantly decreased after establishment of grasslands on former arable lands. In this way, also protected grassland habitats of EU importance as well as the habitats suitable for wetland species are being created and/or restored, including many bird species.

When assessing the benefits in the light of climate change mitigation, appropriate sources of funding should be selected. In case of peatlands, also various financial instruments provided for the climate change mitigation can be used.

5. Natura 2000 Programme in relation to implementation of Water Framework Directive in Latvia

The purpose of the Water Framework Directive[6] is to establish a system for the management of inland surface waters, transitional waters, coastal waters and groundwaters, ensuring reaching at least a good status in all waters of the European Community. Among other issues, the Water Framework Directive instructs to prevent the further deterioration of water ecosystems, to protect and strengthen them, as well as to protect terrestrial ecosystems and wetlands which are directly dependent on aquatic ecosystems. Thus, the objectives of the Nature Directives and the Water Framework Directive are alike – to ensure functioning of aquatic ecosystems and associated species by balancing interests of nature conservation and sustainable use of natural resources (European Commission 2011b). The implementation of all three directives is complementary to the objectives, and many of the measures chosen for their implementation are in line with the objectives of both Nature Directives and the Water Framework Directive.

In accordance with the requirements of the Water Framework Directive, each EU Member State must establish a Register of Protected Areas which includes a list of territories where specific requirements or certain economic restrictions have been imposed for the purpose of ensuring water quality. Such areas include bathing sites, drinking water extraction sites, water basins important for fish stock protection, areas which are particularly sensitive to agricultural and wastewater pollution, as well as protected nature territories. This register includes protected nature territories (Natura 2000 sites) established for the protection of aquatic habitats or species associated with aquatic habitats, or which include important aquatic habitats.

This means that the implementation of all three directives has to be coordinated and that their goals can not be achieved by separating them from one another. The actions specified in the river basin district management plans and nature management plans as well as in other relevant planning documents must be harmonized. The implementation of Natura 2000 Programme can have a direct positive impact on the achievement of the goals of the Water Framework Directive in ecosystems which depend on aquatic habitats, if at least good ecological quality of water is attained.

[6] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

6. Past experience of habitat restoration and management in Latvia

Since the end of the 1990s, numerous nature conservation projects have been implemented in Latvia using both national and EU funding, in which the habitats and suitable conditions for the associated species were restored. Extensive experience has been accumulated during the project implementation, as well as experience on practical aspects, expected benefits and difficulties that can be used also in the future. Restoration examples and references to projects part of which the tasks were carried out are discussed in the NAT-PROGRAMME Protected Habitat Management Guidelines.

6.1. Coastal habitats and heaths

In coastal areas, restoration and management has been mainly carried out in open dunes by fixing the sand with woven branches and willow *Salix* spp. plantings, in some places also with surface coating using twigs. Artificial barriers hold up the wind-blown sand, promote the gradual establishment of plants and the development of dunes. This management method has been recognized as applicable, and it provides good results as it is possible to reach the expected outcome with a relatively low cost. It can be applied not only on naturally eroded coasts, but also in areas heavily affected by humans. Planting of willows without any justification causes unfavourable impacts, this is observed in many areas, for example, in Ķemeri National Park. It results in expansion of willows which causes negative influence on white dunes and grey dunes. Willow planting should be applied only in exceptional cases when wind-blown sand poses risk to human residences and there are no other ways to fix the sand.

Eradication of invasive plant species has been carried out in several Natura 2000 sites (Pape, Ziemupe, Piejūra). The most valuable experience was gained with the eradication of *Rosa rugosa* and *Amelanchier spicata* in grey dunes. The shrubs of these species were cut or the roots were extracted, later their regrowth was mown or the territory was grazed. Restoration was much more efficient in cases when mowing was carried out twice or more times during the vegetation season and the mown plants were removed or burned on site. Unfortunately, there are sites in the coastal dunes where invasive alien ornamentals such as *Hippophae rhamnoides, Elaeagnus commutata* and *Rosa rugosa* are still being planted. This is ongoing in rural areas, cities (Ventspils, Rīga, Jūrmala, Saulkrasti, etc.), and coastal villages including Natura 2000 sites (e.g. in Pape Nature Park). To address this problem, stricter regulatory enactments are needed by prohibiting the introduction of invasive species, as well as raising awareness on this issue.

In some coastal sections (Pāvilosta, Užava, Oviši, Engure, etc.), restoration of open grey dunes and dune slacks which were naturally overgrown with trees and shrubs was carried out. In these sites it is necessary to create conditions with good lighting, moisture and wind which would be suitable for the development of pioneer vegetation open substrate for several habitat-specific species. Pines *Pinus sylvestris* and willows *Salix* spp. were removed or burned on site. In Užava Nature Reserve, a dense layer of litter and topsoil was removed from some patches. Although grey dunes have been restored in several places, the total restored area is still too small. The restoration of grey dunes is one of the top priorities for the conservation of coastal species and habitats in Latvia.

The current experience in the management of coastal grasslands shows that grazing is more efficient and more sustainable than mowing. For example, in Daugavgrīva Nature Reserve in Piejūra Nature Park, barriers were constructed and grazing was commenced in 2004. Since grazing is still ongoing, diverse vegetation structure and diverse composition of the species has developed. However, herds and the associated infrastructure at the seaside are threatened by storms. Therefore, grasslands are mainly mown if located along low-lying sea coast, for example, in Mērsrags and in Randu pļavas Nature Reserve. The areas of managed coastal grasslands, surrounding reedbeds and lagoons are insufficient to ensure their long-term persistence, and the management is not always effective.

In rather many coastal dune areas with high visitor load, infrastructure (footbridges, platforms, etc.) has been established that help to concentrate and redirect visitors from fragile habitats to less vulnerable areas.

Since 2009, an extensive experience in the restoration and management of both dry and wet heaths has been accumulated in the Ādaži Protected Landscape Area. Various methods have been applied in this area, for example, tree felling, ring-barking of deciduous trees, prescribed burning, mowing, as well as topsoil removal in patches. In Sakas Grīņi Nature Reserve, an experimental management of wet heaths with *Erica tetralix* has been carried out by selective removal of trees and shrubs and mowing of ground vegetation.

In general, many methods to restore and maintain coastal dunes and heaths are well-proven and suitable for future use in Latvia. Nevertheless, management experience with some habitat types (beach habitats, wooded dunes) is still insufficient.

6.2. Rivers and lakes

In Latvia, extensive experience has been accumulated in the management of freshwater habitats, in particular river habitats, by removing the excessive overgrowth which has developed mainly due to eutrophication (e.g. in Salaca, Lielupe, Mēmele, Venta Rivers). By removal of large woody debris and demolition of beaver dams in small and medium-sized rivers, placing boulders (for

example, in Pitragupe, Ķikans, Vedze, Svētupe, Kauliņa Rivers, etc.), water discharge and self-purification capability was notably improved, and habitats suitable for aquatic organisms were restored. Demolition of beaver dams and removal of large woody debris also improves hydrological regime in the adjacent areas, reduces the risk of inundation, thus eliminating the potential damage to agriculture and forestry. In the framework of various river cleaning projects, spawning grounds for lampreys and salmonids were restored (for example, for several consecutive years such works were carried out in Salaca River). In 2015–2016, lamprey spawning grounds were created and improved in Raķupe River. A lot of work has been done within the "Put a Stone into the Stream" initiative, involving enthusiasts in river cleaning in many sites throughout Latvia.

Reedbeds have been mown and fragmented in several lakes; reedbed burning was carried out to prevent the development of monodominant reedbeds and to diversify the bird breeding conditions (for example, in Lake Engure, Lake Pape, Lake Kaņieris). Artificial islets for the breeding of waterbirds were created, and improved by removing shrubs and smoothing the ground surface (Lake Engure, Lake Kaņieris). In 2015, the mosaic of islets and shallow channels for bird species diversity was created in Lake Engure.

In order to preserve the waterbird populations and for the improvement of their conditions, eradication of invasive predators American mink *Mustela vison,* raccoon dog *Nyctereutes procyonoides* and other carnivores was carried out (for an extended period of time, in Lake Engure). The eradication of *Mustela vison* has a positive impact also on fish productivity.

6.3. Grasslands

Most of the grasslands in Latvia, including semi-natural grasslands and important bird grasslands, are managed by private landowners, using the Rural Development Programme measure "Maintenance of Biodiversity in Grasslands" and/or single area payment. Out of the known total area of semi-natural grasslands and grassland bird habitats (approximately 67,000 ha), less than 50% are being managed (32,619 ha) (LAD 2016).

Within various projects, grasslands have been restored by removing the shrubs and creating conditions for starting regular mowing or grazing. Good examples include the projects financed by the LIFE programme in Ziemeļgauja Protected Landscape Area, Teiči Strict Nature Reserve, Ķemeri National Park, and some other areas. Here, grassland restoration has motivated the landowners to commence grassland management, and continue it after the end of the project by using financial support from Rural Development Programme. Grasslands have been restored also within smaller projects or private initiatives, for example, in Krustkalni Strict Nature Reserve, Slītere National Park, Ķemeri National Park, and elsewhere. Grassland restoration included mainly traditional methods (removal of shrubs in overgrown grasslands, mowing, livestock grazing). Sometimes less known methods were applied (milling of shrub roots, various mowing techniques, different methods of grass collection, restoration of wooded grasslands, etc.). For pasturing, various animal species and breeds are increasingly used, including semi-feral herbivores which can be used for year-round grazing (Pape, Ķemeri National Park, Engure Nature Park, etc.).

Large-scale restoration included restoration of river floodplains (re-meandering of the straightened Slampe River in Ķemeri National Park in 2005, which is being continued by restoring the Skudrupīte River and its floodplain, and restoring the Dviete River floodplain in 2015). In 2006, shrubs were cut in large areas, and drainage ditches were blocked by bulldozing in floodplain grasslands in Lubāna mitrājs Nature Reserve, resulting in deduced runoff and restored hydrological regime in the floodplain.

However, several semi-natural grassland restoration methods have not yet been adopted in Latvia. These include reduction of soil fertility (topsoil removal, deep plowing, growing of cereals for reduction of phosphorus concentrations), active formation of species composition (spreading-out seed-containing grass or hay, collecting seeds from semi-natural grassland and sowing in the target area, introduction of *Rhinanthus* spp. for the reduction of proportion of gramineous plants), restoration of shallow ditch systems, mobile pasturing). Several of them will be used in the LIFE project "Restoring EU priority grasslands and promoting their multiple use" (GrassLIFE, LIFE16 NAT/LV/000262). These methods are becoming increasingly important in semi-natural grassland restoration, as the dramatic decline in their area during the last decades impose the need to restore not only overgrown semi-natural grasslands, but also those which are currently used as arable fields and/or as cultivated grasslands.

6.4. Mires and spring habitats

The restoration of raised bogs in Latvia began at the end of the 1990s when the construction of wooden dams began in the Teiči Strict Nature Reserve. Currently, the construction of dams of various types (wooden, peat, plastic piling) is well adopted in Latvia. Since 2006, dams on ditches (mainly peat dams) have been built in many drained raised bogs (for example, in Cena, Ķemeri, Stikli, Klāņu, Rožu, Rampa Mires, etc.). In most cases, the results are successful – the water level has been stabilized, also promoting the recovery of mire ecosystem functions (water storage and carbon sequestration) and mire vegetation. Ditches were completely filled in two territories (in a Capercaillie *Tetrao urogallus* micro-reserve in the surroundings of Smiltene and in

Gulbjusala Mire in Gauja National Park), thus eliminating the drainage influence. In the north-eastern part of Ķemeri Mire, water level was raised in the former peat extraction site. During a period of approximately ten years, considerable improvements were achieved. For example, mire-characteristic vegetation has developed and the area has become suitable for waders and migratory birds. Similarly, water level was raised also in part of the post-harvested peat extraction area in Lielsala Mire.

In Latvia, the methods of rewetting are sufficiently adopted and can already be used in the future wetland restoration projects. Usually, the restoration of raised bogs also improves the condition of neighbouring wetland habitats (transitional mires, bog woodlands) and associated species. To improve the bog habitat for birds, the excessive tree coverage has been removed in several raised bogs (large areas in Rampa Mire, smaller areas in Janīšu-Dainas Mire, Dūmiņu Mire, and Skalu Mires), thus reducing the transpiration rate and improving the hydrological conditions as well.

Less experience has been accumulated in restoration of fens and spring fens. In recent few years, clearing of shrubs and trees and removal of herbaceous vegetation was carried out in several alkaline fens and spring fens in Ķemeri, Slītere and Gauja National Parks. For several years, calcareous spring fens have been managed in Abava River Valley, as well as in Čužu Mire where conditions are similar to calcareous fens (brush cutting, mowing).

The eradication of invasive plant species, mainly *Heracleum sosnowskyi* has been carried out in spring habitats in Gauja National Park and in Raunas Staburags (also elsewhere in smaller areas).

At present, there is a lack of experience in grazing of fens. In the future, extensive grazing could be one of the sustainable methods used for maintaining open fen areas.

6.5. Outcrops and caves

In Latvia, outcrops and caves are among the most popular tourist attractions and are influenced by high visitor load, which often cause damage to the habitat and species found on outcrops and in caves (e.g. disturbance to bats, damage to habitats of rare moss and lichen species). During the management of these habitats, both positive and negative experience is gained, and it allows choosing better solutions in order to prevent or, at least, to reduce undesirable effects. Infrastructure elements aimed at reducing the visitor pressure have been constructed in many popular tourist attractions, and information boards explaining the desirable behaviour are installed. There have been attempts to establish restrictive barriers and redirect visitors to less sensitive destinations (this measure was applied, for example, near Kalējala Cave) and to close caves using bar gates (Līgatne Cellar Caves) to prevent disturbance to bats. However, the infrastructure does not always help to reduce the load. Often, it has caused the adverse effect by attracting larger number of visitors than before and causing more damage to the outcrops.

6.6. Forests

Since the late 1990s, various methods have been used in restoring and diversifying forest habitats in Latvia. In order to increase the diversity of the forest structure and to mimic natural disturbances, prescribed burning has been carried out in dry coniferous forests in the surroundings of Mežole and Taurkalne and in Ādaži Protected Landscape Area. This method is aimed also at reducing the thickness of moss and litter layer which can cause decline or local extinction of several rare, light-demanding species. Prescribed burning promotes development of multi-aged stand structure – natural regeneration can be observed in patches with bare soil. Presence of burnt dead wood is the key factor for the conservation of many rare species (invertebrates, vascular plants, lichens). Also the advance growth of Norway spruce *Picea abies* is reduced in burned sites, which is important for the habitat quality for *Tetrao urogallus*. Prescribed burning has been widely used in many countries for a variety of nature conservation purposes for at least 20 years including restoration of conditions suitable for rare species. Technically, the method of prescribed burning is well-approbated and regularly applied in restoring the heaths in Ādaži Protected Landscape Area since 2009. In Ādaži, prescribed burning was used also for the diversification of structure of coniferous forests (in 2017). Removal of moss layer has been used as an alternative to prescribed burning (Rāzna National Park). Although this method can be used locally in patches, it is inefficient and unsustainable if compared to prescribed burning.

To improve the habitats for invertebrate diversity, the insolation at the trunks of large trees was improved by clearing the dense advance growth around these trees (for example, in Ukru gārša Nature Reserve). Stand diversification and creation of dead wood has been carried out in several places (for example, Gauja National Park, Ādaži Protected Landscape Area). In broadleaved forests, spruce advance growth and subcanopy layer was removed in order to improve composition of the characteristic species and to prevent undesired soil acidification (for example, in Paņemūnes meži and Tebras ozoli Nature Reserves). Ring-barking has been applied to increase the volume of dead wood (for example, micro-reserve in Rēzekne municipality).

To prevent drainage influence, in two territories (the surroundings of Smiltene and in Gauja National Park) the drainage ditches were filled in. In many cases, rewetting of raised bogs by blocking of ditches was beneficial also for improving the condition of bog

woodlands (for example, in Vasenieki Mire, Aizkraukle Mire). Bog woodlands are important for the conservation of capercaillie (*Tetrao urogallus*) population, therefore in several areas the advance growth was removed to restore the capercaillie population (Ziemeļgauja, Klāņi Mire, Stikli Mire, Veclaicene).

7. Development of the Natura 2000 Programme

7.1. Development process and data used

The programme was developed by a team of experts. Experts specialising in coastal dunes and heaths, freshwater habitats, grasslands, mires, outcrops and caves, and forests were responsible for each group of habitats. The work was supervised by editors. During the project, other competent experts and specialists working in nature conservation field were also asked to give their opinion on various matters.

The work on Natura 2000 Programme was commenced by gathering the data on occurrence and quality of all EU protected habitat types present in all Natura 2000 sites in Latvia. In order to acquire the basic information, Natura 2000 standard forms or the so called Natura 2000 database (available at natura2000.eea.europa.eu) was used. The data on many sites were insufficient, e.g. rather often the data on condition of individual habitat types and factors affecting them was missing. For several sites, the list of habitats was also incomplete or needed improvements (it did not correspond to the actual information). After critical evaluation, additional information sources were used:

- nature management plans for protected nature areas;
- forms filled in by experts when establishing micro-reserves (both of micro-reserves with Natura 2000 status and micro-reserves which are established within the Natura 2000 sites if they contain important information on species and/or habitats in the territory);
- data from the National Biodiversity Monitoring Programme, sub-programme "Natura 2000 sites" (2008–2014): maps of EU protected habitat types and monitoring protocols filled in for habitat monitoring transects (data available in the national information system – Nature Data Management System "Ozols", and Nature Conservation Agency);
- different project reports;
- survey reports;
- scientific papers;
- for grasslands, information on EU protected grassland habitat types which were eligible for agri-environmental payments under the Rural Development Programme measure "Maintenance of biodiversity in grasslands" (data provided by Rural Support Service, 2013);
- all available data layers and maps in the national information system – Nature Data Management System "Ozols";
- unpublished information and opinions provided by professionals working in nature conservation and management (Nature Conservation Board, other institutions, environmental inspectors, certified experts in the field of protection of species and habitats).

When collecting the data, the expert team concluded that in some areas additional data were necessary, therefore Natura 2000 territories were partly inventoried (ca. 85 Natura 2000 sites were visited during the project), mainly focusing on uncertainties and management needs. Habitats of EU importance were mapped in four Natura 2000 sites where the data on habitat types and their distribution were missing (Gargrodes purvs, Brienamais purvs, Mežole, Bejas mežs). In Augšdaugava the survey of semi-natural grasslands covered part of the territory.

The need for management measures in each Natura 2000 site was discussed in several regional seminars by professionals and other persons interested in the process (employees of the regional administrations of Nature Conservation Agency, experts from JSC "Latvian State Forests", managers working in Natura 2000 territories, species and habitat experts, etc.). As a result, it was possible to update the scientific information on habitats (their presence, areas, quality) for many Natura 2000 sites.

Restoration and management priorities at the national level (*see Chapter 9*) were determined by NAT-PROGRAMME experts using common criteria (*see Chapter 7.2.*). Restoration and management priorities in each habitat group were discussed at least in one seminar organized by the project team. After seminars, information was published on the NAT-PROGRAMME project website and sent to experts who expressed interest in the priority selection. Proposals were received from experts working in non-governmental organizations, as well as from independent experts, experts from the JSC "Latvian State Forests", regional administrations of Nature Conservation Agency. Proposals were evaluated and, in cases where they were well-grounded, taken into account when supplementing or adjusting the priority lists.

The work included also evaluation of River Basin District Management Plans encompassing also Flood Risk Management Plans. Management measures and activities provided in these planning documents were evaluated, and potential contradictions between these planning documents and the Natura 2000 Programme were eliminated.

7.2. Cost estimation

To estimate the costs of habitat management, the actual costs of habitat restoration and management within different projects (2010–2017) were summarised. One-off costs included, for example, clearing of shrubs in grassland. Re-current costs (regular management/

maintenance) included, for example, annual mowing. **Cost estimations provided in the Natura 2000 Programme are approximate and must be specified after understanding the necessary activities and most suitable solutions in the particular area.** Costs of similar work may largely vary depending on the geographical location, the complexity of the work, the availability of workers and special equipment and other factors (Jātnieks, Priede 2017). Cost estimations include also preparatory activities (work of experts, construction projects, etc.), and administrative costs (in total estimated as 20% of the sum of direct costs). Recurrent costs (regular management) apply only to areas where the restoration of habitats is planned (priority areas). Total costs of management of all habitats in the Natura 2000 sites listed among the priority areas might be significantly higher. It is likely that costs will probably increase over time, in a way which is difficult to predict, therefore the actual costs for the entire period of the Natura 2000 Programme were not calculated.

7.3. Selecting priorities

In order to select priorities, the most recent data were used. Recent (less than five years old) habitat mapping data[7] were not yet available for most of Natura 2000 sites, therefore the use of quantitative data was limited. To reduce inaccuracies that would inevitably result from incomplete information, a qualitative approach was used for selecting the priorities. Qualitative criteria were developed and advice from competent experts was gathered, as well as advice from various other professionals (site managers, sectoral experts, inspectors working in Nature Conservation Agency; experts with good knowledge of the area concerned). The final decision on the priorities in each habitat group (coastal habitats, heaths, rivers and lakes, mires and springs, outcrops and caves, forests) was made by the experts involved in the project team. The assessment was based on data and, in cases of incomplete data, on evaluation of all available information, including field surveys.

The first step was selection of restoration and management priorities in each habitat group. The second step was selection of the priority Natura 2000 sites where the restoration and management of these priority habitats was the most urgent.

Habitats and areas with habitats for which only non-interference regime (e.g. prevention of disturbance) must be ensured are excluded from the priority list, though it does not mean that they are of lower importance in terms of conservation value than those for which active measures are required. Non-interference regime may include change of functional zoning within the protected nature area or adjusting the border – more in *Chapter 11.1*), regular control of compliance with the rules, and immediate response to violations.

The priority list reflects only the most urgent needs. Absence of some habitat types and Natura 2000 sites in the priority list does not mean that they have no importance in biodiversity conservation. However, when comparing the urgency of necessary activities and taking into account the limited funding, actions for habitats of lower priority can be postponed to a later date. This does not mean that the necessary actions indicated in action lists in Part II of the Natura 2000 Programme can not be implemented, for example, by local initiatives, joint voluntary work, using private funding, or in other ways.

When selecting priorities, first of all the basic criteria and additional criteria provided in Step 1 were applied. Step 1 allowed identifying the priority habitat types. Then, using criteria provided in Step 2, priority Natura 2000 sites, where the restoration and management of priority habitats are the most urgent, were selected.

Step 1. Selection of priority habitat types in terms of management urgency.

Basic criteria (at least two criteria must be met)

A. Habitat types which are included in the Annex I to Habitats Directive, or potentially correspond to such habitat type (or are severely degraded but with restoration potential)[8]. The distribution range of this habitat type in Latvia and in the EU is decreasing and/or habitat condition is poor (and/or declining).
B. In the Article 17 Report required by the Habitats Directive for the period 2007–2012 (Anon. 2013) the habitat conservation status is assessed as unfavourable- bad (U2) or unfavourable-inadequate (U1); the conservation status has a tendency to decline; the particular habitat type (or group of similar habitats) is rare or very rare in Latvia.
C. In Latvia, the area occupied by the habitat type has decreased over the last decades and continues to decline due to increasing fragmentation.

Additional criteria (compliance with at least one criterion increases the importance of a habitat in terms of priority)

D. Habitat-specific species, including protected ones, are at risk of local extinction due to deterioration of habitat quality and isolation; reduction of its distribution range is expected in the forthcoming decades.

[7] Data which are being gathered during the habitat inventory within the project "Preconditions for better biodiversity preservation and ecosystem protection in Latvia", KF No 5.4.2.1/16/I/00 (2016–2020), implemented by the Nature Conservation Agency.

[8] See more in Chapter 7.5.

E. The habitat is the only or almost only locality of at least one species listed in Annex II to the Habitats Directive or in the Birds Directive, or species which is very rare (with very few localities), protected in Latvia, or it is important for migration, breeding or other important part of species life cycle, or it is a habitat of protected species with rapidly decreasing distribution.

Step 2. Selection of Natura 2000 sites of the highest importance for the protection of the priority habitat types.

Criteria (at least four criteria must be met)

F. In the particular Natura 2000 site there are significant areas covered by the specific habitat and/or this habitat is very typical with high representativity (at least B)[9] which is important for the provision of favourable conservation status in the whole country.
G. The restoration of this particular habitat in this area is important for the conservation of particular habitat type at a national level or at level of the EU Boreal biogeographical region[10]. Loss of the habitat in this Natura 2000 site may reduce its distribution range.
H. In the particular Natura 2000 site, the habitat is degraded, but capable to recover; restoration will lead to a significant improvement of the condition and/or will increase the habitat area.
I. It is possible to ensure sustainable habitat management and favourable protection regime.
J. The estimated habitat restoration costs in the particular Natura 2000 site are adequate to the benefits.
K. Habitat restoration in the particular Natura 2000 site does not have adverse effects on other protected habitats or important species, and/or does not raise environmental or socio-economic problems.

Exceptions

Very rare natural habitats and semi-natural habitats (all types of semi-natural grasslands, juniper formations, all habitat types of heaths, all habitat types of grey dunes, alkaline fens, and springfens) are exceptions in Step 2. They are ranked as the priority in any area, as they are critically endangered throughout Latvia, their areas are rapidly decreasing and/or they may soon disappear from several localities if they will not be urgently restored. This is supported by the fact that, at EU level, Regulation No 1307/2013 (Article 45) requires Member States to identify ecologically sensitive grasslands which must be strictly protected, in territories which are subject to the Habitats Directive or the Birds Directive (may also be established outside those territories). In Latvia, grasslands which are recognised as EU protected grassland habitat types and bird habitat of EU importance are designated as ecologically sensitive grasslands[11]. In Latvia there is a goal to preserve ecologically sensitive grasslands in the area of 47,000 ha (LAD 2016). In 2016, "Agri-environment and Climate", a subprogramme of the Rural Development Programme, financially supported the management of 32,619 ha in total (LAP 2014-2020). The scientific assessment shows that 32,619 ha are insufficient for long-term conservation of these habitats, and also 47,000 ha area is too small. The target area should be at least 130,000 ha (Rūsiņa 2017).

However, in all cases, the habitat types mentioned above are placed in the final list of the priorities after considering all circumstances. They are not a priority in cases when their preservation is not perspective if corresponds to all conditions below:

L. in the particular Natura 2000 site, patches of these habitat types cover less than 1 ha each, and they are isolated (more than 500 m away from similar habitat types);
M. it is not possible to increase the area of these habitat types – the area of these habitat type in the territory was not ever significantly larger; they are isolated because there are no larger massifs of semi-natural grasslands (or heaths, grey dunes, alkaline fens) in the vicinity;
N. there is no evidence that they are significant for biodiversity conservation in the particular Natura 2000 territory.

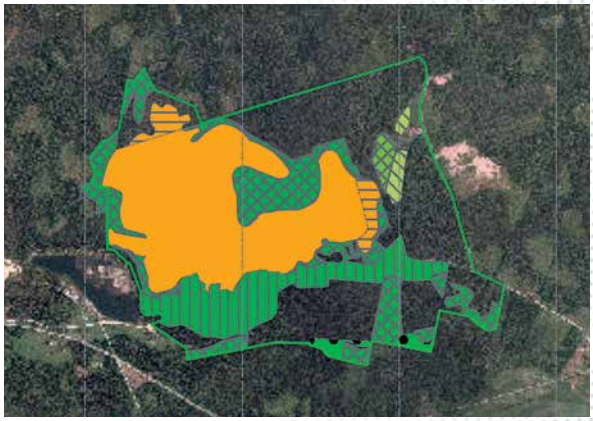
Examples of selecting priorities by using criteria of Step 1 and Step 2 are given in Table 1 and Table 2. Two habitat types in different Natura 2000 sites are analysed.

[9] Representativity is a parameter in the Standard Data Form for Natura 2000 sites. It describes how typical a specific habitat type is in a particular territory. This indicator can only be assessed when using the habitat interpretation manual and characteristics defined here (abiotic conditions, species composition, etc.). Here, in order to meet the criterion, the representativity rating should be A or B (C and D are inappropriate in this case).

[10] EU is divided into biogeographical regions; the entire territory of Latvia falls in the boreal biogeographical region.

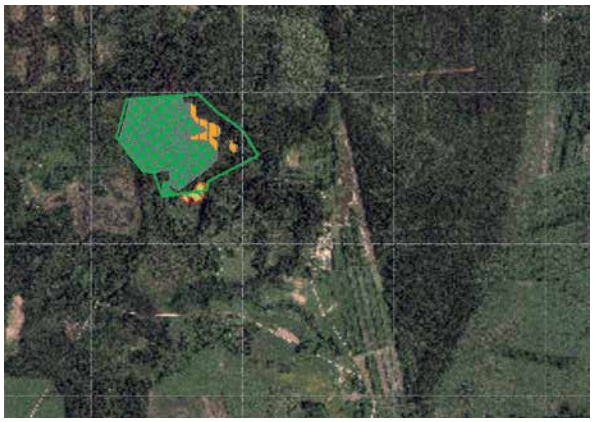
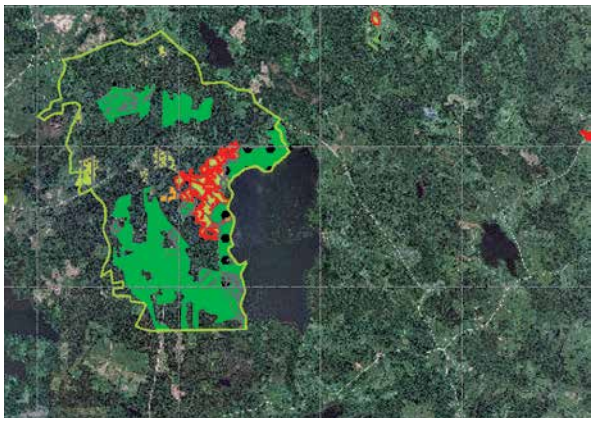
[11] Regulation No. 126. of 10 March 2015. Procedures for Granting of Direct Payments to Farmers.

Table 1. Prioritization of raised bogs (7110* and 7120): Natura 2000 sites "Abavas senleja" and "Mazie Kangari".

	
Raised bog in Natura 2000 site "Abavas senleja". Area of Natura 2000 site: 14 933 ha. Total area of habitat type 7110*: 3.2 ha.	Raised bog in Natura 2000 site "Mazie Kangari". Area of Natura 2000 site: 348 ha. Total area of habitat type 7110* and 7120: 113.7 ha.
Compliance with the criteria given in Step 1	
A, B, C – comply D – complies (the bog is one of the two localities of *Myrica gale* outside the Coastal Lowland), E – does not comply	A, B, C – comply D, E – do not comply
In both cases, the habitat is considered as priority.	
Compliance with the criteria given in Step 2	
K – complies F, G, H, I, J – do not comply	F, H, I, J, K – comply G – does not comply
Exceptions are not relevant to raised bog habitat (as they are not very rare or semi-natural).	

Result. The restoration of raised bogs in **Mazie Kangari** is a priority as it corresponds to all minimum criteria. The raised bog covers rather large continuous area and is preserved in rather natural condition, though part of its area has been adversely affected by drainage. It is possible to restore the degraded part of bog with good results.
In **Abavas senleja**, the restoration of habitat is not considered as a priority (meets just one of the four criteria in Step 2). The bog area is small, very overgrown; there are no ditches, so that the only way to restore open landscape is regular felling of trees. There are also few habitat-characteristic species in the ground vegetation, the bog is dry, and the coverage of Sphagnum mosses is low, thus the expected result is unlikely to justify the resources invested.

Table 2. Prioritization of restoration of Fennoscandian lowland species-rich dry to mesic grasslands (6270*): Natura 2000 sites "Kalēju tīrelis" and "Istras paugurai

	
Fennoscandian lowland species-rich dry to mesic grasslands in Natura 2000 site **"Kalēju Tīrelis"**. Area of Natura 2000 site: 41 ha. Total area of habitat type 6270*: ~1 ha (of them 0.7 ha are located outside Natura 2000). This is the only patch of this habitat type in the surrounding landscape (which is dominated by woodlands, mires, fallow-lands).	*Fennoscandian lowland species-rich dry to mesic grasslands* in Natura 2000 site **"Istras Pauguraine"**. Area of Natura 2000 site: 861 ha. Total area of habitat type 6270*: ~37 ha. Habitat type forms a large continuous area, and there are many other semi-natural grasslands in the surroundings (both 6270* and other protected grassland habitat types).
Compliance with the criteria in Step 1	
A, B, C – comply D, E – do not comply	A, B, C – comply D, E – do not comply
In both cases, habitat is considered as priority.	
Compliance with the criteria in Step 2	
K – complies F, G, H, I, J – do not comply	H, I, J, K – comply F, G – do not comply
There is a relevant **exception** – semi-natural grasslands are critically endangered in the entire country and their area is decreasing, thus the criteria are applicable.	
L, M, N – comply	L, M, N – do not comply
Result. Restoration of *Fennoscandian lowland species-rich dry to mesic grasslands* in **Istras Pauguraine** is a priority as it complies to all the minimum criteria; there is a high restoration potential of grasslands (characteristic species are still present; there are similar habitat patches in the surrounding landscape). The expected result after clearing of shrubs is about 40 ha of restored habitat where regular management can be implemented. In **Kalēju Tīrelis**, restoration of this habitat type is not considered as a priority (meets just two of the four minimum criteria in Step 2). Here, the habitat is isolated, covers very small area, has overgrown and modified by paludification. The expected habitat area after restoration is maximum one hectare.	

Detailed planning of habitat restoration and management is possible only if detailed restoration plans are developed for the particular area. These plans must be based on recent (up to five years old) habitat inventories. The habitat inventory must be supplemented with evaluation of the restoration and management possibilities. Such plans are available in very few cases, therefore the areas where management is necessary are highlighted, but there is no detailed description provided of measures to be applied.

The Natura 2000 Programme experts advise to carry out **detailed planning prior to any activities recommended in this document. Prior to applying to any funding the target area must always be visited and carefully evaluated – not only the particular habitat, its area and impacts, but also the surrounding areas to understand the conditions which may hinder the restoration or management.** In some cases, habitat restoration and management with currently available solutions may be impossible due to specific circumstances, even though the restoration of this habitat is a priority in the territory or even at a national level. In this case, alternative solutions should be considered, such as maintenance of the habitat at the minimum acceptable quality, until it is possible to achieve a better condition. The information necessary for the management planning can change in a relatively short time (within a few years), therefore it must be updated regularly, and habitat classification and assessment of impacts must be complemented with the aspect of habitat management.

7.4. The structure of the description of Natura 2000 territories in this document

The volume of Natura 2000 Programme is limited, therefore the descriptions of Natura 2000 territories are brief and include only the most important information. Management measures proposed are not described in detail – methods, which are the most appropriate for the particular site and conditions, must be always adjusted to the specific situation. In cases when the habitat restoration is complicated and require several permits (for example, rewetting), site investigation is necessary including various measurements, and projects involving building must be developed taking into account all legal requirements. In order to ensure appropriate conservation of the species, it is always necessary to examine what measures are recommended in the species conservation plan of the particular species, if such is developed and approved.

The description of each Natura 2000 territory is structured as follows:

- **brief description of the territory** – includes the most important nature assets (species, habitats, geological formations);
- **threats to habitats and species** – threats which are relevant to the particular territory – both currently or have been significant in the past, or those potentially affecting habitats and species in the future;
- **management performed and brief assessment of its effectiveness** – major management measures and their evaluation if such information is available (unfortunately often management has been carried out without monitoring or any type of evaluation);
- **restoration and management priorities;**
- **necessary management and protection measures** – consists of two parts (in most of the cases) – *General measures* and *Specific measures*.

General measures (if necessary in the particular territory) include activities that are necessary but are not targeted at a particular habitat type, such as improving the habitat map, changes in site borders, changes in functional zoning, site survey prior to starting the management, development of building project prior to rewetting, monitoring related to the assessment of restoration success, etc.

Specific measures include a table with protected habitat types of EU importance (several names of the habitat types are abbreviated in the tables, please see Appendix 2 for full names) and their area (hectares and per cent of the entire territory), habitat quality assessment, and list of restoration and management actions – one-off and/or re-current measures. In some cases, also actions for the key species are provided if the actions for habitats are insufficient for their protection. Restoration and management measures are described in general. Site-specific management methods must be chosen on a case-by-case basis, assessing site conditions, available resources, etc. The methods and substantiation of their choice have been described in the NAT-PROGRAMME Protected Habitat Management Guidelines.

The Natura 2000 Programme does not include a broader assessment of habitats in the landscape-ecological context (including adjacent areas outside Natura 2000 sites), which is essential for preserving the integrity of protected habitats and species and to reduce the fragmentation.

7.5. Restoration of potentially protected habitats

The Natura 2000 Programme is the first planning document in Latvia, which proposes actions for **potentially protected grassland and forest habitats**. In the current nature conservation practice in Latvia, the restoration is limited to areas that already meet at least the minimum criteria of protected habitats (Auniņš (ed.) (2013); Ikauniece et al. 2015; Lārmanis 2015; Rove 2015, etc.). Consequently, in practice, it has been assumed in most cases that the costs of project concerning nature restoration are allocable only to areas of protected

habitats with a quality that must be improved, but not for restoration of heavily degraded habitats in order to return them to a state of functioning ecosystems. However, the restoration of highly degraded ecosystems is widely practised in many European countries, also in areas that no longer meet the criteria for protected habitats (e.g. Gilbert, Anderson 2004; Morris et al. 2006; Kiehl et al. 2010).

In Latvia there are successful examples of cases when heavily degraded ecosystems have been restored to a functioning status and being suitable for rare and characteristic species. For example, alluvial grasslands suitable for Great Snipe (*Gallinago media*) were restored in floodplains which were completely overgrown with shrubs and secondary forests (LIFE-Nature project "Restoration of Latvian Floodplains for EU Priority Species and Habitats", LIFE04 NAT/LV/000198, 2004–2008; LIFE+ project "Restoration of Corncrake habitats in Dviete floodplain Natura 2000 site", LIFE09 NAT/LV/000237, 2010–2015). Semi-natural grasslands were created, and stopover and feeding sites for migratory birds were restored in degraded drained fallow-lands and cultivated grasslands in Dundurpļavas grassland area in Ķemeri National Park (LIFE-Nature project "Conservation of Wetlands in Ķemeri National Park", LIFE02 NAT/LV/008496, 2002–2006).

In many cases, it is possible to restore degraded areas to a condition where, over time, they become similar to natural (or semi-natural) habitats and/or become suitable for protected species. For example, by raising and stabilizing water level in extracted peatlands, it is possible to promote establishment of mire vegetation and, over time, the development of structures which are characteristic to mires, also contributing to the return of the mire species, even though at present they do not meet the minimum criteria for protected habitats. Young forest plantations correspond to the category of potential protected habitats if they can meet the natural forest habitat criteria after taking appropriate measures (creation of canopy gaps, increasing the volume of dead wood, etc.). On former arable land, it is possible to create species-rich grasslands that can, in time, become equivalent to semi-natural grasslands.

Only when accepting and applying such approach in practise, Latvia will be able to prevent the reduction of protected habitats as required in the Habitats Directive. For example, in the reports of 2006 and 2012 on the condition of EU protected grassland habitats (Article 17 report), the conservation status of almost all protected grassland habitats was assessed as unfavourable, with a tendency to decline. In the period 2007–2016, the area of protected grassland habitats of EU importance in which management was supported by Rural Support Service has decreased by at least 812 hectares. Approximately 35,000 hectares of EU protected grassland habitats have not been managed for more than 10 years. Most likely, many of them are irreversibly lost (AREI 2016; LVAEI 2016). The abovementioned approach would allow to at least partially compensate the areas of the lost habitats.

The potentially protected habitats in the Natura 2000 Programme **are indicated by codes 6000 (grasslands) and 9000 (forests).** Such an approach has been taken from the practice of semi-natural grassland inventories, where, since 2014, code 6100 is used for habitats restored with means of public funds (LIFE programme, Latvian Environmental Protection Fund, etc.). Prior to restoration they do not correspond to any protected grassland habitat type, but it is clear towards which habitat type the conditions will develop. Currently, this approach is used in practice for restoring protected grasslands which are heavily overgrown. However, wider use of this approach, including other threatened habitat types, is necessary.

Code 6000 is assigned to grassland areas and code 9000 to forest areas where recovery of a protected habitat is possible and highly probable (after applying specific restoration measures). **The areas of potentially protected habitats selected within the scope of this programme are indicated only in Natura 2000 sites where the primary land use is nature conservation and where the land use that may conflict with habitat conservation (such as construction, ploughing up) is not permitted.** Potential restoration sites should be selected only after country-scale habitat mapping[12], using the following criteria:

- use of grasslands in the past (at first, grasslands must be restored in sites where they existed earlier but have overgrown with shrubs and secondary forest, or transformed into reedbeds);
- landscape-ecological connectivity (grassland restoration is a priority in sites where habitat connectivity must be improved or "stepping stones" must be created ensuring the species distribution within the landscape);
- restoration potential (intensively cultivated sown grasslands and arable lands are not the primary target of semi-natural grassland restoration; only grasslands which have been extensively managed or abandoned for a long time and where natural recovery is ongoing are the potential sites of restoration).

This system of assigning codes currently is used only for grasslands and forests in the Natura 2000 Programme. However, it is recommended to develop this method also for other groups of habitat types, and to implement it in the nature conservation practise. This requires clarification and explanation, and awareness of all parties involved.

[12] Data which are being gathered during the habitat inventory within the project "Preconditions for better biodiversity preservation and ecosystem protection in Latvia", KF No 5.4.2.1/16/I/00 (2016–2020), implemented by the Nature Conservation Agency.

8. Financial instruments for habitat restoration and management in Natura 2000 sites

There are four priority areas set out in the EU Action Plan for Nature, People and the Economy (European Commission 2017, *see also Chapter 3*), including priority C: Strengthening investment in Natura 2000 and improving synergy with EU funding instruments. Action plan aims at strengthening investments in nature and helping the Member States to improve their financial planning for Natura 2000. The action plan aims at increasing the budget share of the LIFE programme, thus giving Member States greater opportunities to raise funding for biodiversity conservation and restoration. It also helps to attract larger funding for the biodiversity conservation in Latvia. The success of the implementation of this action plan will determine the extent to which the priorities outlined in the Natura 2000 Programme can be implemented.

Also the **Environmental Policy Strategy for Latvia (2014–2020)** emphasizes the need to increase funding for the management of protected nature areas, which would help to provide conservation of nature values and develop local entrepreneurship (VARAM 2014).

The potential sources of funding available during the Natura 2000 Programme period are listed in Table 3. The potential use of EU funds for habitat restoration and management shown in Table 3 is in line with EU fund regulation which is in force in the period of 2014–2020. While updating the Natura 2000 Programme, sources of funding available after 2020 (unknown in 2017) should be revised. Until the new programme period (until 2020), only state budget and co-financing from the LIFE programme is available for implementing the priority actions.

In the planning period of 2014–2020, the most significant source of funding for large-scale projects is the LIFE program, as well as the Latvian Environmental Protection Fund for smaller-scale activities. The co-financing from the Latvian Environmental Protection Fund constitutes a significant proportion of the co-financing necessary for the implementation of the projects funded by the LIFE programme. In most cases, funding is available for one-off actions (habitat restoration) but not for regular management.

Instruments that do not directly finance the habitat restoration and management (for example, funding for research, public involvement and education, institutional capacity building) are not analysed in Natura 2000 Programme, although these might indirectly contribute to the nature conservation.

Table 3. Available funding for habitat restoration and management*.

Activity	Coastal habitats and heaths	Rivers and lakes	Grasslands	Mires and spring habitats	Outcrops and caves	Forests
Habitat restoration	LIFE, LEPF, CF	LIFE, LEPF, LZF, CF	LIFE, LEPF, CF	LIFE, LEPF, CF	LIFE, LEPF, CF	LIFE, LEPF, CF
Regular management (maintenance)	NA	LFF	RDP MBDG	RDP MBDG NA	NA	NA

* Potential funding from private funds, non-governmental organizations, municipalities and JSC "Latvian State Forests" is not included in the table, as it may be available during the Natura 2000 Programme period but it is not predictable.

CF – Cohesion Policy Funds, programme "Competitiveness and Employment", specific objective "Conservation and restoration of biodiversity; protection of ecosystems", measure 5.4.1.2. "Activities for restoration of habitat and species protection",
LIFE – EU LIFE programme,
RDP MBDG – Rural Development Programme, measure "Agri-environment and Climate", activity "Maintenance of Biodiversity in Grasslands",
LEPF – Latvian Environmental Protection Fund,
LFF – Latvian Fish Fund,
NA – not available.

9. Costs of restoration and management of priority habitats in Natura 2000 sites

A table for each respective habitat group shows the habitat types (or habitat groups) in which restoration and management is a priority and Natura 2000 sites which are the most important in restoring these habitats, as well as approximate costs of actions necessary (more on cost estimation – *see Chapter 7.2.*).

The total habitat restoration and management costs are shown in Table 4.

The main restoration and management methods are listed for the each group of habitats (for details, see NAT-PROGRAMME Protected Habitat Management Guidelines). However, this does not exclude the use of other methods if they are suitable for the particular circumstances. Potential interactions must also be taken into account (how the planned work might influence neighbouring habitats, hydrologically or otherwise related habitats). In a mosaic of habitats, it is difficult or even impossible to plan activities in a single habitat type, ignoring the others in the neighbourhood. Even if they are not included in the list of priorities, their management is still necessary. Therefore, when planning actions, it is recommended to cover a mosaic of all similar habitats.

Table 4. Total costs of habitat restoration and management.

	Costs (EUR)	**Costs (EUR) including administrative costs**
Total costs of restoration of priority habitats	30,993,930	37,192,716
Total costs of management (maintenance) of priority habitats (once per year or per one time)	2,085,050	2,502,060
IN TOTAL	**33,078,980**	**39,694,776**

9.1. Coastal habitats and heaths

Table 5 shows the priority coastal and heath habitats (target habitats), their area size and the priority Natura 2000 sites for their conservation in Latvia, as well as approximate costs[13].

[13] Except for administrative costs (calculated as 20%) which are given in Table 4; the same applies to the costs in all groups of habitats.

Table 5. Costs of restoration and maintenance of the priority coastal and heath habitats.

Natura 2000 site	EU protected habitat types (target habitats), area (ha)						One-off restoration costs (EUR)	Regular maintenance (EUR/year or per time)
	1150*	2130*, 2140*, 2170	2180	2190	4010	2320, 4030		
Bernāti				3			2100	600
Engures ezers	20	3					8500	7600
Grīņi Strict Nature Reserve					60		45700	
Ģipka				28			20400	2000
Ovīši				10[14]			6300	2000
Pape		20					22200	4000
Pāvilostas pelēkā kāpa		10					4200	800
Piejūra	10	30	50				19500	5000
Randu pļavas	14						21000	5000
Slītere National Park		15	40				88 500	3000
Sventājas upes ieleja						4	2300	1000
Užava		50					31000	4000
Ziemupe		20	50		50		44850	6000
						IN TOTAL	**296 150**	**41 000**

For habitat code explanations – see Appendix 2.

Most frequently used restoration and management methods of coastal habitats and heaths:

- partial or complete removal of trees and shrubs – grey dune, humid dune slack, lagoon, wet and dry heath habitats;
- topsoil removal, creation of bare sand patches – grey dune, humid dune slack, wet and dry heath habitats;
- mowing and removal of grass and dwarf shrubs; grazing – grey dune, humid dune slack, and wet heath habitats;
- rewetting, improvement of hydrological regime – lagoon, humid dune slack, and wet heath habitats;
- regular mowing and removal of reeds and grass; grazing – lagoons and surrounding grasslands;
- improving of the forest structure by creating canopy gaps, topsoil removal, removal of excess shrub cover, increase of dead wood volume – wooded dunes;
- prescribed burning – wooded dune, grey dune, wet and dry heath habitats;
- eradication of invasive and expansive species – all coastal habitats and heaths.

9.2. Rivers and lakes

The priority river and lake habitats (target habitats), their area size and the priority Natura 2000 sites for their conservation in Latvia, as well as approximate costs are shown in Table 6.

[14] Restoration together with grey dunes.

Table 6. Costs of restoring and maintaining the priority habitats of rivers and lakes.

Natura 2000 site (and water objects concerned)	**EU protected habitat types (target habitats), area (ha)**				One-off restoration costs (EUR)	Regular maintenance (EUR/year or per time)
	3130	3140	3150	3260		
Abavas senleja Rivers Abava, Imula, Amula, Īvande, Kroja, and other				217	21000	3000
Ādaži (Lake Mazuika)	25				10000	5000
Augstroze (Lake Dauguļu Mazezers)	62				2000	
Augšdaugava (Lake Varnaviču)			55		7000	1000
Augšzeme (Lake Sventes)			735		7000	1000
Baltezera purvs (Lake Baltezers)	35				1000	500
Cārmaņa ezers			222		2000	500
Dridža ezers (Lake Drīdzis)		748	141		5000	1000
Dridža ezers (Lake Ota)	160				2000	1000
Dūņezers			135		70000	3000
Engures ezers		2951			90000	7000
Gauja National Park				776	57000	5000
Gauja National Park (Lake Driškins)	17				2000	500
Gauja National Park (Lake Ungurs)	393				20000	1000
Jaša				20	900	700
Kapu ezers	8				2000	
Kaučers (Lake Salmejs)			104		2000	
Krustkalni Strict Nature Reserve (Lake Dreimaņu)			126		1000	
Klaucānu un Priekulānu ezers			40		1000	500
Kurjanovas ezers		126			2000	2000
Ķemeri National Park (Lake Aklais in Sloka)		42			1000	
Ķemeri National Park (Lake Kaņieris)		1205			32000	3000
Ķemeri National Park (Lake Slokas)		250			10000	1000
Ķemeri National Park (Rivers Vēršupīte, Vecslocene, Slocene)				8,5	72000	3000
Laukezers	52				250	250
Liepājas ezers			3715		5500	5500

Table 6. Costs of restoring and maintaining the priority habitats of rivers and lakes.

Natura 2000 site (and water objects concerned)	**EU protected habitat types (target habitats), area (ha)**				One-off restoration costs (EUR)	Regular maintenance (EUR/year or per time)
	3130	3140	3150	3260		
Lubāna mitrājs (Lake Lubāns)			8166		9000	2000
Maizezers	5				1000	500
Melturu sils				10	28000	2000
Ojatu ezers	28				1000	1000
Pinku ezers	29				7000	2000
Pape			708		177000	7000
Piejūra (Lake Dienvidu Garezers)	12				2000	500
Piejūra (Lake Ummis)	25				3000	2000
Pokratas ezers			10		3000	1000
Rāzna National Park (Lake Rāzna, Lake Ežezers, Lake Olovecs)			7260		40000	5000
Rāzna National Park				5,0	8500	2000
Rauza				2,0	3000	2000
Ruņupe				25,1	10000	1000
Salacas ieleja				35	70500	7000
Seda			500		80000	7000
Šepka				17,5	12000	5000
Silabebru ezers	66				5000	1000
Silene (Lake Riču)			587		3000	
Slītere National Park				10	20000	3000
Tosmare		30			90000	7000
Veclaicene (Lake Raipuļu)	36				1000	
Vecpiebalga (Lake Alauksts)	775				5000	1000
Ventas ieleja				100,9	68000	7000
Ventas un Šķērveļa ieleja				5,9	9000	500
Vitrupes ieleja				8,6	5600	1000
Ziemeļgauja				655	25000	3000
				IN TOTAL	**1112250**	**115950**

For habitat code explanations – see Appendix 2.

Most frequently used restoration and management methods for rivers and lakes:

in lakes – removal of emergent aquatic macrophytes, mowing of belts in reed stands, removal of roots of aquatic macrophytes, removal of excess biomass; establishment and maintenance of grassland belts along the lakeshores and oxbows; ensuring functionality of streams: removal of large woody debris and beaver dams in stretches where the riverbed is dominated by boulders or pebbles (river rapids of high quality, suitable for spawning of *Lampetra planeri, L. fluviatilis,* and salmonids); restoration or creation of habitats for *Margaritifera margaritifera*; reduction of excess aquatic macrophytes overgrowth.

9.3. Grasslands

The priority grassland habitats (target habitats), their area size and the priority Natura 2000 sites for their conservation in Latvia, as well as approximate costs are shown in Table 7.

As priority grassland habitats all semi-natural grasslands have been selected except for 6110* *Rupicolous calcareous or basophilic grasslands of the* Alysso-Sedion albi (in Latvia, this habitat occurs outside its basic distribution range and covers very small areas, thus being of low significance for conservation of this habitat type at EU level) and 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels* (its conservation status is favourable in Latvia). Taking into account the limited funding, the sequence of priority for semi-natural grasslands should be as follows (from the highest to the lowest): 6120*, 6230*, 6410, 6210, 6530*, 6450 (for alluvial grasslands, priority areas are those significant for *Gallinago media*), 6270*, 6510.

Individual semi-natural grassland habitat types cannot be viewed separately from each other, as most of the species in semi-natural grasslands inhibit a variety of grassland types. Therefore, the conservation of one grassland habitat must always be planned along with conservation of all other grassland habitats in the adjacent area. For this reason, the lists of habitat types in particular Natura 2000 sites are indicative. If the restoration and management of a particular habitat type is planned, then restoration of all semi-natural grassland types in the priority Natura 2000 sites should be carried out. This would improve the connectivity of grassland species which is crucial in preserving rich and diverse grassland ecosystems. Therefore, both the areas of priority habitats and other grassland habitats (which are considered to be the "supporting" habitats that guarantee the long-term conservation of the priority habitats) are listed in Table 7. To facilitate the planning of work in cases of insufficient funding, restoration and maintenance costs for these habitat groups are indicated separately in Table 7 (habitats for which the restoration is a priority are highlighted). Habitat areas in priority Natura 2000 sites that are important to the higly protected species are not shown in Table 7, as the size of the area is unknown. It is assumed that the area size is the same as for habitats, as stable populations of these species can only exist if habitats for these species are in favourable conservation status.

Priority Natura 2000 sites for protected invertebrate species are: Abavas senleja (*Euphydryas aurinia, Lycaena dispar*), Ances purvi un meži (*Osmoderma barnabita, Lycaena dispar*), Diļļu pļavas (*Euphydryas aurinia, Lycaena dispar, Vertigo* spp.), Liepājas ezers (*Maculinea teleius, Lycaena dispar, Euphydryas aurinia, Vertigo* spp.), Slītere National Park (*Euphydryas aurinia*), Užavas augštece, Ziemeļgauja *(Lycaena dispar*), Ziemupe, and Ādaži (Maculinea arion).

Priority Nature 2000 sites for protected bird species are specific for particular species and groups of species. Priority territories for **Baltic Dunlin *Calidris alpina schinzii*** are Randu pļavas, Liepājas ezers (Liepājas Ezerkrasts Meadow and Vītiņu Meadows), Engures ezers (Mērsrags Meadow, the sea coast in Bērzciems), Piejūra (Daugavgrīva Nature Reserve). The current quality of the semi-natural habitats is not suitable for breeding (excessive reedbeds, shrubs, declining open grassland area). However, these are the only sites where the restoration of habitats suitable for this species is possible. Therefore, by restoring the bre≠eding habitat according to the NAT-PROGRAMME Protected Habitat Management Guidelines (Rūsiņa (ed.) 2017), it is possible to expect the return of the target species.

Priority Natura 2000 sites for **Great Snipe *Gallinago media*** are Lubāna mitrājs, Sitas un Pededzes paliene, Dvietes paliene, Rūjas paliene, Kuja, Burgas pļavas, Vidusburtnieks, Sedas purvs, Mugurves pļavas, Ziemeļgauja, and Dubnas paliene. In these territories, it is necessary to restore or at least improve the hydrological regime suitable for this species. In parts of the previously restored areas, belts of shrubs along the ditches have already developed. The optimal solution would be blocking the drainage systems, thus ensuring that they further do not interfere with management and do not promote development of dense linear shrub stands. Upon restoration, management of these areas should be ensured, avoiding shredding of mown grass.

Priority Natura 2000 sites for **grassland-breeding waders** (*Vanellus vanellus, Tringa totanus, Gallinago gallinago, Limosa limosa, Philomachus pugnax, Tringa stagnatilis, Haematopus ostralegus, Numenius arquata,* etc.) are Lubāna mitrājs, Liepājas ezers, Engures ezers, Dvietes paliene, Vecdaugava, Lielupes palienes pļavas, Svētes paliene, Burtnieku ezera pļavas, and Piejūra (Daugavgrīva Nature Reserve). For the conservation of grassland-breeding waders, it is not enough to concentrate on Natura 2000 sites. In the relatively recent past (<100 years), grassland breeders, such as *Philomachus pugnax* and *Tringa totanus* (unlike, for

example, *Calidris alpina schinzii* and *Gallinago media*) were abundant in many managed grasslands. Also nowadays, there is still a potential to restore the habitats of these species by providing the necessary grassland management. Grasslands currently inhabited by these species must be identified during the inventory of semi-natural grasslands. Using the possibilities offered by Rural Support Service (i.e. engaging in the activities of this program), the management of these grasslands can become financially attractive, both within and outside Natura 2000 sites.

Corncrake *Crex crex* is still a relatively common species in Latvia. However, a rather small proportion of its population can be found within Natura 2000 sites. Nevertheless, the largest groups of Corncrakes can be found in Natura 2000 sites with large areas of grasslands. For the conservation of Corncrake population, appropriate national rural development policy is important. The management of grasslands suitable for Corncrakes must be made financially attractive for landowners both within Natura 2000 sites and outside them.

Table 7. Costs of restoring and maintaining the priority grassland habitats.

Natura 2000 sites	**EU protected habitat types (the areas (ha) of target habitats are highlighted in bold and coloured; the rest are supporting habitats (second priority))**											**Priority habitats**		**Supporting habitats**	
Habitat type	**1630***	**5310**	**6120***	**6210**	**6230***	**6270***	**6410**	**6450**	**6510**	**6530*, 9070**	**6000**	**One-off restoration costs (EUR)**	**Regular maintenance (EUR/ year)**	One-off restoration costs (EUR)	Regular maintenance costs (EUR/year)
On-off restoration costs (EUR/ha)	3171	3171	3171	3171	3171	3171	3171	3171	3171	3171	3171				
Costs of regular maintenance (EUR/ha/year)	330	330	206	206	206	155	206	330	83	330	206				
Abavas senleja	-	**2,0**	**25,1**	**76,5**	-	1,5	**9,6**	29,8	**-**	**60,0**	65,0	**548 964**	**43 351**	305 336	23 455
Aiviekstes paliene	-	-	4,1	7,2	3,8	**52,2**	-	**52,4**	**9,1**	-	-	**360 543**	**26 138**	47 882	3 111
Ances purvi un meži (in case if Natura 2000 site is enlarged)	-	-	**1,1**	**2,5**	-	20,0	-	**15,8**	10,1	**238,0**	-	**816 215**	**84 496**	95 447	3 938
Augšdaugava	-	-	**63,2**	**40,8**	2,0	**100,0**	-	170,0	**40,5**	-	200,0	**775 310**	**40 286**	1 179 612	97 712
Augšzeme	-	-	-	**19,0**	-	**20,0**	-	11,1	11,1	-	250,0	**123 669**	**7 014**	863 178	56 085
Ābeļi	-	-	1,5	1,3	-	23,0	1,0	49,9	19,4	-	-	**61 517**	**1 610**	243 343	20 823
Bauska	-	-	-	8,0	-	2,0	-	-	37,0	-	-	**117 327**	**3 071**	31 710	1 958
Blažģa ezers	-	-	-	-	-	36,0	**3,6**	-	0,4	-	146,7	**11 416**	**742**	580 547	35 832
Burgas pļavas	-	-	-	-	-	-	0,3	**23,0**	0,1	-	140,4	**73 726**	**7 642**	446 318	28 982
Burtnieku ezera pļavas	-	-	-	-	-	2,8	-	**66,1**	-	-	-	**209 603**	**21 813**	8 879	434
Daugavas ieleja	-	-	-	**25,1**	-	-	-	-	-	-	-	**79 592**	**5 171**	0	0
Diļļu pļavas	-	**0,6**	-	-	-	-	**21,4**	-	-	-	89,0	**69 762**	**4 606**	282 219	18 334
Dubnas paliene	-	-	-	-	-	64,3	-	**157,0**	8,0	-	-	**497 847**	**51 810**	229 263	10 631
Durbes ezera pļavas	-	-	-	-	-	11,0	-	**136,0**	-	-	-	**431 256**	**44 880**	34 881	1 705
Dvietes paliene	-	-	-	-	-	**100,0**	-	200,0	16,9	-	-	**951 300**	**81 500**	53 685	1 405
Engures ezers	**22,5**	9,0	**12,8**	0,9	-	-	**5,0**	-	1,7	-	40,0	**156 203**	**14 055**	163 655	11 539
Gaiļu kalns (if the area is extended)	-	**0,3**	-	0,7	-	-	-	-	-	-	-	**951**	**99**	2 347	152

Table 7. Costs of restoring and maintaining the priority grassland habitats.

Natura 2000 sites	**EU protected habitat types (the areas (ha) of target habitats are highlighted in bold and coloured; the rest are supporting habitats (second priority))**											**Priority habitats**		**Supporting habitats**	
Habitat type	**1630***	**5310**	**6120***	**6210**	**6230***	**6270***	**6410**	**6450**	**6510**	**6530*, 9070**	**6000**	**One-off restoration costs (EUR)**	**Regular maintenance (EUR/ year)**	One-off restoration costs (EUR)	Regular maintenance costs (EUR/year)
On-off restoration costs (EUR/ha)	3171	3171	3171	3171	3171	3171	3171	3171	3171	3171	3171				
Costs of regular maintenance (EUR/ha/year)	330	330	206	206	206	155	206	330	83	330	206				
Gauja National Park	-	-	**41,5**	**29,4**	**4,4**	**99,1**	2,5	67,0	88,0	**60,0**	100,0	**1 022 330**	**57 976**	537 485	43 225
Gudenieki	-	**6,1**	-	-	**2,5**	7,3	-	-	2,6	-	-	**27 271**	**2 528**	31 393	1 347
Istras pauguraine	-	-	-	**18,0**	-	20,0	-	-	5,0	-	60,0	**57 078**	**3 708**	269 535	15 875
Kalnciema pļavas	-	-	-	-	-	1,3	-	**56,0**	2,0	-	-	**177 576**	**18 480**	10 464	368
Kaučers	-	-	1,1	0,6	**4,3**	**35,0**	4,2	-	2,4	-	200,0	**137 939**	**7 176**	660 519	42 615
Kuja	-	-	-	0,6	-	**38,0**	**6,2**	**39,0**	2,6	**3,9**	70,0	**276 194**	**21 324**	232 117	14 759
Ķemeri National Park	-	**1,0**	-	-	1,2	0,4	**0,6**	**96,0**	-	-	-	**309 490**	**32 134**	5 074	309
Lielupes grīvas pļavas	**1,4**	-	-	10,5	-	1,4	**6,9**	22,7	8,4	-	-	**26 097**	**1 865**	136 290	10 564
Lielupes palienes pļavas	-	-	0,9	-	-	8,4	-	**170,0**	40,4	-	-	**667 178**	**59 453**	29 490	1 487
Liepājas ezers	**19,0**	-	-	**166,4**	-	10,5	**77,4**	**159,7**	-	-	-	**1 339 748**	**109 194**	33 296	1 628
Lubāna mitrājs	-	**3,7**	**18,0**	0,3	**34,6**	**68,0**	3,4	**307,0**	10,0	56,7	1700,0	**1 399 362**	**124 737**	5 582 355	369 681
Mežamatveju kadiķu pļavas and Mežamatveju pļavas	-	**4,2**	-	**3,0**	-	1,0	-	-	-	-	2,7	**22 831**	**2 004**	11 733	711
Mugurves pļavas	-	-	-	-	-	4,5	-	**50,0**	4,0	**14,7**	60,0	**205 037**	**21 338**	217 214	13 390
Ogres ieleja	-	-	**3,0**	**13,4**	0,1	**55,6**	2,6	1,7	21,7	8,0	60,0	**297 123**	**13 798**	229 580	16 117
Ovīši	-	-	**14,8**	-	**5,5**	16,3	-	-	-	-	37,0	**64 371**	**4 182**	169 014	10 149
Pape	-	-	**7,5**	4,8	**0,5**	6,2	**31,0**	7,0	5,2	-	600,0	**123 669**	**8 034**	1 976 167	128 291
Piejūra	22,1	-	-	8,5	1,2	0,0	-	5,1	1,3	-	-	**70 079**	**7 293**	51 148	3 794

Table 7. Costs of restoring and maintaining the priority grassland habitats.

Natura 2000 sites	**EU protected habitat types (the areas (ha) of target habitats are highlighted in bold and coloured; the rest are supporting habitats (second priority))**											**Priority habitats**		**Supporting habitats**	
Habitat type	**1630***	**5310**	**6120***	**6210**	**6230***	**6270***	**6410**	**6450**	**6510**	**6530*, 9070**	**6000**	**One-off restoration costs (EUR)**	**Regular maintenance (EUR/ year)**	One-off restoration costs (EUR)	Regular maintenance costs (EUR/year)
On-off restoration costs (EUR/ha)	3171	3171	3171	3171	3171	3171	3171	3171	3171	3171	3171				
Costs of regular maintenance (EUR/ha/year)	330	330	206	206	206	155	206	330	83	330	206				
Raķupes ieleja	-	5,0	0,8	3,0	0,7	5,6	**4,7**	**42,4**	1,0	-	62,0	**149 354**	**14 960**	247 655	16 300
Randu pļavas	**36,2**	-	**4,1**	9,7	**2,1**	1,3	0,9	-	0,9	-	74,5	**134 482**	**13 225**	276 828	17 806
Rāzna National Park	-	-	-	8,6	-	**23,7**	-	13,6	1,5	-	3000,0	**75 153**	**3 674**	9 587 994	624 374
Rūjas paliene	-	-	-	2,0	1,0	7,5	9,0	**118,0**	10,2	-	-	**374 178**	**38 940**	94 179	4 481
Salacas ieleja	-		-	2,1	**10,0**	**43,3**	-	**6,1**	18,0	-	100,0	**188 357**	**10 785**	380 837	22 527
Sauka	-	-	-	1,0	-	**13,3**	-	6,7	4,1	-	200,0	**42 174**	**2 062**	671 586	43 949
Sedas purvs	-	-	-	-	-	-	-	**42,0**	-	-	-	**133 182**	**13 860**	0	0
Sitas un Pededzes paliene	-	-	1,4	-	1,4	2,4	-	**90,0**	30,0	**5,6**	-	**398 309**	**34 041**	16 489	949
Slītere National Park	-	-	**7,3**	-	**11,2**	39,0	**20,0**	-	-	-	20,0	**122 052**	**7 929**	187 121	10 167
Sventājas upes ieleja	-	-	8,8	-	**1,5**	3,7	-	**122,4**	20,5	19,7	70,0	**420 792**	**42 514**	361 304	23 209
Svētes paliene	-	-	-	-	-	-	-	**260,0**	1,8	-	-	**824 460**	**85 800**	5 708	149
Talsu pauguraine	-	-	-	0,9	-	13,9	**18,3**	-	1,7	-	200,0	**58 029**	**3 770**	686 522	43 681
Teiči Strict Nature Reserve	-	-	-	0,1	-	**55,0**	-	20,0	37,0	-	-	**291 732**	**11 596**	63 769	6 623
Tosmare	-	-	-	-	-	-	**68,3**	32,0	3,2	3,2	46,0	**216 579**	**14 070**	267 632	21 358
Užavas augštece	-	**1,7**	**1,5**	6,0	**1,6**	8,8	**23,3**	**77,0**	37,0	-	300,0	**333 272**	**31 409**	1 115 558	67 471
Vecdaugava	2,8	-	-	-	-	-	3,7	-	-	-	-	**8 879**	**924**	11 733	762
Veclaicene	-	-	-	0,5	-	**15,5**	0,4	12,2	-	-	320,0	**49 151**	**2 403**	1 056 387	70 140
Vecpiebalga	-	-	0,2	2,0	-	21,1	4,5	3,6	58,6	-	105,0	**185 821**	**4 864**	432 620	27 475

Table 7. Costs of restoring and maintaining the priority grassland habitats.

Natura 2000 sites	**EU protected habitat types (the areas (ha) of target habitats are highlighted in bold and coloured; the rest are supporting habitats (second priority))**											**Priority habitats**		**Supporting habitats**	
Habitat type	**1630***	**5310**	**6120***	**6210**	**6230***	**6270***	**6410**	**6450**	**6510**	**6530*, 9070**	**6000**	**One-off restoration costs (EUR)**	**Regular maintenance (EUR/year)**	One-off restoration costs (EUR)	Regular maintenance costs (EUR/year)
On-off restoration costs (EUR/ha)	3171	3171	3171	3171	3171	3171	3171	3171	3171	3171	3171				
Costs of regular maintenance (EUR/ha/year)	330	330	206	206	206	155	206	330	83	330	206				
Ventas ieleja	-	-	2,0	**52,0**	-	4,5	-	2,1	1,3	-	35,0	**164 892**	**10 712**	142 378	9 120
Ventas un Šķerveļa ieleja	-	-	1,3	**17,0**	-	2,3	-	42,3	-	-	34,0	**58 029**	**3 770**	249 241	21 320
Vestiena	-	-	0,5	**15,6**	1,0	**73,0**	0,1	64,0	25,0	-	200,0	**360 226**	**16 604**	842 218	62 650
Vidusburtnieks	-	-	1,5	-	-	16,7	-	141,8	2,0	-	100,0	**449 648**	**46 794**	381 154	23 664
Vidzemes akmeņainā jūrmala	-	-	-	-	**2,1**	15,5	1,0	-	6,3	-	50,0	**6 659**	**433**	230 849	13 431
Ziemeļgauja	-	**3,8**	**11,0**	**204,0**	**4,3**	**62,0**	0,3	**244,0**	**19,0**	**558,0**	500,0	**3 507 443**	**322 277**	1 586 451	103 062
Priority habitats: total restoration costs (EUR)	329 721	104 643	700 442	2 164 842	268 330	2 707 083	953 425	8 471 961	1 408 875	2 981 279	-	**20 090 600**	**1 671 830**	35 260 822	2 329 682
Priority habitats: total regular maintenance costs (EUR per year of per time)	34 313	10 890	45 503	140 636	17 432	132 324	61 938	881 661	36 877	310 256	-				
Supporting habitats: total restoration costs (EUR)	-	44 394	44 616	262 622	39 320	1 218 235	109 621	1 778 138	606 771	277 906	30 879 198				
Supporting habitats: total regular maintenance costs (EUR per year or per time)	-	4 620	2 898	17 061	2 554	59 548	7 121	185 048	15 882	28 921	2 006 028				

For habitat code explanations – see Appendix 2.

Most frequently used restoration methods in grasslands:

- extending the total habitat area (mostly in semi-natural grasslands overgrown with shrubs or secondary forest (6120*, 6230*, 6410, 6450), abandoned fallow-lands and cultivated grasslands (6120*, 6210, 6270*, 6510);
- removal of excessive tree and shrub cover, deforestation in sites overgrown with forest (6530*, 9070, etc.), thinning of juniper stands (5130), extending the continuous grassland area in floodplains (by removing belts of shrubs, thus eliminating fragmentation);
- ground surface smoothing (molehills, pigroots, anthills, tracks, hummocks, litter);
- reduction of expansive mosses and herbs;
- reduction of eutrophication impact;
- establishment of pastures and restorative grazing (intense and regulated grazing of shrub regrowth and expansive species);
- restoration of hydrological conditions (restoration of shallow ditch systems or rewetting of deeply drained areas by filling in ditches); in many sites, preliminary research is necessary as well as modelling of impacts on grasslands and adjacent habitats, and evaluation of future management possibilities;
- maximizing of continuous area of wooded grasslands (6530*) in perspective territories (Ziemeļgauja, Sitas un Pededzes paliene); deforestation of overgrown wooded grasslands and other activities in accordance to the NAT-PROGRAMME Protected Habitat Management Guidelines (Rūsiņa (ed.) 2017) and habitat management plan (Bāra et al. 2014). It includes a detailed inventory of potential habitat restoration sites from a restoration point of view.

Most frequently used management methods in grasslands:

- regulated grazing (includes also regular monitoring of the grazing pressure depending on season, weather conditions, grassland productivity and natural values and taking action to prevent too high or too low pressure);
- mowing and removal of grass (hay);
- annual maintenance (ground surface smoothing, rolling, brush cutting, pasture mowing, maintenance of paddocks).

9.4. Mires and spring habitats

The priority mire and spring habitats (target habitats), their area size and the priority Natura 2000 sites for their conservation in Latvia, as well as approximate costs are shown in Table 8.

Table 8. Costs of restoring and maintaining the priority mire and spring habitats.

Natura 2000 territory	**EU protected habitat types (target habitats), area (ha)**						One-off restoration costs (EUR)	Regular maintenance (EUR/year or per time)
	7110*, 7120	7140	7160	7210*	7220*	7230		
Abavas senleja					0,5	8	16 750	3 950
Ances purvi un meži (Jaunciema Mire)		6,2					7 440	1 860
Ašinieku purvs	90						27 000	
Bānūžu zelta avots			1,7				3 400	1 360
Dubļukrogs						2		1 600
Engures ezers						30	60 000	9 000
Gaiņu purvs	750						225 000	
Gauja National Park			1,6				3 000	1 280
Ječu purvs						5	6 200	
Lielsalas purvs	184						15 000	
Kalna purvs	155						46 500	
Krustkalni Strict Nature Reserve			1	1			4 000	1 600
Ķemeri National Park (north-eastern part of Ķemeri Mire, Raganu Mire)	500						615 000	
Ķemeri National Park				1		30	61 200	24 800
Laukezers		0,7					1 400	1 000
Lielais un Pemmas purvs	800						150 000	
Lielais Pelečāres purvs	380						114 000	
Lubāna mitrājs (along with rewetting of drained forests)	2000						4 100 000	

Table 8. Costs of restoring and maintaining the priority mire and spring habitats.

Natura 2000 territory	**EU protected habitat types (target habitats), area (ha)**						One-off restoration costs (EUR)	Regular maintenance (EUR/year or per time)
	7110*, 7120	7140	7160	7210*	7220*	7230		
Mazie Kangari	110						33 000	
Mazzalvītes purvs	251						87 800	
Pape (Nida Bog)	1158						500 000	
Palšu purvs	250						250 000	
Pluču tīrelis	105						21 000	
Popes zāļu purvs						16	32 000	12 800
Raķupes ieleja (Dūmiņu Bog)	135						21 000	
Raunas Staburags					1			1 500
Sārnates purvs	370						286 000	
Slītere National Park		50				5	16 200	44 000
Supes purvs	165						49 500	
Talsu pauguraine						1	2 000	800
Teiči Strict Nature Reserve	130						48 100	
Tīreļu purvs	726						150 000	
Tosmare						50	100 000	40 000
Vesetas palienes purvs			4				8 000	3 500
Ziemeļgauja (Pukšu Bog)	350						45 000	
Zušu-Staiņu sēravoti			20				34 000	6 800
						IN TOTAL	**7 139 490**	**155 850**

For habitat code explanations – see Appendix 2.

9.5. Forests

The priority forest habitats (target habitats), their area size and the priority Natura 2000 sites for their conservation in Latvia, as well as approximate costs are shown in Table 9.

Table 9. Costs of restoring and maintaining the priority forest habitats.

Natura 2000 territory	**EU protected habitat types (target habitats), area (ha)**								One-off restoration costs (EUR)	Regular maintenance (EUR/year or per time)
	91D0* and potential 91D0*	9160*	9080* 91E0* 91F0*	9060*	9010* 91T0	9000 (potential 9010* 9060 91T0)	9000 (potential 9020* 9160 91F0*)	Capercaillie leks		
Ances purvi un meži						20		30	57 800	
Ābeļi							30		10 800	
Ādaži						20			47 200	
Dunika							10		10 000	
Eglone							20		20 000	
Gauja National Park (Gulbjusala Bog and adjacent areas)	160				5	30			242 250	
Grebļukalns				3					7800	1800
Grīņu Strict Nature Reserve	6								6000	
Kalna purvs	30								30 000	
Kaļķu gārša		2							2000	
Kaušņu purvs	44								44 000	
Ķemeri National Park						40			14 000	
Kuja							20		7200	
Lielais un Pemmes purvs	50								95 000	
Lielie Kangari				2	15				10 200	

Table 9. Costs of restoring and maintaining the priority forest habitats.

Natura 2000 territory	**EU protected habitat types (target habitats), area (ha)**								One-off restoration costs (EUR)	Regular maintenance (EUR/year or per time)
	91D0* and potential 91D0*	9160*	9080* 91E0* 91F0*	9060*	9010* 91T0	9000 (potential 9010* 9060 91T0)	9000 (potential 9020* 9160 91F0*)	Capercaillie leks		
Lielais Pelečāres purvs	250								50 000	
Lubāna mitrājs	100	5				80	50		105 000	
Maņģenes meži					25				8750	
Mazzalvītes purvs	100								7000	
Nīcgales meži							20		20 000	
Numernes valnis				28					16 800	
Ogres Zilie kalni				5					3000	
Orlovas (Ērgļu) purvs	200								140 000	
Ozoldārzs		10							8000	
Posolnīca				3					1800	1800
Rāzna National Park				5					10 000	
Supes purvs	50								50 000	
Tīreļu purvs	50								50 000	
Ukru gārša							10		10 000	
Veclaicene						20			7000	
Bērzoles riests**	49							2	55 040	720
Bērzu purvs**	22							24	34 600	24 000
Bulvāra riests**	66							2	84 900	700
Igaunijas riests**	40								96 000	

Table 9. Costs of restoring and maintaining the priority forest habitats.

Natura 2000 territory	EU protected habitat types (target habitats), area (ha)								One-off restoration costs (EUR)	Regular maintenance (EUR/year or per time)
	91D0* and potential 91D0*	9160*	9080* 91E0* 91F0*	9060*	9010* 91T0	9000 (potential 9010* 9060 91T0)	9000 (potential 9020* 9160 91F0*)	Capercaillie leks		
Liepnas niedrāji**	137							114	82 200	68 400
Gaujienas purvainie meži**	67								26 800	
Kaļņa riests**								20	20 000	3000
Vidagas meži**	7							120	45 300	21600
								KOPĀ	**1 536 440**	**100 420**

* Management of Capercaillie Tetrao urogallus leks is needed.

For habitat code explanations – see Appendix 2.

Most frequently used restoration and management methods in mire, spring and spring fen habitats:

- rewetting (ditch blocking or infilling); rewetting the entire hydrologically related complex of drained mires and adjacent bog woodlands (91D0*) is recommended in most cases) – in all mire habitats;
- partial removal or clearing of all trees and shrubs – in all mire habitats;
- regular mowing (with grass removal), sometimes restoring the entire fen and wet grassland habitat complex including *Molinia* meadows (6410); establishment of extensive pastures – in fens and spring fens;
- eradication of invasive plant species (*Heracleum sosnowskyi, Impatiens glandulifera*, etc.) and controlling their spread – mainly in spring habitats, potentially in fens;
- removal of beaver dams; regular control of the number of beavers – in fens, spring fens and adjacent areas.

10. Proposals for improvement and efficient management of the Natura 2000 network

10.1. Necessity for improvement of Natura 2000 network

Since the establishment of Natura 2000 network in Latvia, the knowledge on distribution and ecological requirements of species and distribution and quality of habitats have significantly improved. It is concluded that the configuration and protection regime in certain Natura 2000 sites does not provide optimal conditions for the long-term existence of species and habitats of EU importance. Therefore, it is necessary to evaluate the network of existing Natura 2000 sites and its contribution to the protection of species and habitats (VARAM 2014). According to the Environmental Policy Strategy (2014–2020), one of the necessary nature conservation measures is the improvement of Natura 2000 network, based on recent inventories of species and habitats, as well as the latest scientific research and monitoring data.

Inventory of protected habitats of EU importance throughout Latvia was commenced in 2017 and is expected to be completed in 2020[15]. The obtained information will be used for scientific basis for improving the Natura 2000 network and its efficiency. Improvement of the Natura 2000 network involves both establishment of new protected nature areas and adjusting the borders of the existing protected areas. It is also necessary to revise the conservation objectives according to the present situation, revision of borders, review of regulatory enactments and coordination with the EC.

The following conclusions made during the development of Natura 2000 Programme should be taken into account during the evaluation and improvement of Natura 2000 network.

- **Species and habitat information in Natura 2000 Standard Data Forms** (available at natura2000.eea.europa.eu) must be updated. Up-to-date data are important in evaluation and improving of the Natura 2000 network, including re-evaluation of the conservation purposes for each site. The Standard Data Forms can be used as the basic information for further work (current information is insufficient and needs updating and adjusting).
- **Extension of particular Natura 2000 territories, in order to ensure an adequate protection regime for priority habitat types and species in Latvia.** Prior to the extension of the Natura 2000 territory, comprehensive inventories are necessary (habitats, various groups of species, impacts, etc.), as well as evaluation of expected benefits, necessary protection and management measures. Specific, research-based proposals for the extension have been developed for the following Natura 2000 territories: Ances purvi un meži (Kalniņš 2014; Vilks 2014a; Metrum 2016), Dridža ezers (Suško 2013), Augšdaugava, Bauska, Burtnieku ezera pļavas, Eglone, Gaujas Nacionālais parks, Lubāna mitrājs, Mežmuižas avoti, Mugurves pļavas, Sitas un Pededzes paliene, Pilskalnes Siguldiņa, Ukru gārša, Vilce, Ziemeļgauja (Kalniņš 2014). Enlargement of Natura 2000 territories is also often proposed in nature management plans. In all cases, repeated evaluation of the recommendation is necessary in case if nature management plan is older than five years. Recommendations on the extension of Natura 2000 territories are included also in Part II of this programme (information from nature management plans; proposals by Natura 2000 Programme expert group).
- **Establishment of Natura 2000 territories in habitat aggregations and concentration sites of particularly important protected species.** This would help to reduce the increasing impact of fragmentation on habitat and species diversity. Such new territories are a priority for more effective conservation of several grassland habitat types (6120, 6230*, 6270*, 6410, 6450, 6530*) and juniper formations (5130), as well as for efficient conservation of forest habitats. Specific proposals for the creation of new Natura 2000 territories can be developed after the mapping of EU habitats and following evaluation of habitat aggregation sites (after 2020). For semi-natural grassland habitats, an indicative map of aggregations of protected grassland habitats of EU importance has been developed under this programme. This may provide the basis for the initial evaluation of the new Natura 2000 territories (electronic Appendix 3)[16].
- **Establishment of new Natura 2000 territories for the conservation of habitats at excellent quality and/or very rare protected species of EU importance.** An example of such a territory is Lake Sivers – an excellent example of oligotrophic lake with large presence of a globally threatened, very rare species Najas tenuissima[17] (currently does not have any protection status in Latvia) and numerous other protected species.
- **Excluding certain areas from Natura 2000 territory listing; creation of new, equivalent (or more valuable) Natura 2000 territories instead.** This case would apply to areas where habitats and/or species habitats have disappeared or their quality is so poor that their restoration is no longer possible or

[15] Project implemented by Nature Conservation Agency "Preconditions for better biodiversity preservation and ecosystem protection in Latvia", KF No 5.4.2.1/16/I/00 (2016–2020).

[16] Available only in Latvian, not included in the English version of this document.

[17] Included in Annex II of the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. *Najas tenuissima* is a very rare species, and Lake Sivers is considered as its richest locality in the world.

their restoration outcome would not, most likely, be effective if compared to the expected result, and there are other areas known in Latvia where the localities of these species or the same habitat type(s) are in better condition in an equivalent or larger area. This case can be applied *only in exceptional cases,* after a thorough study in both the possibly excluded area and in the potential newly created territory. An example of such a site is Kadiķu nora (established for conservation of *Juniperus* formations), where juniper formations have disappeared, habitats do not meet the minimum criteria of the protected habitat type of EU importance, and also the diversity of invertebrates is considered insignificant (Vilks 2014b).

- **The borders of some Natura 2000 territories should be specified, so that they cover the entire ecologically and hydrologically related areas.** Mostly this applies to Natura 2000 territories that have been established to protect mires. The current configuration of borders may cause adverse influences in the marginal areas outside Natura 2000 which may affect the entire ecosystem (Figure 6). In several Natura 2000 territories, the current configuration of borders significantly impedes the restoration of habitats. In such cases, Natura 2000 territory should also include a buffer zone around the mire. During the development of the Natura 2000 Programme, such territories were identified: Dūņezera purvs, Maitiķu avoti, Purgaiļu purvs, Spuļģu purvs, Tīrās sūnas purvs, Vadaiņu purvs, Vērenes purvi, Zodānu purvs. Figure 6. Examples of Natura 2000 territories where the borders must be adjusted in order to include the entire mire in the protected nature area: Vadaiņu purvs and Tīrās sūnas purvs.
- **Adjusting the category of protected nature area, or changing or establishing functional zoning in Natura 2000 territories (if applicable to ensure adequate conservation).** Functional zoning can be established or approved with the individual regulation on protection and use for the particular site. Adjusting the category of protected nature territory, or changing or establishing functional zoning in Natura 2000 territories always requires a scientific justification.

10.2. Increasing the proportion of state-owned land in Natura 2000 territories

To improve the possibilities of ensuring an adequate conservation, to restore and maintain habitats in good quality, land purchase in Natura 2000 territories is one of the national priorities in the nature conservation. If the State would own possibly large land areas (governed by the Ministry of Environmental Protection and Regional Development) in territories which are important for the biodiversity conservation, this would increase the chance to preserve larger territories important to biodiversity. Additionally, this would help avoiding many complications (including insurmountable) in ecosystem restoration and contribute in reducing conflicts between nature conservation and other interests, and improve the public communication.

10.3. Necessary changes in availability of funding for re-current habitat management

Lack of funding is a major problem in ensuring regular management of several habitat types on non-agricultural lands (outside land blocks). Restoration is not sufficient for the habitats that depend on regular management (such as heaths, grey dunes, in some cases – spring fens). Usually, regular funding is necessary also after restoration, in order to ensure that habitats are maintained in good condition (for example, mown annually or once per few years, or extensively grazed). If these habitats will not be restored in the nearest future, they can be lost, and their restoration may become impossible or very expensive. However, after restoration there is lack of potential funding that would ensure the maintenance of restored habitats in good quality. For

Figure 6. Examples of Natura 2000 territories where the borders must be adjusted in order to include the entire mire in the protected nature area: Vadaiņu purvs and Tīrās sūnas purvs.

example, after rewetting a peatland, repair might be necessary for different hydro-technical constructions.

It is necessary to establish a mechanism which allows attracting funding for maintenance of habitats that require regular maintenance after the restoration, but which are not eligible to annual payments provided within Rural Development Programme.

Public-private partnership can be used for the maintenance of grassland habitats in state and municipal land, by renting a territory to an operator which is eligible to receive annual payments within Rural Development Programme. In some cases, the public-private partnership can also be used to maintain popular tourist destinations, if they are important habitats and nature monuments at the same time, and can be exploited for gaining profit. However, usually, there are almost no ways to involve the private sector in habitat management, as no return of investment is expected.

Similarly, there is a **lack of funding opportunities for eradication of invasive species.** In order to be effective, eradication of invasive species must be carried out on a lasting and regular basis. In the absence or shortage of funding, the investments in habitat restoration in invaded areas are often pointless if the further management can not be ensured.

In small areas, restoration of habitats and species may be organised in a way of joint voluntary work or as initiatives by non-governmental organizations. Voluntary work events can be used both for the raising of awareness on nature assets and need for their conservation, and for improving the conservation status of habitats and species in small areas. However, this is not the solution at a national level.

Assessing the availability of funding for the conservation of habitats and species, increased and regular participation of various sectors (forestry, mining, agriculture, etc.) would be necessary. These sectors use nature resources and thus gain profit, often creating a deteriorating impact on ecosystems, so it would be logical if part of their profit would be invested back in nature to contribute to the restoration of ecosystems.

10.4. The need for innovative solutions

Innovative solutions for habitat restoration and management are highly important in nature conservation projects. In order to ensure regular management, including areas where implementation of management is difficult, innovative approaches should be sought and financially supported. Alternative uses of biomass (grass, shrubs, reeds, topsoil, etc.) are necessary to ensure the existence of semi-natural grasslands and other habitats that depend on regular management. Such solutions should help include the ecosystem services in the economic cycle, thus motivating landowners to engage more actively in the management of protected habitats.

10.5. The need for motivating mechanisms

Maintenance of habitats and species in good quality is very important for reducing the fragmentation, and it should be ensured not only on state-owned lands. In order to achieve greater involvement of private landowners, it is necessary to create incentive mechanisms and create a market for ecosystem services and products, and promote the eco-efficiency of the national economy (Latvia 2030). Such motivating mechanisms are needed not only in Natura 2000 territories, but also in the entire territory of Latvia.

11. Priority topics of applied research and monitoring in planning of species and habitat conservation

Efficient restoration and management of habitats are not possible without knowledge-based planning. In Latvia, there is still a lack of applied research and long-term monitoring that should be used for ecosystem restoration and management, as well as for targeted planning and management adjustment. Also it is essential to acquire regular monitoring data and data interpretation for future revision of nature conservation priorities. So far, there is no national-scale, representative and regular long-term monitoring of restoration/management efficiency in Latvia. It exists only in a few areas, and is based on the enthusiasm of a few researchers.

11.1. General research and monitoring topics important for nature conservation

Research

1. Inventory (mapping) of distribution of protected habitat types and species of EU importance. When necessary, data must be updated, and also the need of updating must be constantly revised. For some habitat types, the mapping results are valid for many years (e.g. forests, mires) unless the area undergoes significant changes, while in other cases the mapping results should be revised relatively frequently (e.g. grasslands and other semi-natural habitat types).
2. Inventory of protected species and assessment of the state of their populations (including breeding success of birds, the permanence of breeding sites, availability of feed, factors affecting them). Research of species requirements for habitats (developing mathematical models of ecological niches; identification of suitable habitats and predicting the occurrence based on these models). Priority species: changes in range and prevalence of protected species. Species whose distribution range and/or prevalence have been significantly reduced in last 30 years are considered as priority species.

3. Revision of the protected species list and the Latvian Red Book (re-assessment using the most recent data).
4. Determination of aggregation sites of protected habitats of EU importance; evaluation of habitat connectivity at a national level (including adverse factors at landscape scale) (essential for improving the Natura 2000 network).
5. Testing of habitat restoration methods in Latvian conditions; development of guidelines for the application of these methods. For example, methods which should be first tested in grasslands are targeted development of species composition; reduction of soil fertility; optimization of hydrological regime (especially the restoration or creation of shallow ditch systems). In all groups of habitats, testing of innovative methods which are not yet applied in Latvia is necessary, including methods of eradication of invasive species.

Monitoring

Monitoring of long-term changes in the abiotic conditions (such as groundwater table), vegetation and species (including regular inventory of indicator species, such as plants, birds, invertebrates) for the evaluation of restoration success.

11.2. Habitat-specific research and monitoring topics

11.2.1. Coastal habitats and heaths

Research

1. The influence of climate change on the vegetation succession in coastal dunes and heaths, and on dynamics of populations of ecologically sensitive species.
2. Research of ecology of humid dune slacks (mainly pioneer-stages) and their characteristic indicator species; development of efficient management methods.
3. Evaluation of biodiversity of wooded dunes in Latvia; perspectives of their conservation in the European context.
4. Research on ecology and biology of endemic littoral species in the region of the Baltic Sea; modelling their habitats and distribution in Latvia and in the entire range of the target species.
5. Response of wet heaths and populations of the associated rare species to various management methods.
6. Development of efficient management model for the management of traditional cultural landscapes of grey dunes and dry heaths.
7. Indicators of influence of the anthropogenic load on the structure, ecological processes and species (evaluation and predictions) of beaches and primary (embryonic and white) dunes.

Monitoring

Complex monitoring of coastal habitats, assessing the vegetation succession in relation to the dynamics of coastal processes.

11.2.2. Rivers and lakes

Research

1. Development of criteria to prioritize the beaver presence and river habitat functionality.
2. Determination of the maximum volumes of fallen logs in the rivers in Latvian conditions (in order to ensure the stream functionality and the diversity of aquatic species).
3. Development of criteria to distinguish between natural and human-induced sedimentation and to assess their effects.
4. Assessment of the impact of overgrowth with emergent macrophytes; development of criteria to assess their control effectiveness.
5. Development of criteria for setting the goal in reducing the cover of emergent vegetation (removal, fragmentation, attracting waterbirds, etc.) in lakes.

11.2.3. Grasslands

Research

1. Indicative value of indicator species in semi-natural grasslands (plants, invertebrates, birds). Development of species indexes for well-studied species of invertebrates (for example, butterflies) for every habitat type. Use of indicators and indices for administration of targeted agri-environmental support measures. Identification of typical species (including umbrella species) for each habitat type; assessment of their conservation status in Latvia.
2. Influence of drainage on grassland ecosystems; development of eco-hydrological models for moist and wet grassland habitats (including optimal, permissible and critical values of groundwater seasonal fluctuations).
3. Scientifically-based expertise (including algorithms) for assessing the level of protection of semi-natural grasslands at local scale (based on grassland inventory forms) and at a national scale.
4. Inventory of grassland breeding waders (particularly Tringa totanus, *Tringa stagnatilis, Limosa limosa, Philomachus pugnax*) and the Great Snipe *Gallinago media* in Latvia; their range of tolerance to the intensity of economic activity (mowing height, grazing intensity, etc.); development of management plans for these species.

Monitoring

Monitoring of grassland habitats and birds should be carried out using the developed method for monitoring of the biologically valuable grasslands (DAP 2013). Monitoring system should include both monitoring of Natura 2000 and of biologically valuable grasslands.

11.2.4. Mires and spring habitats

Research

1. The role of climatic factors in changes in mire ecosystems. Impact of climate change on mires in Latvia. Adaptation strategy for mire habitat conservation.
2. The influence of drainage on mire ecosystems (impacts of ditches of different types); studies in model territories (bogs, alkaline fens).
3. The role of tree cover in the water balance in mires. Effectiveness of tree removal in restoring drained mires (studies in model areas).
4. Human-induced modifications in groundwater flows, their role in existence and quality of spring habitats (hydro-geological modelling; comprehensive study of various components of spring ecosystems).
5. Innovative methods to mitigate the drainage impact on the edges of peat extraction sites.

11.2.5. Outcrops and caves

Research of species characteristic to habitats of outcrops and caves, and developing a list of indicator species. Studies on the species composition, ecology, distribution. Determination of indicative value of species to evaluate the habitat quality by using species data extracted from monitoring and habitat mapping data sets.

11.2.6. Forests

Research

1. The diversity and volume of the structural elements important for forest biodiversity at landscape scale.
2. The impact of climate change on the composition and distribution of tree species in forests, including the distribution of broadleaved tree species of lower economical importance.
3. Distribution and diversity of broadleaved forests. Fragmentation of broad-leaved forests, the impact of fragmentation on protected species.
4. The potential impact of climate change on the structure of protected forest habitats (long-term research).
5. Impact of forest use on biodiversity in Latvia (long-term research).
6. Research on the dispersal ability of forest species in the fragmented landscape in Latvia (including long-term research).
7. Evaluation of forest ecosystem services.

Monitoring

1. Impacts of drainage on protected forest habitats; changes induced by drainage on the abiotic environment in drained forests; drainage impacts on characteristic species (long-term studies).
2. The long-term influence of drainage on bog woodlands.
3. Establishment of a joint, complex forest monitoring system (including forest biodiversity, habitat and species condition, etc.). At present, monitoring of forests is carried out by JSC "Latvian State Forests", by Nature Conservation Agency and by Latvian State Forest Research Institute "Silava". Monitoring should be carried out both within and outside protected nature areas, including both the evaluation of biodiversity and economic activity. The results could be used for developing the Article 17 Report required by the Habitats Directive, as well as for updating the Natura 2000 Standard Data Forms, and to provide scientific justification for the conservation and management of habitats.

12. Cooperation and communication

Many of the nature conservation goals can only be implemented through cooperation of all stakeholders – the governmental institutions, municipalities, the private sector, and non-governmental organizations. Conflicts about nature conservation, especially if they are lengthy and formed due to various misunderstandings and incomplete information, may block the opportunities to implement measures which are crucial to preserve certain nature assets. Thus, ensuring permanent cooperation and communication is essential for the effective management of Natura 2000 sites. Awareness-based and sustainable ecosystem conservation and provision of ecosystem services can be reached only through cooperation.

For the management of semi-natural grasslands, continuous cooperation and information exchange among the Nature Conservation Agency, Rural Support Service, landowners and other grassland managers is essential. It is important to keep landowners regularly informed about the possibilities of financial support for the management of grasslands (Agri-environmental payments, potential funding available for projects) both within and outside of Natura 2000 territories, thus promoting private initiatives. Also regular information on the changes in agri-environmental payments and other funding availability and requirements is necessary.

In the restoration of mire and forest habitats, cooperation and joint planning between Nature Conservation Board and JSC "Latvian State Forests" is essential, as well as informing private forest owners regularly on the protected nature areas, micro-reserves and their conservation requirements. In management of coastal, freshwater, outcrop and cave habitats

cooperation among Nature Conservation Agency and municipalities, and local managers of the sites, including JSC "Latvian State Forests" are of particular importance.

In order to plan and ensure efficient exchange of information, as well as for the successful dissemination of information and to respond to current issues timely, provision of informative support to landowners and other operators, it is advisable to develop and implement a Management Communication Strategy of Nature Conservation Agency.

13. Updating Natura 2000 Programme

The Natura 2000 Programme is not a static document. It must be updated according to the newest knowledge on the distribution and quality of species and habitats in each Natura 2000 site. Also the measures necessary for the improvement of the conditions of habitats and species (over time, some of them will no longer be relevant) have to be updated according to the actual needs. The restoration and management proposals must be adjusted upon obtaining the newest available information such as: habitat mapping results of EU importance; biodiversity monitoring results; scientific knowledge and practical experience on habitat management. The Natura 2000 Programme and its priorities must be updated after completing the EU protected habitat mapping in 2020. Natura 2000 Programme is part of the Strategy of the Nature Conservation Agency, so that it needs to be updated every time when the strategy is being updated or a new strategy is being developed.

PART II

STRICT NATURE RESERVES

Grīņi Strict Nature Reserve (LV0100300)

1. Brief description

YEAR OF FOUNDATION: 1936.

LOCATION: Pāvilosta municipality Saka rural territory.

AREA: 1454.9 ha.

NATURE MANAGEMENT PLAN: 2008 (2008 – 2018).

LAW: On Grīņi Strict Nature Reserve, 16.03.2000.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Grīņi Strict Nature Reserve is established for the conservation of poor, periodically wet pine forest (forest site type *grīnis*) which is a very rare habitat in Latvia, and for the protection of cross-leaved heath *Erica tetralix* whose distribution here reaches the north-eastern border of distribution. There are seven EU protected habitat types in the strict nature reserve, and the most significant areas are covered by wet heaths.

The strict nature reserve is located in a wooded area near the Durbe River. Its area and surroundings have long been subjected to various human influences. The development of habitats has been closely related to people and their activities – forest cutting, slash-and-burn cultivation, pasturing, mowing of fens. Some of these have had a positive effect on the development and preservation of nature values, for example, grasslands, heaths, fens. Part of the reserve and adjoining areas are drained, which has negatively affected the condition of wet habitats (wet heaths, woodlands, mires).

There are 52 protected species found in the nature reserve. The most important protected plant species are *Carex buxbaumii, Juncus bulbosus, Viola uliginosa, Lycopodiella inundata, Hydrocotyle vulgaris, Dactylorhiza baltica, Dactylorhiza incarnata, Dactylorhiza maculata, Hammarbya paludosa*. There are large stands of *Myrica gale*. Of mammals, *Lutra lutra* can be found. Important bird species are *Bonasa bonasia, Pernis apivorus, Tetrao tetrix* and *Tetrao urogallus*. Cyclostome – *Lampetra planeri*.

2. Threats to habitat and species conservation

- Heaths are affected negatively by drainage, lack of fire disturbance, lack of traditional management, and natural succession. In result, sparse woodlands and heaths are replaced by closed woodlands.
- Transition mires are adversely affected by drainage.
- Grasslands and fens are overgrowing due to lack of management.
- Bog woodlands (*grīnis*) are threatened by lowering of water level, lack of fire disturbances, resulting in overgrowth with shrubs and the simplification of vegetation.
- The lack of fire disturbance degrades the quality of *Erica tetralix* habitats and reduces the habitat area.
- Migration of fish and cyclostomes is encumbered by beaver (*Castor fiber*) dams in Kārpa river.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 most of the grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". More than half of the total area of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* (total area 1.2 ha) received the support, but habitat type 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* was not managed.

4. Priorities of management and conservation

- The main nature values in the strict nature reserve are related to habitats of open landscapes – heaths, fens, and grasslands. Therefore the priority is to maintain biodiversity and favourable conservation status in habitats other than forest.
- Restoration and conservation of wet heaths with *Erica tetralix*.
- Grassland restoration and maintenance is a priority only in case if also heaths are restored and maintained. Otherwise, their area in the territory is too small to ensure their long-term existence.
- Rewetting; maintenance of hydrological regime.
- Conservation of open fens with *Myrica gale*.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of the change of protection status of the territory – from strict nature reserve to nature reserve.
- Update of habitat maps (according to the cartographic material, the area of protected woodland habitats is larger than it is currently known).
- Hydrological regime research. Clarifying of drainage impact mitigation possibilities and the existence and restoration possibilities of shallow (manually excavated) ditches.
- Maintenance of free water discharge in Kārpa river and its tributaries (including drainage ditches), while preserving hydrological conditions necessary for wet habitats of the territory.
- Deepening or straightening of Rudupe river (located near the strict nature reserve) can not be allowed because it will increase runoff from the territory.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	5.8	<1	Poor.	Rewetting – in complex with mires. Prescribed burning, in complex with heaths.	According to research results. 25.0	
9010*	Western Taïga	13.1	<1	Poor.	Non-intervention.	13.1	
7140	Transition mires and quaking bogs	3.3	<1	Poor.	Maintenance of open landscape (felling of shrubs).	3.3	
7110*	Active raised bogs	0.8	<1	Poor.	Non-intevention.		
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	2.5	<1	Poor.	Restoration. Maintenance.	0.8	2.6
6000	Grasslands to be restored	8.2	<1	-	Restoration. Maintenance.	8.2	8.2
6230*	Species-rich *Nardus* grasslands	0.00087	<1	Bad.	Restoration. Maintenance.	<0.1	<0.1
4010	Northern Atlantic wet heaths with *Erica tetralix*	60.0	4.1	Poor.	Clarification of the area which must be restored. Prescribed burning. Felling of trees and shrubs. Soil scarification or topsoil removal in patches.	60	60
3260	Natural river reaches and river riffles	3.5	<1	Poor.	Limitation of population of beavers. Elimination of beaver dams and inundations, mainly in Kārpa river.	Number and sites must be specified after inventory (hydrology, grasslands).	On necessity, continuously.

According to nature management plan (2008), the area of grasslands which must be restored is 10.7 hectares. Restoration is necessary also in forest edge habitats along the Liepāja-Ventspils railroad, in length of 6.5 kilometres, in an area of 20.3 hectares. As semi-natural grasslands can change relatively rapidly, repeated assessment of their restoration possibilities is necessary.

Krustkalni Strict Nature Reserve (LV0100400)

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Madona municipality Ļaudona and Mārciena rural territories.

AREA: 2978 ha

NATURE MANAGEMENT PLAN: 2006 (2006–2010).

LAW: On Krustkalnu Strict Nature Reserve (16.03.2000)

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Krustkalni Strict Nature Reserve is located in the East-Latvian Lowland, Arona hill-plain. The territory is characterized by undulated terrain. It includes forests and grasslands on slopes of Madona-Trepe ice-marginal ridge and Prauliena hillock, discharges of lime-rich springs at the base of ridge forming several small mires, pools and several lakes. The largest of these are Dreimaņu (Svētes) Lake, Lielais Plencis and Mazais Plencis Lakes, as well as Kaļķu Pond which has formed in the former tufa extraction site. Calcareous habitats and associated species are of particular value.

Krustkalni Strict Nature Reserve is important for the conservation of woodlands, tufa formations, freshwater habitats and their associated species and biodiversity. There are calcareous soils, a particular terrain and hence various humidity conditions in the territory, therefore various types of grassland habitats are present in the area. At a national level, the territory is among the first twenty Natura 2000 sites regarding the total area of habitat types 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* and 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) (the territory is the second most important for this habitat type in eastern Latvia).

In total, 43 protected vascular plant species and 21 protected moss species have been found in Krustkalni Strict Nature Reserve. Grasslands are important as habitats for vascular plants *Thesium ebracteatum* and *Iris sibirica*. Also *Platanthera bifolia, Dactylorhiza incarnata* and *Dactylorhiza baltica* can be found. Dry forests on slopes are habitats for *Pulsatilla patens, Pulmonaria angustifolia* and *Lathyrus niger*. Moss species *Hamatocaulis vernicosus* can be found here. Krustkalni Strict Nature Reserve is one of the two localities in Latvia for *Ligularia sibirica,* which grows in forest with spring discharges.

Lycaena dispar and *Coenonympha hero* are very important invertebrate species. In total, seven protected insect species have been found.

41 protected bird species are found in the area, but only some of them are breeding in the reserve. The most important ones are the relatively large populations of *Picoides leucotos* and *Picoides tridactylus*, and large number of breeding *Bonasa bonasia*. There is a rather rich fauna of nocturnal predatory birds (*Strix uralensis, Glaucidium passerinum, Aegolius funereus* are breeding here). Grassland habitats are important for bird species *Lullula arborea, Aquila pomarina, Crex crex*.

11 protected mammal species have been found, including a very rare *Sicista betulina*. There are also several bat species, for example, *Myotis brandtii*.

2. Threats to habitat and species conservation

- Overgrowth of grasslands; degradation of vegetation after the discontinuation of management. Management is hindered due to access difficulties; management of some grasslands is not possible with tractor machinery.
- Overgrowth of mineral-rich springs and springfens with willows and reeds; unfavourable changes of water level due to activities of beavers. As a result, groundwater table is permanently increased in areas near rivers, which adversely affects the quality of habitats in these areas.
- Freshwater habitats are negatively affected by eutrophication and the overgrowth of lake shores with shrubs and reeds.
- Breeding birds are threatened and disturbed by illegal angling.
- Spread of invasive plant species *Acer negundo, Swida alba, Amelanchier spicata, Lupinus polyphyllus, Impatiens parviflora, Impatiens glandulifera.*

3. Existing management of the protected habitats and its assessment

- At the culvert at upper reach of Svētupe river, regular demolition and control of the beaver dams has been carried out in order to regulate the water

level and to preserve the springfens in the Dreimaņu lake peninsula.

- Grassland habitats have been managed mainly by mowing (high-mowing; grass often is left on site or mown with shredding; in some areas hay is left at the forest edges where it promotes forest eutrophication and decrease of biodiversity associated with it). Since 2003, grassland monitoring has been carried out every other year. Data indicate deterioration of grassland condition: increased abundance of expansive species, decreased number of species.
- According to Rural Support Service, in 2014 about half of the grasslands of habitat type 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis), and 66 % of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". There were no applications for support for grasslands of habitat type 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae).
- In 2015, a project supported by Latvian Environmental Protection Fund was implemented. It included restoration of grassland areas by cutting trees and shrubs.
- In 2015, the shores of Mazais Plencis Lake were cleaned – broken and fallen trees were removed from the lake.
- Since 2016, *Acer negundo* restriction measures are implemented by Nature Conservation Agency. *Acer negundo* trees are felled in grasslands and their stumps are milled (in the area of 0.6 ha). Trees were felled in 2016, stumps were milled in 2017.
- In 2017, project "Management of grassland habitats in Teiči and Krustkalni Nature Reserves in 2017" supported by Latvian Environmental Protection Fund is implemented. It includes brush cutting, and management of 20.9 ha of grasslands is planned.

4. Priorities of management and conservation

- Undisturbed course of the natural processes of natural and slightly-disturbed habitats of the Krustkalni Strict Nature Reserve, by ensuring non-intervention in the forest habitats, except for the implementation of species conservation measures.
- Restoration of semi-natural grasslands in their maximum possible area, and maintenance in favourable conservation status. The restoration of habitat type 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) is a priority.
- Conservation of biodiversity of naturally eutrophic lakes including Dreimaņi Lake, ensuring appropriate management.
- Elimination of invasive species and reduction of their distribution.

5. Necessary management and conservation measures

5.1. General measures

- Mapping of protected habitats according to newest methods.
- Conservation and restoration of localities of light-demanding protected plant species (*Pulsatilla patens, Thesium ebracteatum, Lathyrus niger, Pulmonaria angustifolia*) by removal of roadside shrubs and felling of *Picea abies* advance growth.
- Eradication and limitation of spread of invasive plant species (regardless of the habitat type).
- Assessment of rewetting possibilities in woodlands adjacent to Dreimaņu Lake; evaluation of potential influence of rewetting on other habitats.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	94.1	3.2	Poor.	Non-intervention. Rewetting in area adjacent to Dreimaņi Lake.	According to research results	94.1
9180*	Slope forests	1.0	<1	Poor.	Non-intervention.		1.0
9080*	Fennoscandian deciduous swamp woods	7.1	<1	Poor.	Non-intervention.		7.1
9010*	Western Taïga	46.4	1.6	Bad.	Non-intervention.		46.4
9050	Herb rich spruce forests	155.0	5.2	Poor.	Non-intervention.		155.0
7210*	*Cladium mariscus* fens	0.8	<1	Poor.	Reduction of reedbeds – on necessity and according to actual situation (must be evaluated). Felling of shrubs at least once per five years in the peninsula and western coast of Dreimaņi Lake (avoiding damaging the springfen). Removal of cut shrubs and reeds (not allowed to be burnt on site).		0.8
7160	Fennoscandian mineral-rich springs and springfens	12.7	<1	Favourable.	Regular control and removal of beaver dams. Felling of shrubs and mowing of reeds in the peninsula and western coast of Dreimaņi Lake		12.7 1
7140	Transition mires and quaking bogs	23.64	<1	Favourable.	Regular control and removal of beaver dams in the whole hydrologically related area. Felling and removal of shrubs at least once per five years.		23.64 1
7110*	Active raised bogs	1.02	<1	Favourable.	Regular control and removal of beaver dams in the whole hydrologically related area. Felling and removal of shrubs at least once per five years.		1.02 0.5
6510	Lowland hay meadows	0.27	<1	Favourable.	Non-intervention.		0.27

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	2.00	<1	Poor.	Restoration. Maintenance.		2.00
6430	Hydrophilous tall herb fringe communities	7.43	<1	Bad.	Restoration. Maintenance.		7.43
6410	*Molinia* meadows	4.99	<1	Poor.	Restoration. Maintenance.		4.99
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	4.82	2.5	Bad.	Restoration. Maintenance.		4.82
6210	Semi-natural dry calcareous grasslands	73.21	<1	Poor.	Restoration. Maintenance.		73.21
3260	Natural river reaches and river riffles	0.05	<1	Poor.	Restoration. Maintenance.		0.05
3160	Natural dystrophic lakes and ponds	4.5	<1	Poor.	Restriction of beaver activities in Niedruška, Svētupe, Nirīte rivers – control, removal of dams and large woody debris, maintenance of results (improvement of water discharge).		4.5 On necessity
3150	Natural eutrophic lakes	0.47	2.0	Poor.	Non-intervention.		0.47
3140	Charophyte lakes	60.43	1.70	Poor.	Removal of fallen logs (Mazais Plencis and Draimaņi lakes). Cutting and removal of shrubs in Dreimaņi lake. Mowing of aquatic macrophytes up to depth of 2 m in Dreimaņi lake.	1.0 0.2 0.2	
		50.67		Poor.	Reed mowing once per 5 years in Mazais Plencis lake.	2.0	

The restoration and management of grassland habitats is analysed in detail in the Krustkalni grassland management plan which is currently being prepared (author A. Namatēva). Restoration measures include road and bridge repairs to ensure access for grassland management machinery. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Moricsala Strict Nature Reserve (LV0100200)

1. Brief description

YEAR OF FOUNDATION: 1912.

LOCATION: Ventspils municipality, Usma rural territory.

AREA: 818 ha.

NATURE MANAGEMENT PLAN: 2009 (2009–2024).

LAW: On Moricsala Strict Nature Reserve (16.03.2000).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Moricsala Strict Nature Reserve is located in Lake Usma. It includes Moricsala Island, Lielaksnīte Island and Luiziķērte Bay of Usma lake, with aquatorium. Moricsala Reserve was the second oldest protected nature territory in Russian Empire and it is the oldest protected nature territory in Latvia. Its oldest part is Moricsala Island where the most important value is an old, naturally developed broadleaved forest with an outstanding structure of an undisturbed forest of long continuity. There are grasslands which have been used for grazing. Also woodlands of Lielaksnīte Island (the other island of the Strict Nature Reserve) are characterized by undisturbed development of woodlands, however, grasslands and overflowing areas cover most of the island. The strict nature reserve is important for the conservation of peculiar forest landscape which has not been influenced by people for a long time, and for the protection of large diversity of rare plant, lichen, mushroom and animal species.

There are nine EU protected habitat types. The most important ones are oak (*Quercus robur*) forests and old broad-leaved deciduous forests. Protected species include 10 species of mammals, 16 bird, four fish, 53 invertebrate, 18 moss, 19 vascular plant species.

In 2004, Moricsala Strict Nature Reserve was included in the territory of internationally important bird area *Moricsala and Viskūžu Island* (site code LV074). The most important species in the territory are plant species *Isoëtes lacustris, Littorella uniflora, Najas flexilis* in the lake, moss *Dicranum viride*, plants *Corydalis cava* and *Corydalis intermedia* in forest. Several rare invertebrate species have been found, especially beetles such as *Osmoderma barnabita, Agrilus biguttatus, Cucujus cinnaberinus, Leptura thoracica* and others. Birds *Haliaeetus albicilla* and *Pandion haliaetus* live on the island.

2. Threats to habitat and species conservation

- Anthropogenic impact – research activities in the strict nature reserve; anglers staying in the reserve water aquatorium. Tourism development in the territories adjacent to the strict nature reserve.
- Littoral part of lake is adversely affected by construction of boat docks and channels, and use of bathing sites.
- Eutrophication in the lake; the discharges of unmanaged agricultural drainage systems into the lake.
- Semi-natural grasslands are threatened by overgrowth and discontinuation of management.
- Natural processes and disturbances – storm damage, water level fluctuations in the lake, mechanical influence of the ice in the spring, bank of decayed reeds that hinder the surface runoff and promote paludification of grasslands; biotic disturbances; forest succession; changes in light conditions in wooded grasslands.
- Overgrowth with aquatic macrophytes. Although the total cover of emergent vegetation in Usma lake is small, ~ 5 %, it overtakes practically all the areas which are suitable for *Isoëtes lacustris, Littorella uniflora* and *Najas flexilis*. (Habitats and potential habitats for these species are up to 3 m deep littoral part with substrate of sand and gravel, with sparse growths of reeds, not dominated by float-leaved (nympheid) plant communities.)

3. Existing management of the protected habitats and its assessment

- There are lowland species-rich dry to mesic grasslands in Moricsala Island at "Kalviņi" farmstead. Grasslands have been managed by mowing, but the grass was left on site for several years. This has led to grassland eutrophication and the simplification of species composition. Negative influence is reversible if grass removal will be started.

4. Priorities of management and conservation

- Undisturbed course of natural processes in habitats, as well as in habitats of species that need undisturbed, natural environment.
- Conservation and sustainable existence of protected habitats and populations of their plants, aquatic invertebrates and birds in aquatorium of the strict nature reserve in Usma lake.
- Conservation of semi-natural grasslands is recommended for the preservation of biodiversity in the strict nature reserve, particularly concerning flower-feeding invertebrates and protected species of dragonflies.

5. Necessary management and conservation measures

5.1. General measures

- Maintenance of grassland habitat at "Kalviņi" farmstead by grazing or by mowing with subsequent grass removal, for the conservation of species diversity. Evaluation of the restoration potential of juniper formations.
- On necessity – limiting the number of wild boars (*Sus scrofa*), beavers (*Castor fiber*) and cormorants (*Phalacrocorax carbo*), if nature values of the strict nature reserve are negatively affected by activities of these animals.
- Continue to ensure the protection of the territory and the control of human limited residence, as it is essential for bird breeding success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	7.4	<1	Favourable.	Non-intervention.		7.4
9160	Oak forests	13.2	1.6	Favourable.	Non-intervention.		13.2
9080*	Fennoscandian deciduous swamp woods	3.5	<1	Favourable.	Non-intervention.		3.5
9020*	Broad-leaved deciduous forests	30.3	3.7	Favourable.	Non-intervention.		30.3
9010*	Western Taïga	13.7	1.7	Favourable.	Non-intervention.		13.7
6450	Northern boreal alluvial meadows	0.1	<1	Bad.	Restoration. Maintenance.	0.1	0.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.1	<1	Poor.	Restoration. Maintenance.	0.0	1.1
5130	*Juniperus communis* formations on heaths or calcareous grasslands	0.6	<1	Bad.	Restoration (after the evaluation of the potential of restoration; maybe the course of succession is more important). Maintenance.	0.6	0.6
3150	Natural eutrophic lakes	690.9	84.5	Poor.	Mowing of emergent and float-leaved vegetation in sites where it threatens habitats of *Isoëtes lacustris, Littorella uniflora* and *Najas flexilis*. On necessity.	0.5	

Teiči Strict Nature Reserve (LV0100500)

1. Brief description

YEAR OF FOUNDATION: 1982.

LOCATION: Madona municipality Mētriena and Barkava rural territories; Varakļāni municipality Murmastiene and Varakļāni rural territories; Krustpils municipality Atašiene rural territory.

AREA: 19 779 ha.

NATURE MANAGEMENT PLAN: 2006 (2006–2010), validity extended until 2019.

LAW: On Teiči Strict Nature Reserve (15.06.2008).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Teiči Strict Nature Reserve is located in the Eastern Latvia Lowland, in the area where large mires are characteristic, bordering with a landscape mosaic of woodlands and agricultural lands. Territory includes the largest massif of active raised bogs in Latvia. In Teiči Mire, there is a vegetation characteristic to mires of Eastern Latvia. Together with 18 lakes and bog pools, it forms an important complex of wetlands. The largest lakes are: Kurtavas, Islienas, Siksalas, Lisiņas and Vaboles lakes. There are mineral-ground elevations (Rāksala, Siksala, and others) which are glacial flutes by their origin. Forests cover about 20 % of the strict nature reserve, mainly wet woodlands dominated by *Betula* spp and *Pinus sylvestris, Picea abies,* also *Alnus glutinosa* swamp woods and drained woodlands. There are also small areas of coniferous forests on dry mineral soils. The largest forests are located in the northern part of the territory and south of Lake Kurtava. Transition mires and fens cover small areas, mostly on shores of lakes. The largest continuous transition mire and fen lays in the area of the overgrown Lake Šūmāna.

In total, 16 EU protected habitat types have been found in the strict nature reserve. The most important ones are active raised bogs, bog woodlands, western Taïga, natural dystrophic and natural eutrophic lakes, as well as semi-natural grasslands.

At national level, the strict nature reserve is the fifteenth most important territory for the conservation of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* (3.4 % of its total area in Natura 2000 network). 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) is a benchmark for this habitat type in Eastern Latvia. From landscape-ecological point of view, grasslands of the territory are important as a stepping stone for species dispersal between Lubāns Wetland and Daugava River Valley; there are no other Natura 2000 territories in North-Eastern Geobotanical District with significant areas of grasslands.

The territory is a habitat for rare and protected plant species. For several species, the largest or the only localities in Latvia can be found in the area. There are 38 rare and protected vascular plant species, 24 protected moss, 79 bird, 14 invertebrate and 15 mammal species. The territory is an Important Bird and Biodiversity Area, and it is included in the list of Ramsar sites. It is important for the protection of mire-specific and rare species of birds, and as a foraging and stopover site for migratory waterbirds. The most important bird species in the territory are *Grus grus, Bonasa bonasia, Circus pygargus, Haliaeetus albicilla, Philomachus pugnax, Tetrao tetrix, Limosa limosa, Pluvialis apricaria*, and *Numenius phaeopus*. There is a large number of breeding *Tringa glareola* and *Tringa totanus*. Lake Vaboles is the area that is the richest in birds in Teiči Mire. *Sterna hirundo* is breeding in the lake, as well as a large number of ducks, particularly *Aythya fuligula*.

Rare vascular plant species in the territory include *Cinna latifolia, Cypripedium calceolus, Liparis loeselii, Corallorhiza trifida, Gladiolus imbricatus,* and others. Rare moss species are *Bazzania trilobata, Splachnum sphaericum, Splachnum rubrum, Sphagnum molle.* Protected invertebrate species include *Leucorrhinia pectoralis, Graphoderus bilineatus, Euphydryas aurinia, Lycaena dispar.* Important invertebrate species are *Lutra lutra, Lynx lynx, Sicista betulina, Myotis dasycneme.*

2. Threats to habitat and species conservation

- Teiči Mire and its surroundings has been drained before the establishment of protected nature territory. Although dams have been constructed on part of drainage ditches, and others are blocked by beavers, individual ditches still continue to function, contributing to the drainage of the territory.

- Management cessation of semi-natural grasslands; inappropriate management (mown grass is placed on ditch verges, therefore promoting eutrophication).
- Paludification process has started in several semi-natural grasslands (Ozolsala, Medņuriesti, Pulcenes (Zaļā) Island) due to clogged drainage systems and activities of beavers. Habitats lose their botanical value, and their management becomes difficult.
- Water level lowering in Lake Vaboles due to drainage. Some parts of the former lake are overgrowing with trees which adversely affect species of breeding birds.
- Spread of invasive plant species *Heracleum sosnowskyi*.

3. Existing management of the protected habitats and its assessment

- LIFE programme project "Measures to ensure the nature conservation management of Teici Area" (LIFE00 NAT/LV007127, 2001-2005) undertook a series of actions, including restoration of mire (about 1 000 hectares) and grassland (858 ha) habitats.
- Until 2010, 101 dams for rewetting were established in mire. In the following years dams were repaired and maintained. As a result, the recovery of mire habitats and the improvement of conservation status have been observed.
- According to Rural Support Service, in 2014 84-98 % of grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".
- With support of Teiči Fund for Nature, grasslands were mown and hay was removed in 2017, in an area of 179.45 hectares. In part of the grasslands, mown grass was placed on edges of grasslands, in shrubs. In framework of project funded by Latvian Fund for Nature, "Grassland habitat management measures in Teiči and Krustkalni Strict Nature Reserves in year 2017", small grasslands, where management with heavy machinery was difficult, were mown and trees and shrubs were removed in an area of 5.7 hectares (manager - Teiči Fund for Nature).
- In 2016, Lake Vaboles hydrological systems and their restoration potential were researched. Guidelines were developed for implementation of Lake Vaboles optimal and sustainable management measures.
- *Heracleum sosnowskyi* elimination measures (mowing, root cutting) are carried out annually. Measures are not always effective. In 2017, hogweeds were mown twice and pastured in an area of 2.2 hectares; in Ozolsala, herbicides were used according to expert recommendation, in an area of 0.218 hectares.

4. Priorities of management and conservation

- Maintenance and repair of the existing dams. Construction of new dams and limitation of water discharge in dams which drain the raised bog.
- Lake Vaboles: restoration and maintenance of water level which is optimal for breeding and migratory species.
- Management of *Cypripedium calceolus* locality, maintaining the optimal conditions for species.
- Limitation of *Heracleum sosnowskyi* spread.
- Restoration and maintenance of semi-natural grasslands in favorable conservation status in their historical areas (1960s – 1970s), except in situations where it is objectively demonstrated that the maintenance or restoration of grassland drainage systems is a significant threat to priority protected mire habitats, and in situations when other protected habitats (mires, woodlands) have developed in overgrown grasslands.

5. Necessary management and conservation measures

5.1. General measures

- Additional research on hydrological regime restoration for semi-natural grasslands, based on the following material: Evaluation of grassland hydrological regime (O. Aleksāns, 2015), and Recommendations on grassland management (A. Namatēva, 2015). Restoration and maintenance of shallow ditch systems must be evaluated (for example, Ozolsala grasslands). The priority role in the territory for the mire habitat conservation must be taken into account in the conclusions.
- Limitation and elimination of *Heracleum sosnowskyi*.
- Amendments to Law On Teiči Strict Nature Reserve, providing an option for the rewetting in Lake Vaboles.

5.2. Specific measures

5.2.1. Species

- *Cypripedium calceolus* locality: felling of *Picea abies* in subcanopy and advance growth, area of 6.9 hectares, once per 5-10 years (6th compartment of 135th forest block).

5.2.2. Habitats

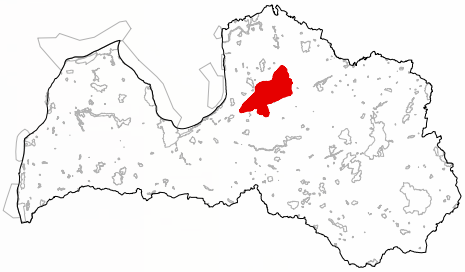
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	151.9	<1	Poor.	Non-intervention.		152.1
9060	Coniferous esker forests	39.4	<1	Bad.	Non-intervention.		
9010*	Western Taïga	195.7	1.0	Poor.	Non-intervention.		195.9
9020*	Broad-leaved deciduous forests	35.5	<1	Poor.	Non-intervention.		35.6
91D0*	Bog woodland	2624.3	13.3	Poor.	Non-intervention.		2624.3
7150	Depressions on peat substrates	170.2	<1	Favourable.	Non-intervention.		170.2
7140	Transition mires and quaking bogs	177.9	<1	Favourable.	Felling of trees around Lake Vaboles.	According to research results.	
7120	Degraded raised bogs	4.0	<1	Poor.	Construction of dams; discharge regulation in dams which drain the bog.	On necessity.	
7110*	Active raised bogs	13509.3	68.3	Favourable.	Non-intervention.		
6510	Lowland hay meadows	8.38	<1	Poor.	Restoration. Maintenance.	Up to 8.38	8.38
6410	*Molinia* meadows	27.1	<1	Poor.	Restoration. Maintenance.	Up to 27.1	27.1
6450	Northern boreal alluvial meadows	1.68	<1	Poor.	Restoration. Maintenance.	Up to 1.68	1.68
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	90.37	<1	Poor.	Restoration. Maintenance.	Up to 90.3	90.3
3260	Natural river reaches and river riffles	2.0	<1	Favourable.	Non-intervention.		2.0
3160	Natural dystrophic lakes and ponds	238.0	1.2	Favourable.	Lake Vaboles: creation and maintenance of optimal water level (target area 130 ha). Options: 1) Construction of water flow regulator on Vabole river, as close as possible to its outflow; 2) Construction of dams on Vabole river and complete filling of individual ditches.	130.0	
3150	Natural eutrophic lakes	156.8	<1	Poor.	Non-intervention.		156.8

One-time grassland restoration measures are necessary in almost all the area, as most of the grasslands overgrow from edges. In most of the areas, eutrophication (occurred due to unsuitable management in previous years) must be reduced.

NATIONAL PARKS

Gauja National Park (LV0200100)

1. Brief description



YEAR OF FOUNDATION: 1973.

LOCATION: Amata, Beverīna, Cēsis, Inčukalns, Krimulda, Līgatne, Pārgauja, Priekuļi, Sēja, Sigulda, Kocēni municipalities.

AREA: 91 789 ha.

NATURE MANAGEMENT PLAN: 2004 (2004–2013), validity extended until 2018.

LAW: On Gauja National Park (30.04.2009.).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 317 of 02 May 2012, Regulation on Individual Protection and Use of Gauja National Park (30.04.2009).

Gauja National Park is located in the central part of Vidzeme Region. It includes a unique complex of nature – Gauja River ancient valley, with valleys and side-ravines of its numerous tributaries, some relatively unaffected forest massifs, rock outcrops, mires, springs, and cultural landscapes. The national park was established for the conservation of almost unmodified and biodiverse terrain forms, as well as landscapes typical for Vidzeme region, monuments of nature and culture, and for the promotion of nature tourism and sustainable development of the territory.

The territory is characterized by a high diversity of habitats, diverse flora and fauna. Gauja valley is also an important species dispersal corridor at a regional level. The geological objects found here are of particular importance. There are several hundreds of peculiar and interesting geological formations: outcrops of bedrocks and Quaternary sediments, caves, sinkholes, springs, waterfalls and ravines. About two thirds of all Latvian caves can be found here. Sandstone and dolomite outcrops and caves provide habitats for characteristic mushroom, lichen, plant and animal species. For example, rare moss *Schistostega pennata* and lichen *Cystocoleus ebeneus* grow here. The Gauja National Park is one of the most important bat hibernation sites in Latvia, including species *Myotis dasycneme* and *Barbastella barbastellus*.

Forests cover about half of the territory, and almost all forest site types which are found in Latvia, can be found here – various types of pine (*Pinus sylvestris*), spruce (*Picea abies*) forests, woodlands with oaks (*Quercus robur*), aspen (*Populus tremula*), and ash (*Fraxinus excelsior*). Particularly outstanding are old linden (*Tilia cordata*) woodlands of slopes, screes and ravines. In Gauja River valley, there are diverse alluvial forests which are flooded in spring floods. There are also numerous rivers, including river riffles. Lakes of various types can be found.

Since the Gauja River is almost unmodified over its whole length, with its tributaries, it is one of the few rivers throughout the Baltic Sea Region where natural spawning grounds of *Lampetra fluviatilis* and salmonids are preserved. It is also a habitat for *Lutra lutra*. Some of the rivers are Latvian-scale benchmark rivers, with species composition characteristic to clean or slightly polluted rivers. For example, Amara is a benchmark for rhithral-type rivers, but Rakšupe, Vellupe and Dzērdupe rivers – benchmarks for small rivers. A particular value which can be found in several rivers, are protected mollusk species – *Margaritifera margaritifera* and *Unio crassus*.

Mires cover about 6% of the national park territory. Mostly they are influenced by drainage and peat extraction, for example, one of the largest peat extraction sites is located in Unguru Mire, and Vārnēni Mire is modified by peat extraction in its entire area. Of raised bogs, the most important one is Suda Mire, and although partially affected by drainage, it is still a remarkable example of raised bogs in the country. In some places, springfens can be found – important habitats of rare and protected plant species.

The natural processes of the national park have developed alongside human activities. More than a third of the territory is covered by agricultural land – meadows, pastures and arable land. Nowadays, due to changes in people's lifestyle, the landscape is changing in a result of changes in land use. Agricultural lands are overgrowing, therefore grasslands have become endangered habitats; their biological value decreases as well as the chance of survival for many species. At the national level, the national park is the second most important Natura 2000 territory for the conservation of habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) and 6510 *Lowland hay meadows* (Alopecurus

pratensis, Sanguisorba officinalis) (18 % and 10 % of the total habitat area of Natura 2000 territories in Latvia), and it is among the ten most important territories for the protection of 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*, 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia), 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe).*

From landscape-ecological point of view, Gauja River valley is the most important core-area of grasslands in North-Vidzeme Geobotanical District, as well as indispensable species dispersal corridor. Semi-natural grasslands of the national park are the most important localities of endangered species *Cenolophium denudatum* and *Silene tatarica*. Solitary growing large deciduous trees are particularly valuable – habitats for light-lowing polypore, lichen and invertebrate species, for example, *Osmoderma barnabita*.

A mosaic landscape with forest massifs, mires and grasslands is a prerequisite for a large variety of bird species. In total, 37 rare and protected species of breeding birds have been found in the territory. Gauja ancient valley is an important breeding site for B*ubo bubo, Dendrocopos leucotos, Alcedo atthis, Ciconia nigra, Bonasa bonasia, Pernis apivorus, Tetrao tetrix,* and a wintering site for *Mergus merganser, Cinclus cinclus*. Grasslands are particularly important for *Aquila pomarina, Crex crex, Lanius collurio and* Lullula arborea.

In total, 67 rare and protected vascular plant species are found in the national park, for example, *Lunaria rediviva, Equisetum scirpoides, Cenolophium denudatum, Cucubalus baccifer, Cypripedium calceolus, Liparis loeselii, Agrimonia pilosa, Gymnocarpium robertianum, Saxifraga hirculus,* and *Pulsatilla patens*. In several lakes, rare plant communities with *Lobelia dortmanna, Isoëtes* spp. and *Sparganium* spp. can be found. Also 23 protected moss species (this number likely is larger), are found in the territory, including *Hamatocaulis vernicosus*, as well as 27 rare and protected lichens and 17 mushroom species.

There are 71 protected invertebrate species and 24 protected mammalian species in Gauja National Park. Gauja ancient valley is one of the few places in Latvia, where the edible dormouse *Glis glis* lives.

Gauja National Park is one of the most important tourist destinations in the country, due to its rich natural and cultural heritage, as well as the favorable location in the vicinity of Rīga city. Consequently, there is a large visitor load, which influences nature values. Therefore, a balanced planning of development is necessary, in order to conserve the nature values and outstanding landscapes, and to preserve the role of the territory as an attractive tourist destination.

2. Threats to habitat and species conservation

- The condition of geological formations and their associated habitats are deteriorating (soil erosion, bedrock leaching, trampling, inscriptions in sandstone outcrops, pollution) due to human economic activities and recreation.
- Forest habitats and their associated species are adversely affected by habitat fragmentation and logging. Volumes of dead wood, proportion of old trees and old woodlands decrease due to logging permitted by regulatory enactments.
- Drainage of mires or adjoining territories; peat extraction; lack of traditional management in fens and springfens.
- The deterioration of the biological quality of water, due to pollution caused by untreated or partly treated wastewater.
- Disappearance of rare and protected plant species in lakes due to lake eutrophication. For example, disappearance of *Lobelia-Isoëtes* complex.
- Rapid decline of *Margaritifera margaritifera* populations due to eutrophication and beavers (*Castor fiber*) in rivers.
- Reduction of semi-natural grasslands due to overgrowth and inappropriate management. Landscape-ecological connectivity of semi-natural grasslands is critically low, and the existence of semi-natural grasslands, their species and communities is endangered.
- Paludification of semi-natural grasslands near the watercourses in a result of beaver activities.
- Spread of invasive species (for example, *Heracleum sosnowskyi, Impatiens glandulifera, Mustela vison, Astacus leniusculus*) in natural habitats (rivers, lakes, spring habitats) causes decrease of biodiversity, reduction in number and distribution or even disappearance of local species (for example, orchids, *Astacus astacus*). Spring habitats are particularly endangered by a risk of introduction of *Heracleum sosnowskyi, Impatiens glandulifera* and other invasive species.
- Mineral-rich springs and springfens are threatened by economic activities in the habitat and its surrounding areas in at least 20-40 m wide belt, as well as by hydrological regime changes which influence resources and movement of subsurface waters.
- Clogging of fish spawning sites and blocking of fish migration routes are promoted by large woody debris and beaver dams in rivers.
- Petrifying springs with tufa formation are threatened by excessive trampling in the popular tourist destinations (for example, Dāvida Avoti Springs, Lībānu-Jaunzemju tufa formations).

3. Existing management of the protected habitats and its assessment

- Since 2007, various measures for limitation of visitor presence have been carried out in caves: restricting barriers which can be partially or fully closed, lockable bars, maintained trails, and surveillance cameras. However, it is not possible to completely eliminate visitor influence; signs of rock trampling can be observed, torches and candles are used in winter which disturb bats.
- Since 2010, removal of trees and shrubs from sandstone outcrops has been carried out in several places (in 2010 – at Brasla hydroelectric power plant, in 2013 at Viksmeste Cliff, in 2016 at Velnala Cliffs, Piķene cliffs and caves). In result, lighting conditions on cliffs were improved. However, shrubs regrow with time, and repeated cutting is necessary. To avoid excessive trampling, boardwalks have been constructed in some sites at springs. Trail at Ainavu Cliff was renovated. The attempt to redirect a trail at Īļaku cliff was unsuccessful – trampling of slope continues.
- In 1990s, felling of trees (preserving individual trees) in surrounding of Dāvida Springs was organized by Latvia University of Agriculture. Plain boardwalks were constructed, limiting visitor movement in springfen. In years 2013–2014, springfen was in good condition – signs of trampling were insignificant, it was not overgrown with shrubs.
- In springfen at Rakši, felling and mowing of trees and shrubs was continued for three years in scope of LIFE Programme project "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371). Activities can be assessed as positive as the open mire area has increased and light conditions for characteristic species are improved.
- For three consecutive years, felling and mowing of trees and shrubs in xeric sand calcareous grasslands (0.7 ha) was organized by LIFE Programme project "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371). Results are successful: the cover of expansive plant species *Calamagrostis epigeios* has decreased, abundance of xeric grasslands characteristic species is increased, and light conditions are improved.
- Gauja National Park is one of the few Natura 2000 sites with relatively large areas of EU protected grassland habitats in possession of Nature Conservation Agency. So far, most of them have been managed. However, the conservation status of these grasslands in many cases is poor or even bad. Part of the grasslands is not managed.
- According to Rural Support Service, in 2014 about 40 % of semi-natural grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 9 % of 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* were managed.
- Large woody debris has been removed from river riffles (Brasla, Pērļupe, Lorupe rivers, and others) in scope of various activities. Fishways are maintained in Līgatne and Kārļi with good success.
- In framework of LIFE programme project "Forest Habitat Restoration within the Gauja National Park" (LIFE10 NAT/LV/000159), 2014–2016, improvement of *Osmoderma barnabita* habitats, restoration of bog woodlands and western Taïga was carried out. Although in 2017 it is too early to evaluate the management results, the measures can be assessed as positive. Monitoring is carried out for the evaluation of management efficiency.
  - In habitats inhibited by protected beetle *Osmoderma barnabita* (forests of slopes and ravines, alleys, old parks, etc.), tree liberation was carried out: trees and shrubs around large oaks were felled, canopy gaps were created. Stump shoots were mown, stumps and roots, which had remained, were milled. In total, 65 hectares were managed.
  - Rewetting in Gulbjusala Mire in an area of 138 hectares – filling of ditches, construction of wooden dams.
  - Restoration and management of western Taïga in an area of 281 hectares. Measures included: creation of canopy gaps, feeling of spruce advance growth, and increase of dead wood volumes by creation of snags.
- In framework of LIFE Programme project "Conservation and management of Priority wetland habitats in Latvia" (LIFE13 NAT/LV/000578), rewetting in Suda Mire was carried out in year 2017 (blocking of ditches).
- With the support of Latvian Environmental Protection Fund, restoration of river riffles (3260 *Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation*) was carried out in Rauna river (from Cēsis-Valmiera motorway to inflow in Gauja), Vaive river (from Millpond to Gauja), Lenčupe river (between Sila Mill and Gauja), Strīķupe river (between Gauja river and Kocēni municipality border). Pērļupe and Draņķupe rivers were cleaned during the voluntary work events (*talka*).
- Transfer of *Margarita margaritifera*; measures of population increase.

4. Priorities of management and conservation

- Conservation of nature, cultural history and landscape values of Gauja river ancient valley, and valleys of its tributaries, while maintaining a sustainable development of the territory.
- Development of management plans for territories where resource use is in conflict with requirements of nature, cultural history and landscape values.
- Management of rifer rifle areas firstly for the conservation of *Margaritifera margaritifera* populations, and for the maintenance of spawning possibilities for salmonids and lampreys.
- Improvement of structural quality in western Taïga woodlands.
- Increase of landscape-ecological connectivity of semi-natural grasslands by increasing the total area of semi-natural grasslands to at least 700 hectares, and maintenance of their favourable conservation status. Management of habitat types 6120*, 6210, 6230*, 6270*, 6510 is a priority.
- Lake Ungurs: prevention of the negative influence of peat extraction on lake water quality.
- Protection and conservation of sandstone outcrops and their associated species by ending the creation of active tourism offers for particularly sensitive areas, and reducing the visitor flow to caves.
- Rewetting; restoration of open mires. Measures include felling of trees and shrubs in overgrowing fens and springfens, as well as introducing mowing where necessary.
- Maintenance of natural aquatic habitats; prevention of water pollution.

5. Necessary management and conservation measures

5.1. General measures

- Granting of protection status to geological objects which are not included in a list of nature monuments of national significance.
- Creation of visitor infrastructure (restricting barriers, etc.) for the suspension of human-induced soil and bedrock erosion and leaching.
- Development of conservation and tourism organization plan for habitats of outcrops and caves, and their related rare and protected species.
- Development of rewetting plans for mires which are adversely affected by drainage.
- Development and implementation of semi-natural grassland restoration and management plan. Grassland management must be evaluated in complex in the entire national park, without division between EU protected grassland habitats in possession of Nature Conservation Agency, and private properties. Plan must include:
  - Inventory of all currently known semi-natural grasslands; a plan for their restoration;
  - Inventory and restoration plan for all potential EU grassland habitats: historical grasslands (middle of 20th century); old cultivated grasslands and fallow-lands with good restoration potential.
  - A vision for cooperation between Nature Conservation Agency (NCA) and owners/ managers of privately owned grasslands in sites where NCA managed territories have borders with privately owned grasslands.
  - Measures for raising public awareness on the biodiversity-promoting grassland management (for example, award for best managed grassland).
  - Promotion of adequate grassland management examples (grasslands at Gūtmaņala Cave and Zvārte Rock).
  - Extension of grasslands managed by NCA.
  - Evaluation of the possible mobile pasturing.
- Modernization of existing wastewater treatment plants and sewerage systems; construction of new ones in residential areas.
- Vegetation research with a following determination of the appropriate protection regime for localities of protected species and habitats in Lakes Ungurs, Driškina, Plaužu, Pulles, Pūricu, Rābuta, Kaņepu, Mazmuižnieku, Pidēnu, Āraišu, Briežu, Vaidavas, Auciema oxbow lakes, Raiskuma, Melnezera and Ninieris Lakes.
- Development and implementation of management, conservation and restoration plans for public lakes (Āraiši, Vaidava, Ungurs).
- Elimination of invasive species (priorities: *Heracleum sosnowskyi, Impatiens glandulifera, Mustela vison, Astacus leniusculus*).
- Elimination of beaver inundations in sites where they are undesirable from the point of view of the conservation of species or habitats; reduction of numbers of beavers.
- Inventory of oxbow lakes; determination of management priorities for the conservation of *Hirudo medicinalis*, rare and protected dragonflies, and aquatic insects. Maintenance of oxbow functionality by prevention of their filling with sediments of organic origin.
- Construction of fishways at dams of hydroelectric power plants and other artificial barriers.
- Habitat mapping according to newest methods and approaches.

5.2. Specific measures

5.2.1. Species

- The population of *Margaritifera margaritifera* in the Gauja National Park is declining. For its conservation, it is necessary to manage natural river reaches and riffle areas in Amata, Līgatne, Ieriķupīte rivers, as well as carry out reintroduction and "artificial propagation". Inclusion of Pērļupe river upstream part in Gauja National Park is necessary.
- For the conservation of *Osmoderma barnabita* habitats: felling of trees and shrubs around the old oaks. Management measures are described in detail in the habitat management programme.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91F0	Riparian mixed forests	31.8	<1	Favourable.	Non-intervention.		31.8
91E0*	Alluvial forests	155.4	<1	Favourable.	Non-intervention.		155.4
9080*	Fennoscandian deciduous swamp woods	10.3	<1	Poor.	Non-intervention.		10.3
91D0*	Bog woodland	1019.5	1.1	Favourable to bad.	Non-intervention, except hydrological regime improvement according to protected woodland habitat restoration programme.		1019.5
9180*	Slope forests	956.6	1.0	Poor.	Non-intervention.		956.6
9160	Oak forests	21.1	<1	Poor.	Non-intervention. Removal of spruces in advance growth and subcanopy.	According to expert recommen-dations.	21.1
9050	Herb rich spruce forests	0.54	<1	Favourable.	Non-intervention.		0.54
9020*	Broad-leaved deciduous forests	16.1	<1	Favourable to bad.	Non-intervention.		16.1

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	663.0	⟨1	Poor to bad.	Non-intervention.		663.0
9000	Potential Protected woodland habitat	1270.0	1.4	-	Non-intervention. Improvement of structure. Prescribed burning. Increase of dead wood volumes to 20m^3/ha (diameter over 25 cm).	 20.0 25.0 25.0	1200.0
8310	Caves not open to the public	⟩0.2	⟨1	Poor to bad.	All caves: limitation of visits. Evaluation of limitation results using bat monitoring results (numbers, behaviour).		
	Largest caves						
	Kalējala Cave			Poor.	Limitation of visits. Evaluation of influence on bats (numbers, behaviour) after closure of caves from October to April.		
	Līgatnes pagrabalas (Cellar Caves)			Bad.	Limitation of visits. Establishment of infrastructure. Preferable: closure of caves.		
	Liepas Ellīte Caves			Bad.	Limitation of visits. Evaluation of necessity and possible solutions of cave delimitation (hibernating bats are relatively safe, behind a hard-to-cross spring.		
	Caves in Kazu Gravā Ravine			Bad.	Limitation of visits. Establishment of infrastructure. Limitation of visits year-round, or closure (there are bats in caves also in summer).		
	Zanderu Caves			Poor.	Limitation of visits.		
	Kvēpene			Poor.	Limitation of visits.		
	Sikspārņu ala (Bat Cave)			Poor.	Non-intervention, except delimitation, according to expert recommendations.		

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
8220	Siliceous rocky slopes	3.8	<1	Favourable to poor.	Establishment of visitor infrastructure. In some places: rock outcropping; according to expert recommendations.		
	Largest Siliceous rocky slopes with chasmophytic vegetation (sandstone outcrops):						
	Līču-Laņģu Rocks			Favourable.	Non-intervention. Opening, if overgrown with shrubs.	On necessity.	
	Sigulda at Gūtmaņala Cave; Vikmeste			Poor.	Additional infrastructure is not desirable; existing infrastructure should not be maintained and restored as negative influence is observed. Limitation of visits. Reduction of information on objects. Gradual removal of shrubs.		
	Braslas Rocks			Favourable.	Non-intervention. Opening, if overgrown with shrubs.	On necessity.	
	Ramātu Rocks			Favourable.	Non-intervention. Opening, if overgrown with shrubs.	On necessity.	
	Sarkanās (Red) Rocks			Favourable.	Evaluation of possible opening at locality of solitary bees.		
	Sietiņiezis Rock			Bad.	Establishment of visitor infrastructure and maintenance of the territory; ensuring that tourists do not damage the cliff. Removal of shrubs in the adjacent area, thus enhancing the lighting condition on the outcrop.	According to expert recommen-dations.	
	Zvārtes. Miglas. and other rocks at Amata river			Poor.	Non-intervention.		
	Ērgļu Rocks			Favourable.	Maintenance of infrastructure.		

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
8210	Calcareous rocky slopes	2.8	<1	Favourable.	Establishment of visitor infrastructure. Assessment of possible removal of trees and shrubs.		
	Largest calcareous rocky slopes with chasmophytic vegetation (calcareous rock outcrops):						
	Lībānu – Jaunzemju Rocks in Kazu Grava Ravine			Poor.	Non-intervention, except maintenance of existing infrastructure; promotion of the object is not allowed.		
7230	Alkaline fens	0.2	<1	Bad.	Clarification of areas which potentially can be restored (mapping). Rewetting (dams, ditch filling, limitation of beaver activities, etc.). Felling of trees and shrubs. Mowing (with grass removal).	According to research results; potential restoration in 4 – 5 ha.	According to research results.
7220*	Petrifying springs	2.3	<1	Poor.	Non-intervention (all spring discharge sites in forests. In open spring discharges: felling of shrubs; repeated mowing in some places (once per 3 years). Immediate elimination of invasive species, particularly *Heracleum sosnowskyi*. In all locations where they have been detected (Dāvida Springs, etc.). Kazugrava: establishment of infrastructure which decrease the anthropogenic load.	According to research results and after habitat mapping.	According to research results and after habitat mapping.
7160	Fennoscandian mineral-rich springs and springfens	62.3	<1	Favourable to bad.	Non-intervention (all spring discharges in forests), except in sites where reduction of beaver activities is necessary. Felling of shrubs (Rakši surrounding). Mowing with grass removal, at least once per three years. Immediate elimination of invasive species, particularly *Heracleum sosnowskyi*. In all locations where they have been detected (Dāvida Springs, etc.).	According to research results and after habitat mapping. 1.0	1.6

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7150	Depressions on peat substrates	79.5	<1	Favourable.	Non-intervention.		79.5
7140	Transition mires and quaking bogs	92.9	<1	Poor.	Non-intervention.		92.9
7120	Degraded raised bogs	328.5	<1	Bad.	Clarification of the total habitat area. Rewetting (ditch blocking or filling) – Gulbjusalas, Marijkalna, Ungura Mires and others, according to habitat mapping results. Felling of trees and shrubs. Re-naturalization in finished peat extraction fields and their parts (Ungura, Vārnēnu Mires); here, the restoration and maintenance of conditions characteristic to mire is the priority. Maintenance and repair (on necessity) of existing ditch dams (Suda, Gulbjusala Mires).	According to research results	
7110*	Active raised bogs	1853.4	2.0	Poor.	Non-intervention. Maintenance and repair (on necessity) of existing ditch dams (Suda, Gulbjusala Mires).	1853.4	
6530*	Fennoscandian wooded meadows	61.9 (?)	<1	Poor.	Restoration. Maintenance.	Unknown.	61.9 (?)
6510	Lowland hay meadows	191.97	<1	Poor.	Restoration. Maintenance.	88.0	192.0
6450	Northern boreal alluvial meadows	123.87	<1	Bad.	Restoration. Maintenance.	67.0	123.9
6430	Hydrophilous tall herb fringe communities	Unknown.	-	Favourable to poor.	Restoration. Maintenance.	Unknown.	0.0
6410	*Molinia* meadows	2.91	<1	Bad.	Restoration. Maintenance.	2.5	2.9

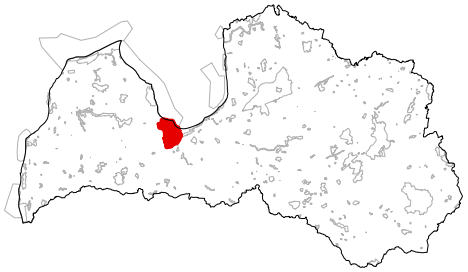
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	157.88	<1	Bad.	Restoration. Maintenance.	99.1	157.9
6230*	Species-rich *Nardus* grasslands	7.39	<1	Bad.	Restoration. Maintenance.	4.4	7.4
6210	Semi-natural dry calcareous grasslands	49.52	<1	Bad.	Restoration. Maintenance.	29.4	49.5
6120	Xeric sand calcareous grasslands	71.65	<1	Bad.	Restoration. Maintenance.	41.5	71.7
6110	Rupicolous calcareous or basophilic grasslands	0.27	<1	Bad.	Restoration. Maintenance.	0.27	0.27
6000	Grasslands to be restored	100.0	<1	-	Restoration. Maintenance.	100.0	100.0
4030	European dry heaths	1.86	<1	Poor.	Prescribed burning.	1.0	
3270	Rivers with muddy banks	2.31	<1	Poor.	Non-intervention.		0.003
3260	Natural river reaches and river riffles	776.51	0.85	Poor.	Removal of large woody debris. Demolition of beaver dams. Mowing of aquatic macrophytes; removal of their roots. Cleaning of rivers (30 ha Gauja river, 20 ha other rivers). In individual cases: regulation of shade.	On necessity. 50	
3160	Natural dystrophic lakes and ponds	71.45	<1	Favourable.	Non-intervention.		71.45

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	60.54	<1	Poor.	Monitoring. Recreation sites. Reduction of overgrowth. Reopening of open littoral zones, to promote sediments being washed ashore. Oxbow lakes (particularly the drying out ones): felling of shrubs and low-value trees in near-shore area, in order to reduce litter accumulation. Creation of open oxbow shores suitable for aquatic invertebrates (dragonflies, caddisflies, mayflies etc) emerging to adults.	3	
3140	Charophyte lakes	32.1	<1	Poor.	Lake Pūricu: reduction of emergent vegetation.	0.5	
3130	*Lobelia-Isoetes* lakes	498.4	<1	Poor.	Prevention of new bathing site creation in lakes Plaužu and Driškinu. Maintenance of existing infrastructure. Lake Plaužu – reed mowing, for the maintenance of *Isoëtes* complex. Lake Ungurs – planning and construction of sedimentation pond (for the sedimentation of peat particles from the nearby peat extraction field); redirection of water discharge from peat extraction fields.	1.0	

One-time grassland restoration measures are necessary in an area of at least 392 hectares – in the currently known overgrowing semi-natural grasslands. In about 100 hectares, grasslands must be restored in their historical areas (overgrown with shrubs and forest) and in extensively managed cultivated grasslands and fallow-lands with a good restoration potential (potential EU protected habitats). Potentially, habitat type 6530* *Fennoscandian wooded meadows* must be restored. It is mentioned as a priority in Restoration plan of wooded grasslands, and is already restored in Ungurmuiža and Klauku Bay. Additional inventory and research on the distribution of this habitat type in Gauja National Park is necessary. Sites which must be surveyed: surroundings of downstream of Miegupīte river, Sapas and Līči residential areas.
Annual grassland management measures are necessary in the entire area of managed grasslands, and will be necessary in restored grasslands. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Ķemeri National Park (LV0200200)

1. Brief description



YEAR OF FOUNDATION: 1997.

LOCATION: Babīte municipality Sala rural territory; Engure municipality Lapmežciems, Engure and Smārde rural territories; Jelgava municipality Valgunde rural territory; Tukums municipality Džūkste and Slampe rural territories; Jūrmala City.

AREA: 36180 ha.

NATURE MANAGEMENT PLAN: 2002 (2002–2010).

LAW: Ķemeri National Park law (30.05.2001.).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 601 of 06 September 2016, Regulation on Individual Protection and Use of Ķemeri National Park.

INCLUDES OTHER PROTECTED NATURE AREAS: Krāču kalni and Sēravoti Zaļajā purvā Protected Geological and Geomorphological Monuments.

Ķemeri National Park (hereinafter - KNP) is established for the protection of values of nature, cultural history and resort resources, as well as for the protection of development of curative mud and for the development of sustainable economic activities. The territory covers a variety of mire and forest habitats, including wet deciduous forests, swamp woods, old boreal forests (western Taïga) and wooded dunes, alkaline fens, springs with tufa formation, mineral-rich springs and springfens, as well as various coastal habitats.

Large areas are occupied by alluvial grasslands, and the territory is significant for the maintenance of *Molinia* meadows on calcareous, peaty or clayey-siltladen soils and *Juniperus communis* formations. In total, there are 33 EU protected habitat types. At national level, this is the most important territory for the conservation of 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and the second most important for 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) (they cover 12 % and 14 % of the total habitat area in the country respectively). Located near Rīga city, ĶNP is the most important territory for six grassland habitat types (5130, 6120*, 6270*, 6410, 6510 and 6530*) in close vicinity of the city and the second most important territory for the conservation of 6450 *Northern boreal alluvial meadows*, after the Svētes paliene Nature Park.

From the landscape-ecological point of view, grasslands of the south-eastern part of ĶNP are associated to Lielupe River valley as a species dispersal corridor which is important for the grassland biodiversity conservation in Coastal Lowland Geobotanical District and Zemgale Plain Geobotanical District. Therefore the conservation and protection of these grasslands must be planned in close connection to grasslands in Lielupe river floodplain, in Babītes ezers and Kalnciema pļavas Nature Reserves.

ĶNP forms an important complex of wetlands – mires, coastal lakes, wet forests and grasslands. Lake Kaņieris is included in the list of Ramsar sites. The great Ķemeri Mire is one of the largest raised bogs in Latvia. Together with Raganu, Zaļais and Slokas Mires, it is one of the few sites in Latvia with development of sulphur-rich springs.

There are many botanically valuable calcareous fens in the area, including large areas with *Cladium mariscus* stands. The territory is rich in rare, protected plant species. For example, there is one of the largest populations of *Cypripedium calceolus*. *Liparis loeselii* can be found in several localities, there are also *Asplenium trichomanes, Botrychium virginianum, Euphorbia palustris, Gladiolus imbricatus, Najas marina, Orobanche elatior, Saussurea alpina* ssp. *esthonica* and others.

Mires, grasslands, lakes (including coastal lagoon lakes, especially Lake Kaņieris) are important for bird protection. There is a large variety of bird species, the most important are *Anser fabalis, Anser albifrons, Grus grus, Dendrocopos leucotos, Picoides tridactylus, Ciconia nigra, Bubo bubo, Haliaeetus albicilla, Botaurus stellaris*, and others.

The territory is also important for rare invertebrate species, for example, *Leucorrhinia albifrons, Leucorrhinia pectoralis, Vertigo angustior, Unio crassus, Maculinea arion, Nothorina punctata*. Important reptile species in the ĶNP are *Coronella austriaca* and *Lacerta agilis*. Wolves *Canis lupus* and lynx *Lynx lynx* live in woodlands, and *Lutra lutra* in rivers. Several species of bats can be found, such

as *Myotis dasycneme, Pipistrellus pipistrellus, Pipistrellus nathusii*, and others.

2. Threats to habitat and species conservation

- The most significant negative influence is caused by drainage of forests, mires and grasslands carried out in the past.
- Overgrowth of grasslands and fens due to lack of management.
- Eutrophication of alluvial grasslands with biogenes from nutrient-rich flood waters.
- Paludification of moist grasslands in sites where the systems of shallow ditches established in the early 20th century are not functioning.
- Expansion of the building construction, especially in costal areas.
- Excessive anthropogenic load caused by visitors to habitats of dunes, forests, and mires.
- Water pollution with domestic wastewater.
- Intensive farming in the western part of the territory (frequent mowing, pesticides).
- Eutrophication of forests in the course of natural succession is threatening forests of oligotrophic types.
- Spread of invasive species, especially in ruderal habitats in residential areas and their surroundings. There are such invasive plant species as *Heracleum sosnowskyi, Impatiens glandulifera, Solidago canadensis, Rumex confertus, Rosa rugosa, Sorbaria sorbifolia, Swida alba*. Of invasive animal species, *Mustela vison* has spread throughout the area.

3. Existing management of the protected habitats and its assessment

- Since 2004, extensive habitat restoration and management projects have been carried out in the territory. Management and restoration was mostly done in grasslands and mires, and other habitats (freshwaters, forests) were less influenced.
- The first large tasks were carried out in the framework of the EC LIFE project "Conservation of wetlands in Ķemeri National Park" (LIFE02NAT/LV/008496), from 2004 to 2006. During this time, the first project of river re-naturalisation – meandering in Latvia was carried out in Slampe river, and natural flooding regime in Dundurpļavas grasslands was restored.
- Regular grassland management by mowing and grazing was renewed in grasslands of Dundurpļavas and Melnragu Rīkle.
- In 2004, the first *Heck* cattle were released into Dundurpļavas grasslands and later also *Konik* horses which have been continually grazing the territory since then. In 2006, cattle and horses were also released in grasslands of Lielupe river where they graze in the territory between Kaļķis and Odiņi, all year round. In addition to grazing, some parts of grasslands at Lielupe river are mown. Every year, additional grassland areas are being restored by removal of shrubs and reeds. Over the years, the forest edge in Dundurpļavas grasslands is restored by grazing. As a result, landscape of wooded grasslands is established that has probably been there before. In the framework of LIFE project, mire restoration in the former peat extraction site in Ķemeri Great Mire was carried out by water level elevation. In large areas, mire vegetation has restored in areas of former peat extraction fields; partly flooded area of shallow water has become suitable for breeding waders and migratory birds. Floodgates of Lake Kaņieris were renovated, improving water level regulation. Also the surface of artificial islets – a significant breeding site for waterbirds – was smoothened, and reedbeds around the Rieksti Island were fragmented.
- Grasslands were restored and managed regularly in the entire territory. Their management was started within the framework of LIFE project mentioned above and continued with the support of Rural Support Service and projects financed by Latvian Environmental Protection Fund. Several already overgrown grasslands were restored by cutting of shrubs, shredding of shrub roots and topsoil (in sites with tussocks or highly overgrown with reeds), regular mowing was restarted. Also several grasslands with *Juniperus communis* formations were restored, and their area was significantly increased.
- Several botanically valuable *Molinia* meadows on calcareous soils were restored (in the vicinity of Sloka and Čaukciems). Since 2014, collective unpaid work events (*talkas*) of haymaking are organised every year, involving volunteers. However, there are sites where grassland management is discontinued and the areas are abandoned because mowing costs are higher than the benefits, or where excessive moisture interferes with mowing.
- Since 2005, the management of alkaline fens is carried out. Shrubs have been cut in several fens at Lake Kaņieris. Mowing with plant removal was carried out in Riekstu Island. Most of the works were implemented by ĶNP Fund with the financial support of Environmental Protection Fund of Latvia. Shrub removal in part of the alkaline fens (Raganu Mire, at Lake Kaņieris) was implemented in scope of EC LIFE project "National Conservation and Management Programme for Natura 2000 Sites in Latvia", (LIFE11NAT/LV/000371).

- Since 2010, with the support of the Latvian Environmental Protection Fund, Jūrmala City, and the Fish Fund, watercourses have been cleaned from fallen logs and clogs (Vēršupīte, Vecslocene), and their flow and functionality was improved. Activities of beavers *Castor fiber* (causing inundations in drained areas with ditches) are at least partly controlled and reduced by removal of dams and by limiting the numbers of beavers by hunting. In smaller areas, also other habitat management tasks have been implemented.
- In the framework of the EC LIFE project "Restoring the hydrological regime of the Ķemeri National Park" (LIFE10 NAT/LV/000160), in 2017 the re-naturalization of Skudrupīte river is planned including restoration of historical meanders, as well as restoration of swamp woods by damming and filling up ditches in the western edge of the Great Ķemeri Mire. The project includes also rewetting of Zaļais Mire by eliminating the adverse impact of ditches as well as by removal of woody species which have appeared due to drainage.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- The protection of the processes of the development of mineral water and curative mud, avoiding the situation that the balneological resources are influenced by habitat management measures.
- Rewetting – restoration of natural or close to natural hydrological regime in wet forests and mires which are influenced by drainage.
- Restoration of semi-natural grasslands which are overgrown or otherwise degraded (paludified, influenced by beavers). Restoration of other biologically valuable grasslands, as well as juniper formations and fens. Further, provision of their regular and adequate management (mowing, haymaking, grazing; choosing the best management method for each area).
- Provision of hydrological regime which is optimal for nature values and management methods of semi-natural grasslands (rewetting; removal and control of beaver dams; restoration of shallow ditch systems in sites where it is necessary, etc.).
- Provision of a favorable conservation regime for birds (by appropriate management, control, etc.) in the most important wetlands of ĶNP - in Kaņieris and other lakes, in mires, grasslands, wetlands, wet forests (for example, by improving the condition of the lake and breeding habitats by regular brush cutting and mowing in islands of Lake Kaņieris, fragmentation of reedbeds, removing sediments from the bottom of the lake).
- Provision of functionality of watercourses by removal of excessive macrophyte vegetation, clogging, debris, beaver dams etc., and by re-naturalisation of river channel and its flow.
- Improvement of the condition of forests and coastal habitats, their structural and species diversity, by restoring or imitating their natural processes (for example, by using prescribed burning of groundcover in eutrophied forests, on necessity).
- Limiting and combating the spread of invasive species.
- Reduction of anthropogenic load by providing visitor infrastructure (footpaths, trails, stairs, etc.), limiting movement in sensitive areas (barriers, information signs).
- Balancing and compliance with requirements of the conservation of species of habitats and the requirements of flood prevention measures in the overlapping zone of Ķemeri National Park and Flood risk territories of national significance.

5. Necessary management and conservation measures

5.1. General measures

- Development of a new Nature management plan.
- Elimination of invasive species; limitation of their further distribution by preventing their spread at an early stage of introduction.
- Maintenance of existing visitor infrastructure (trails, information boards etc.); reparation of infrastructure elements if necessary.
- Continuation of the existing monitoring of management success in grasslands, mires, woodlands.
- The landscape-ecological connectivity of grasslands is high only in the Lielupe floodplain. In other territories, the size of grassland area must be increased as much as possible (by restoring the historical grasslands that are now overgrown with shrubs and with forest). Condition of species populations must be monitored in order to prevent the local extinction of species.

5.2. Specific measures

5.2.1. Species

- Population of *Pulsatilla patens* is formed by 200-300 specimens, condition of the population is considered as bad. Necessary management measures of the

locality include prescribed burning of groundcover in area of 8.5 hectares (13th compartment of forest block 191, 11th of bl. 105, 13th of bl. 106), once per 5 years.

- *Saussurea alpina* ssp. *esthonica*. Restoration of overgrown grasslands by cutting shrubs, shredding shrub roots and topsoil on necessity (4th compartment of block 1). Regular mowing and haymaking; brush cutting (in area of 0.5 hectares).
- Population of *Coronella austriaca* consists of ~100-150 specimens, its condition is considered as favourable. According to species protection plan regular cutting of shrubs along the Slokas Lake – Kūdra road (once per 5 years, 2.5 km) and habitat improvement by targeted thinning (in area of 21.5 hectares) is necessary in order to preserve suitable habitat for this species.
- There are 112 – 118 pairs of *Crex crex* within the national park, condition of population is considered as poor. Necessary conservation measures include annual mowing in Odiņi-Pavasari Polder (private properties), grasslands of Kašķu Mire, Sumragi grasslands, Siliņi grasslands, in the entire area of 660 hectares, with hay removal. Restoration of grasslands overgrown with shrubs (shrub cutting, shredding of shrub roots, restarting of regular management) in Siliņi grasslands is necessary in area of 15 hectares.
- *Aquila chrysaetos, Haliaetus albicilla*. Necessary activities include supplementary feeding in winter and installation of artificial nests.
- Installation of artificial nests for *Bubo bubo* on necessity.
- Condition of populations of gulls and ducks is considered as poor. Once per 1 – 2 years removal of excessive vegetation on artificial islands (Kaņieris lake, Sahalīne Pond) is necessary in area of 3.8 hectares.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	1315.9	3.6	Favourable, poor.	Non-intervention. Reduction of eutrophication (prescribed burning of ground cover) – on necessity.	According to forest inventory of 2012 and 2015 (Latvian Fund for Nature).	1315.9
9020*	Broad-leaved deciduous forests	444.3	1.2	Favourable.	Non-intervention.		444.3
9050	Herb rich spruce forests	26.4	<1	Favourable.	Non-intervention.	26.4	
9070	Fennoscandian wooded pastures	~100	<1	Favourable.	Continuation of pasturing in woodland (signing lease agreement for land), in Mežmalas and in Dundurpļavas grasslands.	100	
9080*	Fennoscandian deciduous swamp woods	1424.0	3.9	Favourable, poor, bad.	Non-intervention. Rewetting. Removal of recently built beaver dams; limiting of beaver population.	100	1424.0
9160	Oak forests	6.5	<1	Poor.	Non-intervention. Improvement of insolation at old oaks.	1	5
9180*	Slope forests	8.2	<1	Favourable.	Non-intervention.		8.2

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	2143.3	5.9	Favourable, poor.	Non-intervention. Rewetting.	 100	2143.3
91E0*	Alluvial forests	220.9	<1	Favourable, poor.	Non-intervention. Rewetting (Skudrupīte river).	 10	220.9
7110*	Active raised bogs	5844	16.2	Favourable, poor, bad.	Non-intervention. Rewetting and felling of trees (eastern part of Raganu Mire).	 450	5844
7120	Degraded raised bogs	887.6	2.4	Bad.	Rewetting (eastern side of the Great Ķemeri Mire). Felling in the drained parts of mire (western part of the Great Ķemeri Mire), once per 15 years.	55 200	
7140	Transition mires and quaking bogs	172	<1	Favourable.	Non-intervention.		172
7150	Depressions on peat substrates	0.58	<1	Favourable.	Non-intervention.		0.58
7160	Fennoscandian mineral-rich springs and springfens	0.6	<1	Favourable.	Non-intervention.		0.6
7210*	Cladium mariscus fens	105.1	<1	Favourable.	Non-intervention. Shrub cutting, mowing with haymaking in sites where habitat type 7230 Alkaline fens is a priority (Cladium mariscus here is regarded as expansive species). In complex with management of alkaline fens. Once per 1-2 years, at Lake Kaņieris.		100.1 5
7220*	Petrifying springs	6	<1	Favourable.	Non-intervention.		6
7230	Alkaline fens	33.8	<1	Poor.	Non-intervention. Cutting of shrubs and their regrowth; mowing with haymaking. Shores of Lake Kaņieris, Zvejnieku Mire, Zaļais Mire, Raganu Mire, Sloka micro-reserve (once per year or at least per three years).		33.8
6210	Semi-natural dry calcareous grasslands	1.6	<1	Poor.	Restoration. Maintenance.	0.0	 1.6
6230*	Species-rich *Nardus* grasslands	1	<1	Bad.	Restoration. Maintenance.	1–1.5	 1-1.5

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	6	<1	Bad.	Restoration (Čaukciems, Kūdra villages). Maintenance.	0.4	6
6410	*Molinia* meadows	97	<1	Favourable, poor, bad.	Restoration (Sloka micro-reserve). Maintenance.	0.6	60
6430	Hydrophilous tall herb fringe communities	6.5	<1	Favourable.	Non-intervention (shores of rivers with natural spring flood regime). Maintenance in complex with 6450 *Northern boreal alluvial meadows* – brush cutting and pasturing on necessity.		4 2.5
6450	Northern boreal alluvial meadows	156	<1	Favourable, poor, bad.	Restoration (Lielupe floodplain, Melnragu Rīkle). Maintenance.	96	130
6510	Lowland hay meadows	175	<1	Favourable.	Restoration. Maintenance.	0.0	175
6530*	Fennoscandian wooded meadows	0.6	<1	Favourable, poor.	Restoration. Maintenance.	0.6	0.6
5130	*Juniperus communis* formations on heaths or calcareous grasslands	4.3	<1	Favourable.	Restoration (Dzirkaļi, Kaņieris, Jaunslavieši). Maintenance.	1	4.3
3260	Natural river reaches and river riffles	9	<1	Poor.	Removal of excess macrophytes, large woody debris obstructing water discharge, litter (waste), beaver dams. Reduction of number of beavers (Vēršupīte, Slocene, Vecslocene, Slampe, Skudrupīte rivers, and others). Re-naturalization of straightened and modified rivers; diversification of river channels (Kauguri canal, Slampe, Skudrupīte rivers). Improvement of spawning conditions for *Lampetra fluviatilis* creating river riffle areas at the same time (creating river-beds with coarse gravel and pebbles).	At least 500 m long river reach.	9, on necessity.
3160	Natural dystrophic lakes and ponds	64	<1	Favourable.	Non-intervention.		64

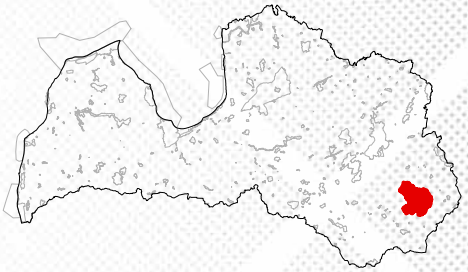
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	58	<1	Poor.	Non-intervention.		58
3140	Charophyte lakes	1205	3.3	Poor.	Non-intervention. Fragmentation of reedbed once per 10 years. Cleaning and sediment removal of Slocene river mouth (the most polluted site in Lake Kaņieris).	 20 10	1175
2320	Dry heaths	1.8	<1	Bad.	Cutting of shrubs (once per 3-5 years).	1.8	1.8
2180	Wooded dunes	791	2.2	Favourable, poor.	Thinning of dense 60-80 years old pine woodlands (Gausā Jūdze). Thinning for the improvement of insolation of old pines (noble trees) in Jaunķemeri and in Gausā Jūdze at Ragaciems. Prescribed burning in Kaugurroza.	150 20 5	
2130*	Grey dunes	1.8	<1	Bad.	Felling of pines, pulling out pine seedlings, creation of moderate groundcover disturbances once per few years.	1.8	
2120	White dunes	18	<1	Bad.	Removal of anthropogenic pollution (accumulated algae etc.), reduction of invasive and expansive plant species. Non-intervention.	2	 16
2110	Embryonic dunes	11	<1	Bad.	Non-intervention.		11
1640	Sandy beaches with perennial vegetation	4	<1	Bad.	Non-intervention.		4
1310	Annuals colonising mud and sand	0.1	<1	Bad.	Non-intervention.		0.1
1210	Annual vegetation of drift lines	0.3	<1	Bad.	Non-intervention (prevention of transportation of drifts from beach to edge of woodland).		0.3

Restoration of habitat type 6530* *Fennoscandian wooded meadows* (felling of trees and shrubs which have grown into the crowns of old, wide-crowned, previously open-grown trees (gradual felling); cutting of regrowth in the next years; grazing). Potential habitat restoration sites – western part of the Great Ķemeri Mire, along Dundurpļavas and Melnragu rīkle grasslands. Management – in complex with habitat type 9070.

In the restored areas of habitat type 5130 *Juniperus communis formations on heaths or calcareous grasslands* the following management must be applied: cutting of shrubs and regrowth once per year or at least once per two years and regular mowing or grazing (Čaukciems and shores of Lake Kaņieris - Riekstu Islet, Riekstu Peninsula, Niedru laipa).

Rāzna National Park (LV0303400)

1. Brief description



YEAR OF FOUNDATION: 2007.

LOCATION: Rēzekne municipality Mākoņkalns, Čornaja, Kaunata and Lūznava rural territories; Dagda municipality Andzeļi, Andrupene, Ezernieki rural territories, Ludza municipality Rundēni rural territory.

AREA: 59 615 ha.

NATURE MANAGEMENT PLAN: 2009 (2009–2019).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 447 of 26 June 2007, Regulation on Individual Protection and Use of Rāzna National Park (02.11.2006).

Rāzna National Park is established for the conservation of species and habitat diversity of Lake Rāzna and its surroundings, the cultural and historical values of the territory, and for the promotion of nature tourism and environmental education. The key element of the nature park is Lake Rāzna, as well as many other lakes in the area. Woodlands cover almost half of the nature park. In many places, they also serve as buffer zones around lakes which are the most sensitive landscapes in park. There are 37 lakes with the size of more than 10 hectares. About 16% of the territory is covered by freshwater areas. Lake Ežezers is particularly unique – a lake which is the richest in islands in the Baltic countries; there are 33 to 36 islands. Lake islands, peninsulas and coasts are covered with oak (*Quercus robur*) forests, which are rare in Latgale Region. Rare moss species *Dicranum viride* is found in several islands. Lake Ežezers and its surroundings have been protected since 1928; it is a nature area that has been protected for the longest period of time in Rāzna National Park. The area between Lake Rāzna and Lake Ežezers is characterized by a particularly impressive terrain and several hilltops – Lielais Liepu Kalns, Dzerkaļu Kalns, Dubuļu Kalns, Mākoņkalns Hills.

The nature values of the national park have evolved and are maintained in close interaction between nature processes and human activities. Under the influence of human activity, a high-quality mosaic landscape and diverse semi-natural grasslands, mostly used for grazing, have been created. Part of semi-natural grasslands are overgrown due to decreasing management, and their fragmentation is therefore increasing.

At a national level, Rāzna National Park is one of the fifteen most important Natura 2000 territories for the conservation of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* (3 % of the total habitat area in Natura 2000 territories in Latvia). Both semi-natural and cultivated grasslands are an important part of the landscape mosaic. They are important for breeding of *Crex crex* and foraging of *Aquila pomarina*. So far, only 233 hectares of grassland habitats of EU importance are known in the national park. However, the area of perennial grasslands and old fallow-lands which potentially can develop to EU protected grassland habitats is much larger. According to landscape ecological plan (2009), it is at least 8359 ha. In nature management plan of 2009, the area of potentially valuable perennial grasslands is assessed as 1789 ha. From landscape-ecological point of view, this territory is the only core area in central part of Latgale Upland which is important for the conservation of semi-natural grasslands. It is a part of species dispersal corridor which is important in Eastern Europe. It consists of a series of uplands located in the north-south-west direction – Otepää and Haanja Uplands in Estonia, Alūksne, Latgale and Augšzeme Uplands in Latvia, Aukštaitija, Dzūkija and Sūduva Uplands in Lithuania, Suwałki Upland in Poland.

The territory is not densely populated; therefore natural processes which are important for biodiversity conservation can dominate in large areas. Such areas are broadleaved and wet forests, individual dry forests, lakes, floodplains of rivers and lakes, mires, and their associated species communities.

The territory is rich in rare and protected species. Five protected species of lichens, three moss, two charophyte, 34 protected vascular plant species have been found in the nature park. The most important ones are *Pulsatilla patens* and *Liparis loeselii*. In lakes, *Lobelia dortmanna, Najas flexilis, Najas marina* and *Hydrilla verticillata* can be found. There are 18 rare and protected invertebrate species. The most important ones are *Vertigo angustior, Aeshna viridis, Leucorrhinia pectoralis, Dytiscus latissimus, Lycaena dispar.* Lakes are rich in fish, including two protected species – *Coregonus lavaretus* and *Coregonus albula*. Five protected amphibian and reptile species are

found. Since 2006, the re-introduction for the protected *Bombina bombina* has been carried out in the national park. Also Pelobates fuscus is a rare species in Latvia and Europe.

In total, 44 rare and protected bird species have been observed in the national park. Large numbers of *Crex crex* and *Lanius collurio* are breeding in the territory. *Aquila pomarina* is foraging in the agricultural landscape. Lake Rāzna has been recognized as the third best nesting place in Latvia for *Botaurus stellaris*. Other important species are *Bonasa bonasia, Circus pygargus, Ciconia nigra, Haliaetus albicilla, Chlidonias niger, Lullula arborea, Pernis apivorus, Tetrao tetrix, Picoides leucotos, Picoides tridactylus, Picoides medius, Glaucidium passerinum, Columba oenas*. Of mammals, important species are *Lynx lynx, Canis lupus* and *Lutra lutra,* as well as bats, for example, *Myotis dasycneme*. In total, 15 protected mammal species have been found in the territory.

2. Threats to habitat and species conservation

- Forest biodiversity is threatened by logging in the whole territory of national park.
- The existence of wet forest habitats is threatened by drainage and road construction which cause changes in hydrological regime, microclimate and species composition.
- Spread of invasive plant species *Heracleum sosnowskyi*.
- Biodiversity, area size and quality of semi-natural grasslands are decreasing due to decline in extensive agricultural practices. Grassland landscape-ecological connectivity is reduced due to irregular mowing, insufficient grazing, as well as by grassland afforestation, or by overgrowth with trees and shrubs due to lack of management. Areas of potential EU protected grassland habitats decrease due to overgrowth, grubbing up and building construction.
- Eutrophication of lakes, causing their overgrowth. This process is mainly caused by input of diffuse pollution from agricultural and forestry activities, as well as wastewaters from residential areas on the banks of the lakes.
- Existing and potential mineral extraction.
- Habitats and landscapes of lake shores can be adversely affected by building construction.
- Visitor influence on the islands of Lake Ežezers and in Piloru Oak Woodland – vegetation damage, trampling, campfires, municipal waste pollution.
- Increase in anthropogenic pressure in popular tourist destinations – Lielais Liepu Kalns and Mākoņkalns Hills.

3. Existing management of the protected habitats and its assessment

- In Piloru Oak Woodland, understory was felled in order to increase transparency and sparseness (measure not aimed to habitat conservation).
- Coniferous forests on, or connected to, glaciofluvial eskers were managed is framework of LIFE+ programme project "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371). In 2015, spruces (Picea abies) were felled in an area of 2 hectares, topsoil was scarified in 1 hectare. Spruces in Dracocephalum ruyschiana locality on slope were felled in an area of 1 hectare, in order to improve insolation. Management influence on species can be evaluated after a few years.
- Mowing of lake shore areas in individual sites, in order to improve access and landscape attraction.
- According to Rural Support Service, in 2014 more than half of semi-natural grassland areas were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Habitat types 6510, 6270*, 6450 and 6120 were managed up to 63-92 % of their known area; 6210 – only 39 % of its area.
- Between 2015 and 2017, experimental removal of groundfloor mosses and litter layer was carried out in several sample plots in habitat type 9060 *Coniferous forests on, or connected to, glaciofluvial eskers,* in order to improve lighting conditions for sun-loving species.

4. Priorities of management and conservation

- Implementation of tourism development plan; balancing of economic and nature conservation interests.
- Conservation of terrain, mosaic and continuous landscapes characteristic to the territory at least in their current quality.
- Conservation of natural plant communities, animal species and their habitats characteristic to Latgale hillock; maintenance of high biodiversity; sustainable management of habitats.
- Adjustment of the water level of Lake Rāzna only according to the lake management (operation) rules.
- Natural development of biologically valuable forests, by promoting and preserving the favorable conservation status of protected woodland habitats (including woodland key habitats) and their characteristic species.

- Promotion of broadleaved forest development in suitable conditions.
- Restoration of habitat type typical to national park – 9060 *Coniferous forests on, or connected to, glaciofluvial eskers*.
- Maintenance of semi-natural grasslands in a favorable conservation status, at least in their current area (233 ha), and increase of their total area to at least 3250 ha. Restoration of 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* is the priority.
- Maintenance of the role of the territory as a species dispersal corridor for species of EU protected grasslands.
- Reduction of eutrophication in freshwater habitats; maintenance of conditions necessary for associated plant, invertebrate, fish and bird species.
- Reduction of influence of beavers (*Castor fiber*) by prevention of lake outflow blockage and prevention of inundation of valuable river reaches where riverbeds are covered with pebbles, gravel, boulders.
- Natural development of mire habitats; maintenance of optimal hydrological regime.
- Conservation of lake shore habitats in national park. Protection of landscapes. Maintenance of favorable conservation status for freshwater habitats and their associated protected bird, invertebrate, mammal and fish species.
- Prevention of deterioration of protected freshwater habitats: implementation of measures for biogene input reduction and prevention.
- Provision of favorable conditions for fish populations in the priority fish water bodies – Lakes Ežezers, Dubuļu, Rāzna, Zosna, by improvement of water quality and protection.

5. Necessary management and conservation measures

5.1. General measures

- Maintenance of cultural landscape mosaic of the territory, creating and maintaining viewpoints in the places specified in the Tourism Development Plan.
- Evaluation of Malta river upper reaches; development and implementation of ecologically-sound building project for cleaning of Malta river upper reaches.
- Creation and maintenance of new recreation sites at lakes (with appropriate infrastructure and waste management).
- Update of habitat maps according to the latest methods.
- Elimination of *Heracleum sosnowskyi* colonies; regular monitoring of its distribution.
- Development and implementation of semi-natural grassland restoration and conservation plan. Plan must include:
  - Inventory of all currently known semi-natural grasslands, their condition; restoration plan;
  - Inventory of historical grasslands (middle of the 20th century) which can be restored to semi-natural grasslands, old cultivated grasslands and fallow-lands (potential EU protected grassland habitats); a plan for their restoration in an area of at least 300 hectares. The most important potential semi-natural grassland territories are indicated in nature management plan (2009);
  - Measures for raising public awareness of biodiversity-promoting grassland management (for example, award for best managed grassland).
- Limitation of *Phalacrocorax carbo* colony.
- Prevention of untreated wastewater (according to legislative enactments) discharge in Lakes Rāzna and Ežezers.
- Maintenance and extension of biologically valuable littoral part with sand and pebble substrate and with sparse vegetation, in Lakes Ežezers, Rāzna, Oloveca, Biža, Zosna.
- Mowing of emergent vegetation in sites where it suppresses colonies of charophytes – Lakes Rāzna, Oloveca, Kaunata, Biža (Rindēni village), Idzepoles, Salāja and Ežezers.
- Research in Lake Rāzna, in order to clarify the influence of reed mowing on lake trophic state on *Botaurus stellaris* population.

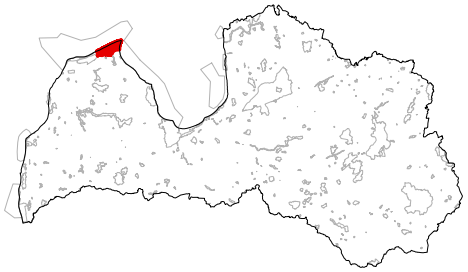
5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	1496.4	2.5	Poor.	Non-intervention.		1496.4
91E0*	Alluvial forests	451.8	<1	Bad.	Non-intervention.		451.8
9180*	Slope forests	73.5	<1	Bad.	Non-intervention.		73.5
9160	Oak forests	22.1	<1	Favourable.	Non-intervention.		22.1
9080*	Fennoscandian deciduous swamp woods	223.0	<1	Poor.	Non-intervention.		223.0
9060	Coniferous esker forests	55.0	<1	Bad.	Non-intervention. Felling of spruces in advance growth and subcanopy; reduction of litter layer. Prescribed burning.	15.0 10.0	35.0
9050	Herb rich spruce forests	33.4	<1	Favourable.	Non-intervention.		33.4
9010*	Western Taïga	287.5	<1	Poor to favourable.	Non-intervention.		287.5
9000	Potential Protected woodland habitat	185.5	<1	-	Non-intervention. Decrease proportion of spruces (within coniferous forests on, or connected to, glaciofluvial eskers)	90.0	98.5
7160	Fennoscandian mineral-rich springs and springfens	0.5	<1	Favourable.	Non-intervention.		0.5
7140	Transition mires and quaking bogs	0.03	<1	Favourable.	Non-intervention.		0.03
7110*	Active raised bogs	204.9	<1	Poor.	Non-intervention.		204.9
6510	Lowland hay meadows	19.80	<1	Poor.	Restoration. Maintenance.	1.5	19.8
6450	Northern boreal alluvial meadows	67.93	<1	Poor.	Restoration. Maintenance.	13.6	67.9

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6430	Hydrophilous tall herb fringe communities	12.18	<1	Poor.	Restoration. Maintenance.	Unknown.	0.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	119.04	<1	Poor.	Restoration. Maintenance.	23.7	119.0
6230*	Species-rich *Nardus* grasslands	Unknown.	<1	Bad.	Restoration. Maintenance.	Unknown.	Unknown.
6210	Semi-natural dry calcareous grasslands	14.02	<1	Bad.	Restoration. Maintenance.	8.6	14.0
6120*	Xeric sand calcareous grasslands	0.59	<1	Poor.	Restoration. Maintenance.	0.0	0.6

Slītere National Park (LV0200300)

1. Brief description



YEAR OF FOUNDATION: 2000 (Nature Monument since 1923; Strict Nature Reserve since 1957).

LOCATION: Dundaga municipality Dundaga and Kolka rural territories.

AREA: 16 414 ha.

NATURE MANAGEMENT PLAN: 2009 (2010–2020).

LAW: On Slītere National Park (22.01.2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 751 of 29 November 2016, Regulation on Individual Protection and Use of the Slītere National Park.

Slītere National Park is located in the northern part of Kurzeme Region, at the shore of the Baltic Sea and Gulf of Rīga. The territory of the Slītere National Park is one of the richest territories in Latvia and in Europe, both in terms of habitat and species diversity. The great diversity is determined by the geological, hydrological and climatic conditions. The territory covers Baltic Ice Lake coastal formations – the bluff of Šlīteres Zilie Kalni (Šlītere Blue Hills) which is 30-50 m high. Outstanding, species-rich broad-leaved forests can be found in this area.

A particular value is a complex of wooded dunes and interdune depressions (*kangaru-vigu komplekss*). *Kangari* are dune ridges located parallel to the sea, usually covered with dry pine (*Pinus sylvestris*) forests. Between *kangari* there are *vigas* – wet, almost linear interdune depressions, usually with fens. At the foot of the Zilie Kalni Hills, there is an abrasion plain with natural wet forests, and Bažu Mire – raised bog of coastal type, which gradually changes to a complex of wooded dunes and interdune depressions. An essential part of the national park is the sea coast with sandy beaches and open dunes, cliffs, dune woodlands and dry grasslands. The national park in an important bird gathering and stopover site during the migration period.

Historically, coastal area was populated by Livs (Livonians) – people of ethnic group which is now extinct. There are several fishermen villages; the main occupation of the population used to be fishing and farming. Agricultural land has decreased and currently occupies only 0.7% of the territory. However, there are still grasslands which indicate on land management in the past – Dāvida, Tamnītes and Zvejnieku Grasslands. They are important for both nature diversity and cultural history.

Semi-natural grasslands in the territory are small, but nationally important for the conservation of habitat types 6120* *Xeric sand calcareous grasslands,* 6230* *Species-rich* Nardus grasslands, *on siliceous substrates in mountain areas (and submountain areas, in Continental Europe),* and 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae). Together with grasslands of Ovīši, Ances purvi un meži, Kadiķu nora Nature Reserves, they form the most important core area of semi-natural grasslands in Northern Kurzeme.

The Slītere National Park's forests mostly are large, little-populated, and nearly uninfluenced for a long time, with high biodiversity – particularly on Šlītere Zilie Kalni Bluff and at its base, as well as in Zviedru Woodland massif. Drainage works carried out during 20th century have left negative influence on mire and forest ecosystems.

Natural ecosystem development, including large-scale natural disturbances, takes place in the territory. After severe wind-throws in 1960s, broken trees were not removed, and natural forest development (in an area of about 100 hectares) continued. In Bažu Mire, natural development was supported after major wildfires of 1992; burnt trees were not removed.

The national park is rich in rare and protected species. Of mires, the most rich are transition mires and alkaline fens. Rare species in interdune depressions are *Drosera intermedia, Liparis loeselii Rhynchospora fusca, Paludella squarrosa, Hamatocaulis vernicosus, Riccardia incurvata*. Protected species in forests include *Cypripedium calceolus, Buxbaumia viridis* and *Dicranum viride*. The most important rare species in springfens are *Philonotis tomentella, Scapania nemorea, S. undulata*. Important species at the sea coast are *Linaria loeselii, Lathyrus maritimus, Cephalanthera rubra, Dianthus arenarius*. In total, 88 protected vascular plant species and 53 moss species have been recorded in the diverse ecosystems of the national park. Here is a large diversity of lichens; 200 species have been recorded so far, including several very rare species.

In total, 38 bird species protected in Latvia are breeding in the national park. The most important of them are *Aquila pomarina, Bonasa bonasia, Circus pygargus, Ciconia nigra, Haliaetus albicilla, Aquila chrysaetos, Pernis apivorus, Tetrao tetrix, Tetrao urogallus*. Also 16 protected mammal species have been found, including *Myotis daubentoni, Nyctalus noctula, Pipistrellus nathusii, Sicista betulina*. There are also four protected amphibian and reptile species – T*riturus cristatus, Bufo calamita Lacerta agilis*, and *Coronella austriaca*.

Of invertebrates, 63 species protected in Latvia have been found, for example, *Gnorimus nobilis, Chalcophora mariana, Euphydryas maturna, Vertigo genesii, Nothorina punctata,* and others. The small rivers serve as spawning sites for *Salmo trutta* and *Salmo salar.* Also *Hirudo medicinalis* and *Astacus astacus* can be found in freshwater habitats.

2. Threats to habitat and species conservation

- Hydrological regime of Bažu Mire may be adversely affected by economic activities that takes place in part of the mire which is located outside the national park.
- Overgrowth of mire habitats (particularly in Pēterezera Mire) due to drainage and due to natural succession.
- Sensitive coastal habitats and populations of associated species are threatened by anthropogenic load created by recreation and fishing. Due to lack of well-maintained trails, dunes are excessively trampled, ground vegetation is damaged, terrain elevations are eroded.
- Overgrowth of grey dune habitats.
- Overgrowth of semi-natural grasslands and degradation of species composition due to management cessation. In territories of residential areas, threats to semi-natural grasslands are: mowing with the grass shredding, and transformation to lawns.
- Fragmentation of habitat type 2180 *Wooded dunes of the Atlantic, Continental and Boreal region* is increased due to building construction.
- In some places, localities of protected vascular plants, mosses and lichens are adversely affected by elevated water level caused by beavers.
- Salmonid migration to spawning grounds is hindered due to large woody debris and beaver dams in rivers.
- Springfen in vicinity of Juši farmstead, in former tufa extraction site, is threatened by overgrowth with trees and shrubs.
- Coast of the Baltic Sea is threatened by shipping accidents causing pollution of oil, fertilizers and others.

3. Existing management of the protected habitats and its assessment

- In the winter of 2013/2014, trees and shrubs were selectively felled in alkaline fen at basal part of Šlītere Zilie Kalni Hill, in an area of 5.2 hectares. The measure can be assessed as positive, however, the maintenance of open areas must be continued. Mowing is necessary in areas overgrown with *Phragmites australis* and *Molinia caerulea*.
- Large woody debris was removed from Pitraga river, and activities of beavers (*Castor fiber*) were regulated. Measures have a temporary effect on situation improvement.
- In 2011, part of the trees and shrubs in Pēterezers Mire were felled. The effect was temporary – in 2013 shoots had already appeared.
- In framework of LIFE programme project "Conservation and management of Priority wetland habitats in Latvia" (LIFE13 NAT/LV/000578) in 2017 management measures were carried out in Bažu Mire, Pēterezera Mire and Kukšupe Mire. It is too early to evaluate the management results in 2017, but in general the measures can be assessed as favorable and will likely have a beneficial effect on mire habitats. The maintenance of open areas, liberated from trees and shrubs, must be continued. Also regular monitoring and repair (on necessity) of ditch dams is necessary.
- Since 2007, grassland habitats are being successfully restored in Dāvidpļava Grassland (hydrological regime regulation, restoration of shallow ditches, felling of shrubs, mowing) and Zvejniekpļavas Grasslands (restorative mowing). In Tammītes Grasslands, trees and shrubs were felled in 2011 and 2012; in 2016, stumps were milled, shallow ditches were cleaned and two access roads were renovated. In 2017, stumps and roots were milled also in Dāvidpļavas Grasslands and in a small part of Zvejniekpļavas Grasslands, which is managed by mowing.
- The area of managed semi-natural grasslands in the national park is small. According to Rural Support Service, in 2014 about 7–11% of habitat types 6120* and 6230* area and 39% of 6270* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

- Structure diversification in woodland habitats.
- Rewetting in wet forests influenced by drainage.
- Maximal extension of semi-natural grasslands, by restoration of historical grasslands and pastures of the middle 20th century. Measure is necessary in order to increase landscape-ecological connectivity which is a prerequisite for successful conservation of currently the most valuable massifs of grasslands (Dāvidpļavas, Tamnīšu, Zvejniekpļavas, Slītere lighthouse surrounding grasslands), as well as for the maintenance of favourable conservation status for habitat types 6120*, 6230*, 6270* and 6410.
- Restoration of riffle habitats and spawning grounds suitable for salmonids and lampreys.
- Conservation of coastal habitats and their associated species by reduction of anthropogenic pressure.
- Removal of excessive trees and shrubs in mires, grey dunes and humid dune slacks.
- Prescribed burning in western Taïga.

5. Necessary management and conservation measures

5.1. General measures

- Extension of Slītere National park by inclusion of:
- Adjoining protected nature territories (Ovīši, Ances Purvi un Meži, Kadiķu Nora, Kaļķupes Ieleja Nature Reserves);
- Valuable territories which currently are not protected (part of Bažu Mire which is not included in protected nature territories; massifs of historical grasslands which are overgrown but can be restored (according to expert recommendations)).
- Habitat mapping in the entire territory of national park and adjoining potentially valuable territories (recommendations of experts), in order to update data on areas of protected habitats.
- Development of grassland restoration and management plan. Plan must include:
  - Inventory of all currently known semi-natural grasslands, their condition; plan for their restoration and management.
  - Assessment of restoration potential of historical grasslands; plan for their restoration and maintenance.
  - Inventory of semi-natural grasslands adjoining the national park; assessment of their restoration potential and possibilities to include them in national park.
  - Identification and conservation of cultural history information on grasslands.
- Establishment, improvement and maintenance of visitor infrastructure for the reduction of anthropogenic load (boardwalks in dunes, downwarding trails to the sea, car parks, etc.).
- Maintenance of localities of protected moss species growing on boulders by felling of trees and shrubs in the surroundings of boulders.
- Limitation of beavers in Pitragupe and Zviedru Grāvis rivers, in order to protect moss species and grassland habitats in Vaides and Zvejniekpļavas Grasslands.
- Conservation and restoration of invertebrate habitats in grey dunes, dry semi-natural grasslands, burnt areas and wooded dunes by felling of trees and shrubs and by development and experimental implementation of methods which can be used for protection of invertebrates.
- Hydrological regime research in mires, woodlands and Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (habitat type 6410), in order to restore optimal humidity conditions for these habitats.
- Development and experimental implementation of methods for conservation of localities of rare invertebrates *Ergates faber* and *Tragosoma depsarium* in burnt areas in Bažu Mire. Measures include, for example, improvement of lighting conditions on fallen logs.
- Regular (once per 5 years) inventory of bird fauna in Slītere National Park. Once per 15 years: inventory of breeding birds.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	155.4	<1	Poor.	Non-intervention.		155.4
91D0*	Bog woodland	3206.7	19.5	Favourable to poor.	Non-intervention.		3206.7
9180*	Slope forests	137.6	<1	Favourable.	Non-intervention.		137.6
9080*	Fennoscandian deciduous swamp woods	838.2	5.1	Favourable to bad.	Non-intervention.		838.2
9050	Herb rich spruce forests	3.1	<1	Favourable.	Non-intervention.		3.1
9020*	Broad-leaved deciduous forests	27.2	<1	Favourable.	Non-intervention.		27.2
9010*	Western Taïga	1214.1	7.4	Favourable to poor.	Prescribed burning (priority). Non-intervention.	1179.1	35.0
8220	Siliceous rocky slopes	0.1	<1	Favourable.	Non-intervention.		0.1
8210	Calcareous rocky slopes	0.003	<1	Favourable.	Monitoring of conditions in Zartlapu and Zeltiņu Ravines. Management of visitor infrastructure, on necessity.		0.003
7230	Alkaline fens	22.4	<1	Favourable.	Felling of trees and shrubs. Mowing (and removal) of shoots and new trees; once per three years (July, August).	36	36
7220*	Petrifying springs	0.22	<1	Favourable.	Non-intervention.	0.22	
7160	Fennoscandian mineral-rich springs and springfens	0.7	<1	Poor.	Felling of trees and shrubs. Mowing (and removal) of shoots and new trees; once per three years (July, August). Establishment of visitor infrastructure which reduces the anthropogenic load.	0.7	

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7140	Transition mires and quaking bogs	74.9	<1	Poor.	Felling of trees and shrubs. Mowing (and removal) of shoots and new trees; once per three years (July, August).		74.9
7110*	Active raised bogs	1869.6	11.4	Poor.	Maintenance of dams; their repair on necessity.		1869.6
6510	Lowland hay meadows	0.10	<1	Poor.	Restoration. Maintenance.	0.0	0.10
6410	*Molinia* meadows	0.6	<1	Bad.	Restoration. Maintenance.	20.0	20.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	39.0	<1	Poor.	Restoration. Maintenance.	39.0	39.0
6230*	Species-rich *Nardus* grasslands	11.2	<1	Bad.	Restoration. Maintenance.	11.2	11.2
6120*	Xeric sand calcareous grasslands	7.3	<1	Bad.	Restoration. Maintenance.	7.3	7.3
6000	Grasslands to be restored	20.0	<1	-	Restoration. Maintenance.	20.0	20.0
4010	Northern Atlantic wet heaths with *Erica tetralix*	79.09	<1	Favourable.	Felling of shrubs; mowing (with removal); stump milling.	According to expert recommen-dations.	
3260	Natural river reaches and river riffles	15.01	<1	Poor.	Restoration of river riffle areas and spawning sites suitable for salmonids: removal of beaver dams and large woody debris.	10	0.2
3160	Natural dystrophic lakes and ponds	0.3	<1	Poor.	Non-intervention.		0.3
3150	Natural eutrophic lakes	4.03	<1	Poor.	Non-intervention.		4.03
2320	Dry heaths	0.32	<1	Poor.	Maintenance of heaths; felling of trees and shrubs.	0.32	
2190	Humid dune slacks	828.38	5.1	Favourable.	Non-intervention.		828.38

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
2180	Wooded dunes	3418.83	20.8	Favourable.	Maintenance of biodiversity in woodlands. Possibly: improvement of light condition on burnt pines. Measures for insect habitats.	According to forest management plan and expert recommendations.	
2140*	Decalcified fixed dunes with *Empetrum nigrum*	0.52	<1	Poor.	Felling of trees, mowing of heaths.	0.52	
2130*	Grey dunes	60.97	<1	Favourable to poor.	Felling of trees and shrubs, and their shoots.	15	15
2120	White dunes	68.35	<1	Favourable.	Non-intervention or establishment of infrastructure on necessity.		68.35
2110	Embryonic dunes	76.92	<1	Favourable.	Non-intervention.		76.92
1640	Sandy beaches with perennial vegetation	0.18	<1	Favourable to poor.	Non-intervention.		0.18
1310	Annuals colonising mud and sand	20.5	<1	Favourable.	Non-intervention.		20.5
1230	Sea cliffs	1.59	<1	Poor.	Non-intervention.		1.59
1210	Annual vegetation of drift lines	0.54	<1	Poor.	Non-intervention.		0.54

One-time grassland restoration measures are necessary in an area of at least 100 hectares. Restoration measures include felling of trees and shrubs, root shredding, restorative mowing or grazing, assessment and restoration (on necessity) of shallow ditch systems; limitation of the amount of beavers; demolition of beaver dams. In individual places: repair or construction of access roads; installation of culverts.

NATURE RESERVES

Aizdumbles purvs | *Nature Reserve (LV0505400)*

1. Brief description

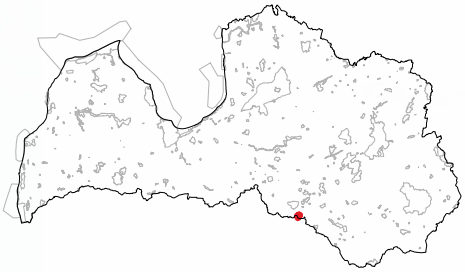
YEAR OF FOUNDATION: 1977.

LOCATION: Viesīte municipality Elkšņi rural territory.

AREA: 376 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



The most significant values of Aizdumbles purvs Nature Reserve are transition mires and quaking bogs, natural eutrophic lake, undisturbed active raised bogs and bog woodland. In total, six EU protected habitat types have been found in the territory. Most of the area is occupied by Lake Aizdumble which is a remnant of the eutrophic lake. It is overgrowing by transition mires and quaking bogs (habitat type 3150) and heavily overgrown with *Phragmites australis*. In a complex of transition mires and quaking bogs and alkaline fens on the lake shores, rare and protected species of vascular plants and mosses can be found such as *Juncus stygius, Liparis loeselii, Malaxis monophyllos, Hamatocaulis vernicosus, Cinclidium stygium, Helodium blandowii, Pressia quadrata*, and *Sphagnum papillosum*. During the bird migration, the territory is an important stopover and concentration site, for example, for *Anser fabalis*. Protected bird species found in the nature reserve are *Botaurus stellaris, Ciconia nigra, Haliaeetus albicilla, Circus aeruginosus, Circus pygargus, Pandion haliaetus, Tetrao tetrix*, and others.

2. Threats to habitat and species conservation

Mires and bog woodlands may be adversely affected by hydrological regime changes.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural mire and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of the current hydrological regime in wet forests and mires.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7230	Alkaline fens	20.5	5.5	Poor.	Non-intervention.		20.5
7140	Transition mires and quaking bogs	159.1	42.3	Favourable.	Non-intervention.		159.1
7110*	Active raised bogs	29.2	7.8	Favourable.	Non-intervention.		29.2
3160	Natural dystrophic lakes and ponds	56.6	15.0	Favourable.	Non-intervention.		56.6
91D0*	Bog woodland	102.1	27.1	Favourable.	Non-intervention.		102.1

Aizkraukles purvs un meži | *Nature Reserve (LV0522600)*

1. Brief description

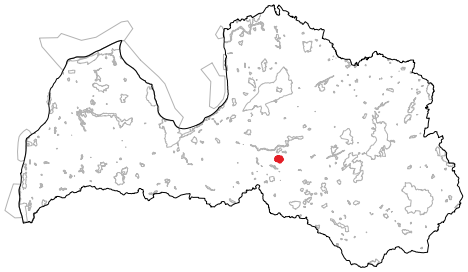
YEAR OF FOUNDATION: 1999.

LOCATION: Aizkraukle municipality, Aizkraukle rural territory.

AREA: 1532 ha.

NATURE MANAGEMENT PLAN: developed in 2011 (2011–2021).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Aizkraukles purvi un meži Nature Reserve is a model of a very diverse forest and mire mosaic in Latvia. There are nine EU protected habitats and a large number of rare species. Aizkraukle Mire is an active raised bog with elements of transition mire and fen, and it includes several bog islets. On the largest islets (Liepu Islet and Lūžņas Islet) there are old *Tilia cordata* woodlands almost unaffected by economic activities. In old broadleaved forests, vascular plants *Festuca altissima*, *Allium ursinum*, *Dentaria bulbifera*, *Poa remota* can be found, as well as EU protected moss species *Dicranum viride*, and others.

Bog woodlands are rich with rare moss species such as *Barbilophozia attenuata*, *Scapania apiculata*, and *Geocalyx graveolens* (in groundwater discharge sites). There are also rare vascular plants *Botrychium virginianum* and *Corallorhiza trifida* and rare fungus species *Fomitopsis rosea* and *Rhodotus palmatus*.

Several protected invertebrate species have been found in the nature reserve, such as *Vertigo moulinsiana*, *Euphydryas maturna*, and *Leucorrhinia albifrons*. Birds *Pandion haliaetus, Strix uralensis, Dendrocopus leucotos, Glaucidium passerinum* are breeding in forests, *Pluvialis apricaria* and others can be found in mires.

2. Threats to habitat and species conservation

- Wet habitats are negatively affected by drainage which degrades mire areas, promoting their overgrowth with forest. Also renovation of drainage systems can have a major negative impact.
- Peat extraction and associated drainage in the south-eastern part of the Aizkraukle Mire outside the nature reserve, negatively affecting the hydrological regime in wet habitats in the nature reserve.
- Maintenance of the nearby gas pipeline and related excavation works can change the hydrological regime, adversely affecting wet forests and mire.
- Road construction in the vicinity of the nature reserve can change the hydrological regime, adversely affecting wet forests and mires.
- Feeding wild boars increases the number of these animals in the area, endangers birds nesting on the ground and causes groundcover eutrophication.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage protected woodland habitats.
- In 2013, 29 dams were constructed on ditches (LIFE Programme project "Restoration of Raised Bog Habitats in the Especially Protected Nature Areas of Latvia" LIFE08 NAT/LV/000449), promotion the improvement of conservation status in mire habitats. However, there is still a negative influence caused by peat extraction and associated ditches in nearby areas.

4. Priorities of management and conservation

- Preserving the optimal hydrological regime for wet habitats.
- Reducing the fragmentation of broadleaved forests by targeted thinning in spruce plantations, promoting the increase of proportion of broadleaved trees. Woodland development towards the protected habitat type 9020* *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes* is expected.
- Improving the quality of habitats of rare plant and invertebrate species.
- Undisturbed natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- In order to preserve a complex of woodlands and wetlands, as well as several rare plant and bird species, nature reserve must be expanded, 101.9 ha of valuable habitats located outside of the territory must be included (see Nature management plan, Chapter 6, Annex 10). Currently, an ecosystem is divided by the nature reserve border in an illogical way.
- Vegetation monitoring and result assessment after the rewetting is necessary.

5.2. Specific measures

5.2.1. Species

- *Botrychium virginianum, Malaxis monophyllos*: Shrub cutting in winter on Meļķītari road (forest block road). Every 10 years.
- *Euphydryas maturna*: Widening of forest block road of the south border by felling trees with diameter less than 30 cm, in 10 m wide belt. In new forests, increase of the proportion of *Fraxinus excelsior* by thinning. Every 10 years.
- *Allium ursinum*: Tending of new and middle-aged forests by increasing the proportion of broadleaved trees. In two steps, felling 50% of spruce in the beginning. According to Nature management plan.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	49.9	3.3	Favourable.	Non-intervention.		49.9
9020*	Broad-leaved deciduous forests	135.5	8.8	Poor.	Non-intervention.		135.5
9000	Potential Protected woodland habitat	32.0	2.1	-	Thinning in spruce plantations, increasing the proportion of broadleaf trees.		
91D0*	Bog woodland	399.7	26.1	Poor.	Non-intervention.		399.7
9010*	Western Taïga	12.4	<1	Poor.	Non-intervention.		12.4
7140	Transition mires and quaking bogs	86.8	5.7	Favourable.	Non-intervention.		86.8
7120	Degraded raised bogs	55.4	3.6	Poor.	Non-intervention. Ditch damming, construction of new dams or ditch filling up – as needed (if necessary in addition to tasks already done). Following the requirements of protective belt (100 m wide) located between the nature reserve and peat extraction area. (In this belt, no digging and transformation work is allowed.)		55.4
7110*	Active raised bogs	573.4	37.4	Favourable.	Non-intervention. Ditch damming, construction of new dams or ditch filling up – as needed (if necessary in addition to tasks already done). Following the requirements of protective belt (100 m wide) located between nature reserve and peat extraction area.		573.4
3160	Natural dystrophic lakes and ponds	0.5	<1	Favourable.	Non-intervention.		0.5

Aklais purvs | *Nature Reserve (LV0519000)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Jelgava municipality Daudzese rural territory.

AREA: 2003 ha.

NATURE MANAGEMENT PLAN: 2011 (2011–2021).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Aklais purvs Nature Reserve is a large complex of raised bogs, bog lakes and transition mires; eight EU protected habitats have been found. This massif of forests and mires is nearly unaffected by human activities. There are 23 species of the EU Birds Directive, such as *Gavia arctica, Anser fabalis, Pandion haliaetus, Haliaeetus albicilla, Tetrao urogallus*. Also six protected species of mammals, one lichen, eight moss, 17 vascular plant species have been found. Of vascular plant species, the most important are *Salix myrtilloides, Poa remota, Malaxis monophyllos*, and *Hammarbya paludosa*.

2. Threats to habitat and species conservation

Hydrological regime in mire has been changed in the past. Several ditches have been excavated in bog and in adjoining forests; natural watercourses have been modified, and water levels in lakes were lowered. The effects of hydrological regime transformation have been long lasting.

3. Existing management of the protected habitats and its assessment

- In the framework of the EC LIFE+ Program project "Restoration of Raised Bog Habitats in the Especially Protected Nature Areas of Latvia" (LIFE08 NAT/LV/000449), in 2011 a hydrological research was completed; 16 dams were constructed in 2012. In general, dams had a beneficial effect on mire habitats. Four dams on Ģirupe river were soon washed out and now they function partly, keeping the water level approximately 15-25-50cm in height. One of the four dams is not functional; dam repair is necessary. In the future, dams on Jūgupe river must be monitored, their role in rewetting must be evaluated, deciding on either their maintenance or repair.
- Special management or rewetting in forests has not been carried out.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural mire and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of optimal hydrological regime in Aklais (Jūgu) Mire and the adjacent forest habitats.
- Favourable conservation status for typical and protected species of plants and animals, especially for birds.

5. Necessary management and conservation measures

5.1. General measures

Continuation of monitoring the vegetation and hydrological regime after rewetting, which was started by the LIFE+ project.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	906.8	45.3	Favourable.	Non-intervention.		906.8
9080	Fennoscandian deciduous swamp woods	83.4	4.2	Favourable.	Non-intervention.		83.4
9020*	Broad-leaved deciduous forests	4.4	<1	Favourable.	Non-intervention.		4.4
9010*	Western Taïga	101.9	5.1	Poor.	Non-intervention.		101.9
7140	Transition mires and quaking bogs	16.3	<1	Favourable.	Non-intervention.		16.3
7120	Degraded raised bogs	4.7	<1	Poor.	Non-intervention. Regular monitoring and repair of ditch dams (on necessity).		4.7
7110*	Active raised bogs	465.5	23.2	Favourable.	Non-intervention. Regular monitoring and repair of ditch dams (on necessity).		465.5
3160	Natural dystrophic lakes and ponds	25.4	1.3	Favourable.	Non-intervention.		25.4

Alsungas meži | *Nature Reserve (LV0532200)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Alsunga municipality.

AREA: 79 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Alsungas meži Nature Reserve is located in a large wooded area in Coastal Lowland, near by the River Ēnava. In the east, it borders with post-harvested peat extraction sites. Woodlands located north of the reserve are drained, as well as wide areas in the surroundings. The nature reserve is important for the protection of bog woodlands but it also includes swamp woods, transition mires and quaking bogs, degraded raised bogs and western Taïga (old boreal forests). In wet forests, there are rare and protected species such as mosses *Geocalyx graveolens, Riccardia multifida, Jungermannia leiantha, Odontoschisma denudatum, Plagiothecium undulatum, Scapania* spp., *Frullania fragilifolia*, vascular plants *Carex buxbaumii* and *Viola uliginosa*.

2. Threats to habitat and species conservation

Wet habitats in wide surrounding are negatively influenced by previous peat extraction in the adjacent territory. Degrading effect of drainage still continues, worsening the condition of forests and mires.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Ensuring the optimal hydrological regime in forest and mire habitats, preventing the drainage influence. Water level stabilisation.

5. Necessary management and conservation measures

5.1. General measures

Hydrological regime research in the nature reserve and the wider area (outside the reserve), assessing the potential influences of water level restoration on the surrounding forests and forest infrastructure. Development of a construction project if it is decided that rewetting is necessary. The measure also includes the preparation of a monitoring program and methodology to assess the efficiency of the restoration.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	58.4	73.9	Bad.	Hydrology research in the wider area. Raising of the water level to eliminate the influence of drainage.	58.4	
9080*	Fennoscandian deciduous swamp woods	2.9	3.7	Bad.	Non-intervention.		2.9
9010*	Western Taïga	7.1	9.0	Favourable.	Non-intervention.		7.1
7140	Transition mires and quaking bogs	2.6	3.3	Poor.	Hydrology research in the wider area. Raising of the water level to eliminate the influence of drainage.	2.6	
7120	Degraded raised bogs.	3.2	4.0	Bad.	Hydrology research. Water level raise for the elimination of drainage influence – by raising water level also in surrounding post-harvested peat extraction fields to eliminate or decrease the influence of ditches at the eastern border of the nature reserve.	3.2	

Ances purvi un meži | *Nature Reserve (LV0523400)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Ventspils municipality, Ance and Tārgale rural territories.

AREA: 9822 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 426 of 02 October 2001, Regulation on Individual Protection and Use of Ances Purvi and Meži Nature Reserve.

The most significant value of Ances purvi un meži Nature Reserve is the almost untransformed Dižpurvs Mire, as well as biodiverse fens, transition mires, complex of wooded dune ridges and interdune depressions, old pine (*Pinus sylvestris*) forests, oxbow lakes, and wooded grasslands on banks of Irbe and Stende rivers. A complex of wooded dunes and interdune depressions (*vigu-kangaru komplekss*) is characteristic to the area. "Kangari" are dune ridges located parallel to the sea, usually covered with dry pine forests. Between "kangari" there are "vigas" – wet, almost linear interdune depressions, usually with mires or wet forests of various types.

Nature reserve with adjoining grasslands in the lower reaches of Rinda and Stende rivers is the sixth largest aggregation site of EU protected grasslands in Kurzeme region, and its potential of landscape-ecological connectivity is high. In evaluating this territory as a whole (not just the grasslands), it is the most important site for the protection of habitat type 6530* *Fennoscandian wooded meadows* in Kurzeme region, and one of the five most important sites of their protection in Latvia.

Development of the ecosystems of the nature reserve has been determined by the economic activity by people living in the coastal areas, which was discontinued after World War II. It ensured natural succession and non-interference in ecological processes. The undisturbed development of natural processes determined the conservation of nature values of the territory. There are 20 EU protected habitats in the nature reserve, with a total area of 9173 ha; 48 protected species of vascular plants, 28 moss, two mushroom, nine lichen, 11 protected mammal species, as well as 51 rare species of birds and 15 species of invertebrates.

Rare and protected plant species in mires include *Saxifraga hirculus, Liparis loeselii, Corallorhiza trifida, Dentaria bulbifera, Euphorbia palustris, Gypsophyla fastigiata, Helianthemum nummularium, Iris sibirica, Juncus squarrosus, Pinguicula vulgaris, Lycopodiella inundata*. A very rare lichen species Mycoblastus sanguinarius can be found in old bog woodlands on the bark of birches (*Betula* spp.). Rare polypores *Xylobolus frustulatus* and *Hapalopilus croceus* can be found on oak (*Quercus robur*) logs in woodlands and in wooded grasslands.

A very rare mammal species *Sicista betulina* has been found. Almost unaffected forests, mires and lakes are important breeding areas for several rare and protected bird species, for example, *Aquila chrysaetos, Aegolius funereus, Anthus campestris,* and others. The nature reserve is important for *Tetrao urogallus* and *Tetrao tetrix* displaying, as well as for the protection of important rare invertebrate species such as *Leucorrhinia pectoralis, Lycaena dispar, Graphoderus bilineatus, Osmoderma barnabita*. Natterjack toad *Bufo calamita* can be found in sands.

2. Threats to habitat and species conservation

- Removal of dead wood and selective thinning in mature woodlands.
- Grasslands are threatened by lack of management, grubbing up. Too intense management may be a threat in the future.
- Invertebrates are adversely affected by the lack of structures and environmental conditions created by fire disturbances, by the lack of dead wood (as a habitat), as well as by overgrowth of wooded grassland landscape and development of shrubs around the old, wide-crowned oaks (*Quercus robur*).
- Decrease of habitat quality in capercaillie (*Tetrao urogallus*) leks due to natural processes.
- There are large areas of semi-natural grasslands in the territories adjacent to nature reserve, in valleys of Stende and Rinda rivers. Grasslands of nature reserve occupy only 10% of the total area of grasslands in

related territories (around 50 ha in nature reserve, more than 400 ha outside it). Provision of grassland management and conservation in the nature reserve will be not efficient if area or biodiversity of grasslands in the adjacent territories will decrease.
- Increasing numbers of boaters in Irbe and Stende rivers; lack of appropriate infrastructure (container-based toilets, waste management).
- Clogging of oxbow lakes with oxygen-demanding mass of dead aquatic plants; leaf and twig litter which decrease the diversity of aquatic organisms.
- The spread of invasive tree species *Acer negundo* in the nature reserve.
- In the vicinity of Ance municipality, as well as on the banks of Stende river there are agricultural lands and several farms which might be one of the main source of the river pollution. Currently, the impact of pollution is considered to be significant and threatening the population of Unio crassus in Stende and Irbe rivers.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage mire, woodland and coastal habitats.
- According to Rural Support Service, in 2014 less than half of the grasslands of the nature reserve were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Restoration of grasslands in their maximum possible area (by restoring grasslands which are overgrown with shrubs after the middle of the 20th century). Maintenance, ensuring optimal conditions for their associated rare species.
- Provision of appropriate management and conservation in grasslands in Stende and Rinda river valleys adjacent to nature reserve.
- Maintenance and creation of habitats suitable for invertebrates and *Bufo calamita*.
- Prevention of adverse changes caused by natural development and previous management in capercaillie leks
- Creation and maintenance of optimal structural elements in habitats of open and wooded dunes.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Approval of Individual regulations on protection, to introduce necessary management measures and ensure the necessary conservation regime.
- Expansion of the area of the nature reserve by including grasslands of downstream areas of Stende and Rinda rivers, southwest from the territory.
- In order to provide the access to grasslands with mowing machinery, roads must be restored in their historical places, roads and culverts must be repaired and a bridge must be built.
- Restoration of the shallow drainage ditches.
- Development of a restoration plan of habitat type 6530* *Fennoscandian wooded meadows*. It must include the restoration of grasslands both in the territory of nature reserve and also in areas adjacent to nature reserve.
- Restriction of the spread of invasive tree species *Acer negund*o in area of nature reserve.

5.2. Specific measures

5.2.1. Species

- Habitat management by periodical grubbing up and cultivation in grey dunes suitable for *Bufo calamita*. Total area of the activity – 33,5 ha, once per 5 years.
- Invertebrates:
  - Creation of gaps and CWD in western Taïga, total area 70 ha.
  - Restoration and management of wooded grasslands, total area 238 ha.
  - Insolation improvement at large trees (*Osmoderma barnabita*) – at least 80 deciduous trees.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	744.1	7.6	Favourable.	Removal of excess woody species in capercaillie leks. Non-intervention.	30.0	 714.1
91E0	Alluvial forests	24.7	<1	Favourable.	Non-intervention.		24.7
9160	Oak forests	20.2	<1	Poor.	Non-intervention. Except measures for the restoration of wooded grassland landscape.	 According to wooded meadows restoration plan.	20.2
9080*	Fennoscandian deciduous swamp woods	255.6	2.6	Poor.	Non-intervention.		255.6
9020*	Broad-leaved deciduous forests	6.8	<1	Poor.	Non-intervention.		6.8
9010*	Western Taïga	882.7	9.0	Poor.	Non-intervention. Prescribed burning once per 10 years. Increase of CWD volumes (>25 cm/diam.) up to 20m3/ha.	 26.8 70	785.9
7210*	Cladium mariscus fens	5.8	<1	Favourable.	Non-intervention.		5.8
7160	Fennoscandian mineral-rich springs and springfens	7.1	<1	Favourable.	Non-intervention.		7.1
7140	Transition mires and quaking bogs	144.4	1.5	Favourable.	Cutting of shrubs and regrowth in the localities of protected species. Non-intervention.	13.4	 131
7110*	Active raised bogs	964.8	9.8	Favourable.	Non-intervention. Cutting of excess woody species in capercaillie micro-reserve.	 30	934.8

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	10.1	<1	Bad.	Restoration. Maintenance.	10.1	10.1
6530	Fennoscandian wooded meadows	238	2.4	Bad.	Restoration. Maintenance.	238.0	238.0
6270	Fennoscandian lowland species-rich dry to mesic grasslands	20.0	<1	Poor.	Restoration. Maintenance.	20.0	20.0
6450	Northern boreal alluvial meadows	15.8	<1	Poor.	Restoration. Maintenance.	15.8	15.8
6430	Hydrophilous tall herb fringe communities	2.2	<1	Favourable.	Non-intervention.	0,0	2.2
6120*	Xeric sand calcareous grasslands	1.1	<1	Poor.	Restoration. Maintenance.	1.1	1.1
6210	Semi-natural dry calcareous grasslands	2.5	<1	Bad.	Restoration. Maintenance.	2.5	2.5
6000	Grasslands to be restored	57.4	<1	-	Restoration. Maintenance.	57.4	57.4
3260	Natural river reaches and river riffles	4.34	<1	Poor.	Removal of large woody debris, ~100m3.	1.0 (10 sites)	
3160	Natural dystrophic lakes and ponds	0.4	<1	Favourable.	Non-intervention.		0.4
3150	Natural eutrophic lakes	76.7	<1	Poor.	Non-intervention. Partly: removal of accumulated organic debris in oxbow lakes.		75.9 0.8
3130	Lobelia-Isoetes lakes	7.4	<1	Poor.	Non-intervention.		7.4
2130	Grey dunes	45.5	<1	Poor.	Removal of excess vegetation. Non-intervention.	15.5	30.0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
2190	Humid dune slacks	199.2	2	Poor.	Removal of excess vegetation. Non-intervention.	50.0	149.2
2180	Wooded dunes	5518.2	56.2	Poor.	Selective thinning according to nature management plan. Creation of canopy gaps and structural elements. Increase of CWD volumes (〉25 cm/diam.) up to 20m3/ha. Structure diversification in new woodlands. Prescribed burning.	1500.0 300.0 120.0 26.8	

One-time grassland restoration measures are necessary in area of at least 50 ha. When taking into account adjacent grasslands in Rinda and Stende river valleys, this area grows to at least 300 ha (including management measures specific for habitat type 6530* Fennoscandian wooded meadows). Grassland restoration measures include: felling of trees and shrubs, root shredding, smoothing of ground surface, and consecutive restorative grazing or mowing (with grass removal).

Apšuciema zāļu purvs | *Nature Reserve (LV0531400)*

1. Brief description

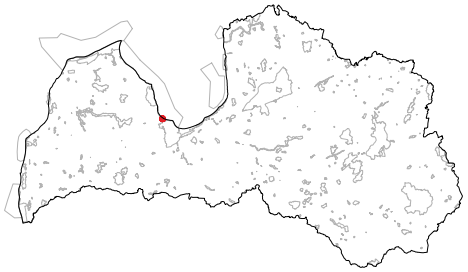
YEAR OF FOUNDATION: 2004.

LOCATION: Engure municipality Engure rural territory.

AREA: 15 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Apšuciema zāļu purvs Nature Reserve is characterised by a peculiar hydrological regime – it is a periodically flooded inter-dune depression near Lāčupīte river. The most important value of the territory is calcareous fen with *Cladium mariscus* and *Schoenus ferrugineus*. Also stands of *Myrica gale* can be found. The most important protected invertebrate species are *Vertigo geyeri* and *Vertigo angustior*.

2. Threats to habitat and species conservation

The territory is influenced by changes in hydrological regime which have promoted the spread and dominance of expansive plant species *Molinia caerulea*.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Mitigation of drainage impact.
- Cutting of shrubs in the western part of nature reserve (recommended).

5. Necessary management and conservation measures

5.1. General measures

- Hydrological regime research. Development of a construction project if it is concluded that rewetting is necessary.
- Evaluation and elimination of the negative influence of ditches of adjacent territories. Development of a monitoring programme and methods if rewetting is carried out, for the evaluation of restoration success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	2.1	14.0	Poor.	Mowing and brush cutting in a small area in the western part of the nature reserve. Blocking or filling up of ditches on the edge of nature reserve (also outside of nature reserve) which promotes the overgrowth (even though it is slow) of mire.	0.5 According to hydrological research results.	
7230	Alkaline fens	4.6	30.7	Poor.	Blocking or filling up of ditches on the edge of nature reserve (also outside of nature reserve) which promotes the overgrowth (even though it is slow) of mire.	According to hydrological research results.	
7210*	*Cladium mariscus* fens	8.1	54.0	Favourable.	Blocking or filling up of ditches on the edge of nature reserve (also outside of nature reserve) which promotes the overgrowth (even though it is slow) of mire.	According to hydrological research results.	

Asūnes ezeri | *Nature Reserve (LV0532400)*

1. Brief description

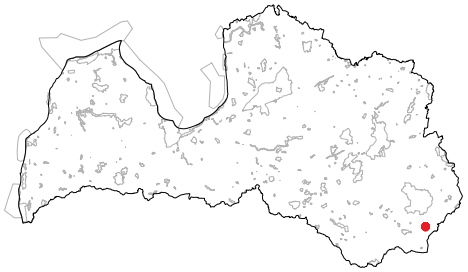
YEAR OF FOUNDATION: 2004.

LOCATION: Dagda municipality Asūne rural territory, Krāslava municipality Robežnieki rural territory.

AREA: 70 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



A large part of Asūnes ezeri Nature Reserve territory is occupied by two endorheic lakes - the Great Asūne Lake and the Small Asūne Lake, which correspond to EU protected habitat type 3150 *Natural eutrophic lakes with* Magnopotamion *or* Hydrocharition - *type vegetation*. The territory is difficult to access; lake shores are overgrown, with wide belts of emergent vegetation. About 60–80% of the central parts of lakes are overgrown with *Nuphar lutea, Potamogeton sp.* and *Nymphaea* spp. There is also a 1-2 m deep mud layer in the central parts of lakes. Ormanjaka river is connecting the Great and Small Asūne Lakes. Its outflow from the Small Asūne Lake is overgrown, with swamps. Sandy shores have remained only in the area of Asūne river inflow into the Great Asūne Lake.

Both lakes are important for the colonies of black tern *Chlidonias niger*. Also other rare bird species can be found, for example, *Botaurus stellaris, Pandion haliaetus, Circus aeruginosus* and *Porzana parva*.

2. Threats to habitat and species conservation

- Lakes are rapidly overgrowing with aquatic macrophytes which interfere with water exchange, promote mud layer formation, eutrophication and deterioration. In the longer term, the development of extensive swamps and emergent vegetation will cause the deterioration of conditions necessary for *Chlidonias niger*, but at the same time it will promote better conditions for *Botaurus stellaris, Circus aeruginosus* and *Porzana parva*. The diversity of lake invertebrates will increase due to increase of emergent vegetation and areas of swamps.
- With increase of emergent vegetation and mud layer, more frequent fish suffocation is expected, as well as the change to fish species which are more tolerant to oxygen deficiency (*Carassius carassius*).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Maintenance of hydrological regime which is necessary for rare bird species (with minimal water fluctuations); conservation of the necessary vegetation.
- Maintenance of water exchange in exorheic lakes.
- Creation of areas which are minimally overgrown, in south-southeastern part of Great Asūne Lake, for the attraction of ducks and *Pandion haliaetus*.

5. Necessary management and conservation measures

5.1. Species

- *Laridae* (gulls): annual mowing of at least 0.1 hectares, in order to maintain gradual transition from emergent vegetation to a mosaic of floating-leaf vegetation.
- *Botaurus stellaris*: maintenance of sparse reedbeds in areas of at least 2 hectares, with open water edges (according to recommendations of ornithologists). Dry reedbeds, which lack aquatic food sources, are not suitable for *Botaurus stellaris*. Once per 5 years, 2 hectares.
- *Chlidonias niger:* emergent vegetation in the lake is suitable for establishment of this species colonies. Black terns tend to change the location of their colonies, so the creation and maintenance of various habitats suitable for bird species should be considered as a priority.

5.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	35.9	51.3	Poor.	Mowing of belts, in direction of Asūne river inflow into the Great Asūne Lake. Once per 5 years. Mowing of aquatic macrophytes in the area of Great Asūne Lake outflow. Creation of open littoral areas in E coast of Great Asūne Lake (for attraction of ducks). Once per five years.	0.2 0.2	
3260	Natural river reaches and river riffles	0.5	<1	Poor.	Limitation of beaver activities in Ormjanka river (to maintain water flow). Mowing of aquatic macrophytes in outflow of Ormjanka river from Small Asūne Lake.	On necessity 0.1	

Ašinieku purvs | *Nature Reserve (LV0512300)*

1. Brief description

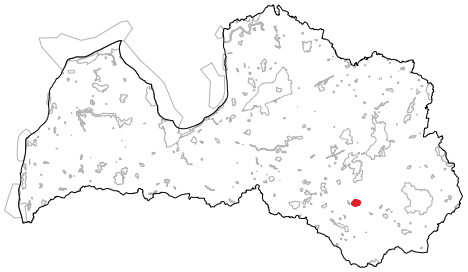
YEAR OF FOUNDATION: 1977.

LOCATION: Vārkava municipality Upmala rural territory.

AREA: 1577 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ašinieku purvs Nature Reserve includes habitats of raised bogs and bog woodlands. In total, four EU protected habitat types have been found in the territory. Most of the nature reserve area is covered by raised bog which is affected by drainage, especially in its northern part.

The nature reserve is important for several protected bird species such as *Aquila pomarina, Falco subbuteo, Tetrao tetrix, Bonasa bonasia, Grus grus, Pluvialis apricaria, Numenius arquata, Tringa glareola*. This is one of the few breeding sites of *Numenius phaeopus* in Latvia. The mire is also a habitat for rare invertebrate species such as *Apatura ilia, Limenitis populi*, and *Leucorrhinia pectoralis*.

2. Threats to habitat and species conservation

The existence of the habitats in the territory may be adversely affected by changes in the hydrological regime, including in adjoining areas outside the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting and maintenance of the hydrological regime suitable for habitats of mires and bog woodlands.
- Prevention of the adverse effects in the boundary zone of the nature reserve (cleaning of ditches may adversely affect protected habitats in the nature reserve).

5. Necessary management and conservation measures

5.1. General measures

Research of the hydrological regime; development of building project for the rewetting.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	206.9	13.1	Poor.	Non-intervention. Rewetting (ditch filling up or blocking) in mires and bog woodlands.	According to results of hydrological research.	206.9
9010*	Western Taïga	2.8	<1	-	Non-intervention.		2.8
9050	Herb rich spruce forests	13.0	<1	-	Non-intervention.		13.0
7150	Depressions on peat substrates	23.3	1.5	Favourable.	Non-intervention.	23.3	
7120	Degraded raised bogs	15.5	<1	Bad.	Rewetting (ditch filling up or blocking) in mires and bog woodlands.	According to results of hydrological research.	
7110*	Active raised bogs	1267.7	80.4	Poor.	Non-intervention. Rewetting (ditch filling up or blocking) in mires and bog woodlands.	According to results of hydrological research.	According to results of hydrological research.

Ašu purvs | *Nature Reserve (LV0532300)*

1. Brief description

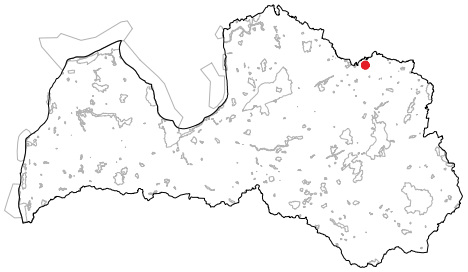
YEAR OF FOUNDATION: 2004.

LOCATION: Ape municipality Ape town with its rural territory.

AREA: 76 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ašu purvs Nature Reserve is located on the edge of a wide massif of wet and drained woodlands. The aim of the nature reserve is to preserve transition mires and fens that have developed as a result of overgrowth of the lake, as well as to preserve old, biodiverse woodlands. There are four EU protected habitat types, as well as rich localities of *Liparis loeselii, Hammarbya paludosa* and *Lycopodium annotinum*. Orchids *Dactylorhiza incarnata* and *Dactylorhiza maculata* can be found in the mire.

2. Threats to habitat and species conservation

Wet habitats of the territory may be affected negatively by changes in hydrological regime.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Conservation of hydrological regime optimal for fens and transition mires.

5. Necessary management and conservation measures

5.1. General measures

Research of the hydrological regime; evaluation of measures for its preservation, taking into account the drainage in adjoining territory.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	15.7	20.6	Favourable.	Non-intervention.		15.7
9010*	Western Taïga	2.4	3.1	Poor.	Non-intervention.		2.4
7140	Transition mires and quaking bogs	29.9	39.3	Favourable.	Non-intervention.		29.2
3160	Natural dystrophic lakes and ponds	0.2	<1	Poor.	Non-intervention.		0.2

Augstroze | *Nature Reserve (LV0000110)*

1. Brief description

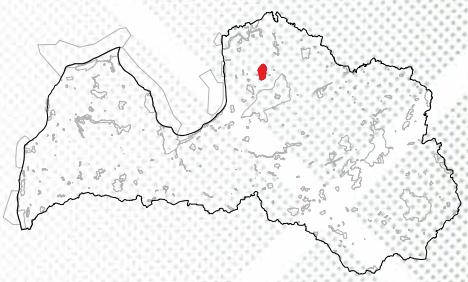
YEAR OF FOUNDATION: 1977 (nature reserve since 2011).

LOCATION: Limbaži municipality Umurga rural territory; Kocēni municipality Dikļi rural territory.

AREA: 4007.2 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Augstroze Nature Reserve is located in Augstroze interlobate heights. It includes forests, Lakes Augstrozes Lielezers and Dauguļu (Augstrozes) Mazezers, as well as surrounding mires. Its most important nature values are mire habitats, bog woodlands, natural eutrophic and dystrophic lakes, broadleaved forests; in total, 13 EU protected habitat types have been found. *Trichophorum caespitosum*, plant species which is very rare in eastern part of Latvia, can be found in mires. The nature reserve is important for breeding of woodpeckers and as a stopover site for geese, as well as habitat for birds of raised bogs. In southern part, there is Augstroze Castle Mound with castle ruins, as well as Augstroze Krusta Kalns Hill which is overgrown with trees. Their slopes are covered by old broadleaved forest which is a habitat for protected species including *Osmoderma barnabita*. Nature reserve is rich in Latvian and EU protected invertebrate, bat, bird and plant species.

2. Threats to habitat and species conservation

- Wet habitats are adversely influenced by drainage.
- Volumes of dead wood can decrease due to forestry activities (selective felling of damaged or infested trees) which are allowed by the regulatory enactments.
- Cessation of grassland management.
- Fragmentation of grassland habitats.
- Increase of recreation load on shores of Lake Augstrozes Lielezers.
- Plants of *Lobelia-Isoëtes* complex are washed out or buried with decayed plants; floating leaves of *Sparganium* spp. are damaged due to the use of motorized watercraft that is allowed in Lake Augstrozes Lielezers.
- The disappearance of *Lobelia-Isoëtes* complex may be promoted by development of residential area "Griezes", without an adequate sewage treatment.

3. Existing management of the protected habitats and its assessment

- So far no particular measures have been taken to manage mire and woodland habitats.
- In Augstroze Castle Mound, shrubs are regularly felled and the dead wood in being removed. Woodlands of the castle mound correspond to criteria of protected habitat, and habitat quality is decreased due to such activities.
- According to Rural Support Service, in 2014 70 % of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".
- Juvenile *Esox lucius* and *Stizostedion lucioperca* have been released in Lake Augstrozes Lielezers. The measure can be assessed as positive because these fish are feeding on low-value and zooplankton-eating fish. In result, the risk of excessive growth of algae ("algal bloom") is reduced, and water transparency can possibly be improved. This is important for *Lobelia-Isoëtes* plants.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Non-intervention in woodlands which have not yet reached the quality of protected habitat, in order to promote the future development of protected woodland habitats and to decrease fragmentation. Development towards habitat types *Fennoscandian herb-rich forests with* Picea abies and *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes* is expected.

- Rewetting; stabilization of hydrological regime in bog woodlands and in parts of mire which are affected by drainage.
- Maintenance and restoration of grassland habitats in an area of 50 hectares.
- Prevention of expansion of recreation areas. Prevention of increase of recreation load in Lauvaskalnu Peninsula. Management of movement of visitors and restoration of infrastructure elements at south-western part of the lake near the "Griezes" residential area.
- Lake Augstrozes Lielezers and Dauguļu (Augstrozes) Mazezers: management of visitor movement in the existing recreation sites. Prevention of creation of new access sites to the lake. Planning of visitor management measures without promoting recreation increase.
- Evaluation of a possible impact in case if a well-maintained recreation area is established at Lake Augstrozes Mazezers.

5. Necessary management and conservation measures

5.1. General measures

- Development of nature management plan. Plan must include hydrological regime evaluation and details of the necessary habitat restoration measures.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	89.9	2.2	Poor.	Evaluation of hydrological regime; rewetting.		89.9
91E0*	Alluvial forests	0.4	<1	Favourable.	Non-intervention.		0.4
9180*	Slope forests	13.3	<1	Favourable.	Non-intervention.		13.3
9160	Oak forests	63.5	1.6	Poor.	Non-intervention.		63.5
9080*	Fennoscandian deciduous swamp woods	45.7	1.1	Poor.	Non-intervention.		45.7
9050	Herb rich spruce forests	22.3	<1	Favourable.	Non-intervention.		22.3
9020*	Broad-leaved deciduous forests	58.9	1.5	Favourable.	Non-intervention.		58.9
9000	Potential Protected woodland habitat	157.7	3.9	-	Non-intervention.		157.7

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	160.7	4.0	Favourable.	Non-intervention.		160.7
7160	Fennoscandian mineral-rich springs and springfens	0.2	<1	Favourable.	Non-intervention.		0.2
7140	Transition mires and quaking bogs	279.4	7.0	Favourable.	Rewetting (ditch blocking or filling).		279.4
7120	Degraded raised bogs	96.3	2.4	Bad.	Rewetting (ditch blocking or filling). Felling of trees.	96.3	
7110*	Active raised bogs	1456.3	36.3	Favourable - poor.	Rewetting (ditch blocking or filling). Felling of trees.	According to research results 3.0	1453.3
6510	Lowland hay meadows	2.2	<1	Bad.	Restoration. Maintenance.	2.0	2.2
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	13.7	<1	Bad.	Restoration. Maintenance.	1.0	13.7
3160	Natural dystrophic lakes and ponds	8.7	<1	Favourable.	Non-intervention.		8.7
3130	*Lobelia-Isoetes* lakes	468.9	11.7	Favourable.	Non-intervention. Thinning and removal of reeds in eastern coast. Once per 5 years - in order to prevent burial of *Lobelias* and *Isoëtes* with decayed reeds.	0.5	468.4

The area of EU protected grassland habitats in the nature reserve is small, and grasslands are isolated from the largest massifs of grasslands in the region. To ensure the sustainable conservation of grassland biodiversity of the nature reserve. The area of EU protected grasslands must be increased to the maximum extent. Therefore, the currently known overgrowing grasslands in an area of 3.4 hectares must be restored. Part of the overgrowing grasslands has not been inventoried yet (for example. west part of agricultural lands at Slavenes farmstead. drained grasslands in west part of Vecmuiža mire). The restoration potential of these grasslands must be evaluated.
Annual grassland management measures are necessary in the entire area of EU protected grassland habitats (11.5 ha). as well as in restored grassland areas. For restoration methods and management specific for habitats and species. please see Rūsiņa (ed.) 2017.

Ābeļi | *Nature Reserve (LV0520000)*

1. Brief description

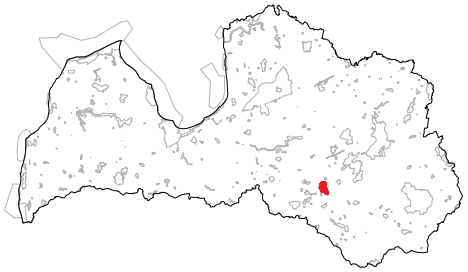
YEAR OF FOUNDATION: 1999.

LOCATION: Jēkabpils municipality Ābeļi, Dignāja and Leimaņi rural territories.

AREA: 3275 ha.

NATURE MANAGEMENT PLAN: 2005 (2006–2016).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 369 of 28 April 2009, Regulation on Individual Protection and Use of Ābeļi Nature Reserve.



Mires and forests cover the largest part of Ābeļi Nature Reserve. Large areas are covered also by grasslands. the area of aquatic habitats is small. In total, 17 habitat types of EU importance have been found in the nature reserve. Transitional mires and quaking bogs, as well as broadleaved forests and bog woodlands are rich in rare and protected species of lichens, vascular plants and birds. In total, 48 protected species have been found. Protected vascular plants *Allium ursinum, Carex disperma, Agrimonia pilosa, Glyceria lithuanica, Dentaria bulbifera, Cinna latifolia* grow in forests, as well as mushroom *Hericium coralloides* on fallen *Populus tremula* logs. Rare moss species *Calypogeia sphagnicola* can be found in mires.

From the landscape-connectivity point of view, the nature reserve is potentially important for the sustainable conservation of grassland biodiversity. Although the territory is not among the most important Natura 2000 sites for grassland conservation at national or regional level, it plays an important role as a species distribution corridor between Ziemeļsusēja and Daugava rivers.

Protected plant species *Gladiolus imbricatus* and *Gymnadenia conopsea* grow in grasslands, and *Crex crex* is breeding here. Alluvial grasslands are important foraging sites for *Aquila pomarina*. Rare bird species in the territory include also *Ciconia nigra, Pernis apivorus, Bonasa bonasia, Pluvialis apricaria, Tringa glareola, Glaucidium passerinum, Strix uralensis*. There is an artificial nest site for *Pandion haliaetus* in Kraukļu Mire, and it is inhabited. Rare invertebrate species include *Cucujus cinnaberinus, Acicula polita, Liocola marmorata, Necydalis major, Peltis grossa, Poecilonota variolosa*. The nature reserve in the largest residing area for large mammals (*Lynx lynx* and *Canis lupus*) in Sēlija (Selonia) region.

2. Threats to habitat and species conservation

- Grasslands in floodplain and fluvial terrace above floodplain of Ziemeļsusēja river overgrow with shrubs.
- Fragmentation of broadleaved forests is promoted by forestry activities – spruce plantations were created before the establishment of protected nature area.
- The quality of wet forest and mire habitats is reduced due to drainage.
- Alluvial grasslands may be threatened due to decrease in duration and frequency of floods.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage mire and forest habitats
- According to Rural Support Service, in 2014 only 32% of the total area of grasslands was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". The most important habitat types 6450 *Northern boreal alluvial meadows* and 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) were managed in 26 % and 52 % of the area respectively.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

- Preservation of the existing hydrological regime or rewetting in habitats of wet forests and mires.
- Prevention of fragmentation of broadleaved forests by combination of non-intervention and special measures in woodlands which have not yet reached the quality of protected habitats. Development towards habitat types 9020* *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) rich in epiphytes and 9050 *Fennoscandian herb-rich forests with* Picea abies is expected.
- Restoration and maintenance of grassland habitats in their maximum possible area throughout the whole Ziemeļsusēja river valley (including areas located outside the nature reserve and areas which are overgrown with shrubs since the end of 20th century).
- In order to promote the ecological connectivity and restoration potential of grasslands in Ziemeļsusēja river valley, it is necessary:
  - To evaluate the possible extension of the nature reserve in southern direction, including upper reaches of Ziemeļsusēja river, up to Grīvas and Zvejnieki farmsteads.
  - To map grassland habitats north-west from the territory, up to "Birži" (Dolomīts village), and to evaluate a possible extension.
- Reduction of impact of beavers (hunting; demolition of dams and lodges) if they threaten woodlands, protected species and their habitats, infrastructure, areas outside the nature reserve, etc.

5. Necessary management and conservation measures

5.1. General measures

- Development of a new nature management plan.
- Hydrological research in Kraukļu Mire and its adjoining woodlands. If research shows that rewetting is necessary – development of a construction project (including also a monitoring programme and methods for the evaluation of restoration success).

5.2. Specific measures - habitats

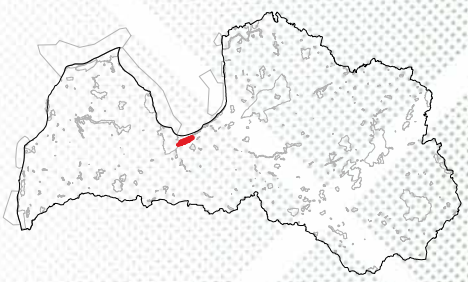
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	44.70	1.4	Poor.	Non-intervention. Rewetting.	According to research results.	44.7
9080*	Fennoscandian deciduous swamp woods	55.4 138.2	1.7 4.2	Bad.	Non-intervention, except rewetting. Hydrological regime research, in complex with mire habitats.	According to research results.	55.4
9020*	Broad-leaved deciduous forests	137.5		Poor.	Non-intervention.		138.2

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9000	Potential Protected woodland habitats	61.1	1.9	-	Non-intervention in woodlands which have not yet reached the quality of protected habitats. Selective felling in order to increase the proportion of broadleaved trees.	42.0	95.5
9010*	Western Taïga	361.4	11.0	Poor.	Non-intervention. Detailed evaluation of influence of ditches.		61.2
7140	Transition mires and quaking bogs	378.9	11.6	Favourable.	Non-intervention. Rewetting.	According to research results.	361.4
7110*	Active raised bogs	40.4	1.2	Favourable.	Non-intervention. Rewetting.	According to research results.	379
6510	Lowland hay meadows	67.2	2.0	Poor.	Restoration. Maintenance.	19.4	40.4
6450	Northern boreal alluvial meadows	1	⟨1	Bad.	Restoration. Maintenance.	49.4	67.2
6410	*Molinia* meadows	28.3	⟨1	Bad.	Restoration. Maintenance.	1.0	1.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.5	⟨1	Bad.	Restoration. Maintenance.	23	28.3
6120*	Xeric sand calcareous grasslands	3.5	⟨1	Bad.	Restoration. Maintenance.	1.5	1.5
6210	Semi-natural dry calcareous grasslands	9.0	⟨1	Poor.	Restoration. Maintenance.	1.3	3.5
3260	Natural river reaches and river riffles	1.1	⟨1	Poor.	Removal of beaver dams (Aldaunīca). On necessity.		0.5
3160	Natural dystrophic lakes and ponds	44.70	1.4	Favourable.	Non-intervention.		1.1

One-time grassland restoration measures are necessary in an area of at least 96 hectares. Grassland restoration measures mainly include felling of trees and shrubs, milling of roots, and the following restorative mowing (with grass/hay removal) or grazing. As large part of the grasslands is abandoned, also soil fertility reduction and restriction of expansive species will be necessary.

Babītes ezers | *Nature Reserve (LV0513100)*

1. Brief description



YEAR OF FOUNDATION: 1957.

LOCATION: Babīte municipality Babīte and Sala rural territory; Jelgava municipality Valgunde rural territory.

AREA: 2988 ha.

NATURE MANAGEMENT PLAN: 2009 (2009–2019).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 409 of 24 May 2011, Regulation on Individual Protection and Use of Babītes Ezers Nature Reserve.

Babītes ezers Nature Reserve includes Lake Babīte and the adjoining coastal area. The territory is surrounded by polders constructed between 1939 (when the enclosing dam was constructed) and 1959, when a pump station was built, and a drainage network was completed. Surrounding polders are agricultural areas of national significance. The nature reserve is located in the national flood risk area, which means that matters of nature protection and human security must be both considered. Lake Babīte is one of the few lagoon-type lakes in Latvia. It is shallow, eutrophic lake with abundant reedbeds (*Phragmites australis*), lakeshore bulrush (*Scirpus lacustris*), and cattails (*Typha* spp.), as well as floating-leaf and submerged plants. Lake Babīte is a public lake.

The nature reserve is important for the conservation of breeding waterbirds and migratory birds, and it is included in the list of Important Bird Areas of European Union importance in Latvia. In total, 70 protected bird species are breeding in the area, such as the *Sterna hirundo, Porzana porzana, Porzana parva, Botaurus stellaris, Ixobrychus minutus, Sterna albifrons*, and others. 12 rare bird species are breeding outside the nature reserve, but they visit Lake Babīte for foraging, for example, *Haliaeetus albicilla*. For 18 species of birds, the lake serves as a stopover site during the migration, for example, for *Cygnus cygnus, Cygnus columbianus, Mergus albellus*. Protected plant species *Najas marina* can be found in the lake, but *Polygonum mite* – in swamps of emergent vegetation.

Four EU protected habitat types have been found in the territory. Lake Babīte has a high fishery significance, both from the perspective of bird foraging, biodiversity conservation and angling.

Regarding the area of alluvial grasslands, nature reserve is a very important Natura 2000 territory concerning its proportion of alluvial grasslands in the region of Rīga. From landscape-ecological point of view, grasslands of the territory (total area 215 ha) are related to Lielupe River as a grassland species distribution corridor which is important for the grassland biodiversity conservation in Coastal and Zemgale Geobotanical Districts. Therefore, conservation and protection of nature reserve grasslands should be planned in close connection with grasslands in the Lielupe River floodplain – in Ķemeri National Park and in Kalnciema pļavas Nature Reserve.

2. Threats to habitat and species conservation

- The quality of the lake habitat is directly linked to the hydrological regime and the economic activity in surrounding polders. Agricultural fertilizers and chemicals adversely affect the quality of water and habitats, as well as the distribution of species. Biogenes contribute to eutrophication and overgrowing of the lake, and deteriorates breeding conditions for waterbirds.
- In bird breeding season, adverse influence is caused by sharp fluctuations of water level (water level elevations in Gulf of Rīga and in Lake Babīte due to western winds). The unpredictable water level fluctuations have a negative effect on the number of moulting males which need constantly good foraging conditions during the complete loss of ability to fly. Foraging possibilities are reduced if water level is elevated.
- In case of high water level which do not freeze in late autumn and winter, partly-floating swamps of emergent vegetation are detached from the lake bottom and moved to shore, resulting in development of excessive overgrowth which is not very suitable for waterbirds.
- Bird breeding success in lake is adversely affected by predatory mammals (*Vulpes vulpes, Nyctereutes procyonoides, Mustela vison*) and anthropogenic disturbance.
- Lake overgrowth with reeds and shrubs is promoted by lack of grassland management and by drainage influence of polders.

3. Existing management of the protected habitats and its assessment

- In 1988, a surrounding canal was excavated around the southeast coast of the lake, and several artificial islets were created. Due to mistakes made (in terms of the size and height of islets), they are not suitable for breeding of ducks and gulls, and are used by predatory mammals.
- According to Rural Support Service, in 2014 only 25 % of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Preventing sudden changes in the water level by restoring the operation of Varkaļi floodgates, in order to provide optimal nesting and foraging conditions for waterbirds.
- Mowing of reeds in the lake, in order to improve conditions for birds staying in the area.
- Creation of open areas of lake which are influenced by wind and its promoted water exchange, in order to conserve colonies of *Najas marina*.
- Ensuring control of the protection regime of the nature reserve.
- Restoration and maintenance of habitat types 6450 *Northern boreal alluvial meadows* and 1630* *Boreal baltic coastal meadows* in Gātupe and Gāte polders, in order to ensure favourable conditions for habitats and for grassland birds.

5. Necessary management and conservation measures

5.1. General measures

- Reconstruction and proper operation of Varkaļi Canal floodgates; prevention of rapid changes in the water level of the lake, provision of optimal breeding and foraging conditions for birds.
- Hydrological regime research; evaluation of the necessary measures for its maintenance, taking into account the drainage systems in the adjoining area. Research must include also the eco-hydrological investigation of grasslands, in order to clarify the possibilities of water regime regulation, as well as the influence of flood water quality on vegetation, and the possibilities of further management in the context of nature values.
- For perennial grasslands which are not influenced by floods (about 104 ha), development of semi-natural grassland creation plan (target habitats: 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis), 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*)

5.2. Specific measures

5.2.1. Species

- Creation of open areas of lake which are influenced by wind and its promoted water exchange, in order to conserve colonies of *Najas marina*.
- Preventing sudden changes in the water level by restoring the operation of Varkaļi floodgates, mowing of reeds in the lake, in order to improve conditions for *Chlidonias niger* and other waterbirds.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	111.1	3.72	Bad.	Restoration. Maintenance.	111.1	111.1
1630*	Coastal meadows	2.9	0.1	Bad.	Restoration. Maintenance.	2.9	2.9
6000	Grasslands to be restored	104	3.48	-	Restoration. Maintenance.	104	104
3150	Natural eutrophic lakes	2247.9	75.23	Poor.	Mowing of reeds, creating mosaic of reedbeds and littoral zone without continuous reedbeds. Prevention of pollution of untreated wastewaters (opposite to Varkaļi Canal); improvement of existing systems. Mowing of aquatic macrophytes: eastern part of Gāte and at the polder pumping station.	Long-term Programme, including the identification of primary watercourses and their cleaning sequence.	On necessity

One-time grassland restoration measures are necessary in almost the whole area of grasslands, because also the managed grasslands are in poor conservation status. Restoration measures for habitat type 6450 *Northern boreal alluvial meadows* includes felling of trees and shrubs, milling of roots (about 70 ha), following restorative mowing and collecting grass/hay, and reduction of area occupied by expansive species, in particular *Phragmites australis*. Perennial grasslands which do not correspond to criteria of EU protected grasslands but can be developed to semi-natural grasslands, cover 105 ha. As these grasslands are drained, the reduction of soil fertility and the targeted development of species composition is necessary.

Baltais purvs | *Nature Reserve (LV0502100)*

1. Brief description

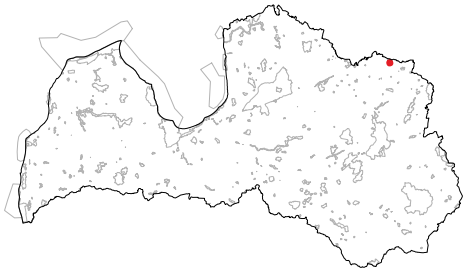
YEAR OF FOUNDATION: 1977.

LOCATION: Alūksne municipality Mārkalne rural territory.

AREA: 139 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Baltais purvs Nature Reserve is established for the protection of raised bog, transitional mire and bog woodlands. There are several small mineral-ground islets in the mire. *Pandion haliaetus* is breeding in the area, and *Pernis apivorus* stays here. Examples of protected plant species are *Dactylorhiza incarnata, Dactylorhiza maculata*, and *Hammarbya paludosa*. The nature reserve borders with two micro-reserves established for protection of *Tetrao urogallus* leks.

2. Threats to habitat and species conservation

Habitats of mires and bog woodlands can be threatened by hydrological regime changes in the nature reserve and also in the surrounding territory.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest and mires, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	26.0	18.7	Poor.	Non-intervention.		26.0
9080*	Fennoscandian deciduous swamp woods	2.3	1.7	Poor.	Non-intervention.		2.3
9010*	Western Taïga	11.1	8.0	Poor.	Non-intervention.		11.1
7150	Depressions on peat substrates	2.1	1.5	Favourable.	Non-intervention.		2.1
7140	Transition mires and quaking bogs	10.3	7.4	Favourable.	Non-intervention.		10.3
7110*	Active raised bogs	33.6	24.2	Favourable.	Non-intervention.		33.6

Baltezera purvs | *Nature Reserve (LV0531100)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Brocēni municipality, Brocēni rural territory.

AREA: 228 ha.

NATURE MANAGEMENT PLAN: developed in 2004 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Lake Baltezers and Baltezers Mire are the most important nature assets of Baltezera purvs Nature Reserve, supporting rare and protected plant species and protected habitats. Lake Baltezers is one of the clearest lakes in Kurzeme Region, with localities of very rare aquatic species *Isoëtes lacustris* and with protected habitat type 3140 *Hard oligo-mesotrophic waters with benthic vegetation of* Chara *spp.* One of the three localities of *Ophrys insectifera* in Latvia is located in the area, as well as the only *Galium triflorum* locality in Kurzeme Region. Forests form a protective belt around the sensitive habitats of mires and lakes, at the same time marking it as a compact and united nature complex. *Geastrum rufescens* can be found in these forests.

In Baltezers Mire, rare orchids, for example, *Dactylorhiza cruenta*, can be found, and other protected plant species, such as *Pinguicula vulgaris*. *Pandion haliaetus*, breeding in the surroundings, is foraging in Lake Baltezers.

2. Threats to habitat and species conservation

- Forests and mires both in nature reserve and surrounding areas are adversely affected by drainage. As a result, mire habitats are degraded, and overgrown with pines.
- Renovation of drainage systems in adjacent territories and input of plant nutrients in the lake can be highly negative.
- The ecological status of lake and the locality of *Isoëtes lacustris* are threatened by recreation.
- Water level changes due to activity of beavers in the ditch outflowing from the lake. Water level is raised, lake coast is flooded and paludified, plant nutrient leaching and reedbed development is promoted, causing suppression of charophytes and *Isoëtes lacustris*.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Prevention of water level elevation in the lake caused by beavers (dams on lake outflow); ensuring the water outflow from the lake.
- Restoration of hydrological regime and water level stabilisation in drained mire areas so that the water level in lake is not elevated.
- Ensuring undisturbed course of natural processes in mire and forest habitats which are relatively unaffected by humans, as well as in habitats of species that need undisturbed natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Improvement of bathing site on the eastern shore of the lake; providing a waste container and toilet, as well as timely removal of waste.
- Development of nature conservation plan including hydrological regime research and assessment of drainage in surrounding territories; planning of wetland restoration.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	107.5	47.1	Bad.	Rewetting (ditch damming or filling up) so that it does not influence the water level of the lake. Land use change (logging) to protected mire habitat.	97.5 10.0	
7140	Transition mires and quaking bogs	26.9	11.8	Bad.	Rewetting (ditch filling up or blocking) so that it does not influence the water level of the lake Tree felling, increasing the area of open mire.	26.9	
3130	*Lobelia-Isoetes* lakes	34.6	15.2	Bad.	Mowing and removal of emergent and floating-leaf vegetation in the eastern littoral part of the lake, in localities of *Isoëtes lacustris*. Prevent the lake water elevation caused by beavers (dams on outflowing ditch); maintenance of water outflow from the lake.	1.7 0.2	

Baltmuižas purvs | *Nature Reserve (LV0504300)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Ilūkste municipality Subate town with rural territory; Aknīste municipality.

AREA: 874 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

The most important nature values of the Baltmuižas purvs Nature Reserve are habitats of raised bogs, transition mires, western Taïga and bog woodlands, as well as old woodlands in mire islets. Rare species *Salix myrtilloides* is found in the territory, as well as *Lycopodium annotinum* and *Dactylorhiza incarnata*. Moss species *Calypogeia sphagnicola* is found in the bog. The territory is important for the protection of *Canis lupus*. Mires are an important habitat for breeding birds. Peat extraction occurs north of the nature reserve.

2. Threats to habitat and species conservation

Mire and bog woodland habitats can be threatened by hydrological regime changes not only in the nature reserve but also in the adjoining areas including peat extraction site north of the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of hydrological regime which is optimal for natural habitats of fens and transition mires.

5. Necessary management and conservation measures

5.1. General measures

Renaturalisation of peat milling fields (north of nature reserve) after the finishing of peat extraction.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	186.9	21.4	Favourable.	Non-intervention.		186.9
9080*	Fennoscandian deciduous swamp woods	24.3	2.8	Favourable.	Non-intervention.		24.3
9020*	Broad-leaved deciduous forests	15.5	1.8	Favourable.	Non-intervention.		15.5
9010*	Western Taïga	30.2	3.5	Favourable.	Non-intervention.		30.2
7140	Transition mires and quaking bogs	53.3	6.1	Favourable.	Non-intervention.		53.3
7110*	Active raised bogs	461.0	52.7	Poor.	Non-intervention.		461.0

Barkavas ozolu audze | *Nature Reserve (LV0511100)*

1. Brief description

YEAR OF FOUNDATION: 1957.

LOCATION: Madona municipality Barkava rural territory, Varakļāni municipality Murmastiene rural territory.

AREA: 62 ha.

NATURE MANAGEMENT PLAN: 2006 (2007–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Barkavas ozolu audze Nature Reserve is located along the Lisiņa river, in a forest massif which serves as a connecting link between Lubāns Wetland and forests surrounding Teiči Mire. It consists of four separate parts. In the past, spring flooding was characteristic to the territory. After the drainage in 20th century, Lisiņa river is modified, and hydrological conditions have changed. Spring floods still occur in a small part of the nature reserve along the river. Several micro-reserves for the protection of *Aquila pomarina* and *Ciconia nigra* are established in the adjacent or nearby territories of the nature reserve.

The most important values of the nature reserve are oak (*Quercus robur*) woodlands, as well the many protected and rare species of plants and animals. The territory is particularly important for invertebrates and bats, for example, *Nyctalus noctula* who needs hollow trees. There are 57 protected species - 13 species of invertebrates, 11 mammal, 17 plant, 14 bird, two reptile species. Examples of protected invertebrate species in the territory are *Apatura ilia*, *Aromia moschata*, *Ceruchus chrysomelinus*. Birds *Glaucidium passerinum*, *Dendrocopus leucotos*, *Aquila pomarina*, *Ciconia nigra* are breeding in nature reserve, or are using it for foraging. Very rare moss species *Dicranum viride* grows on trunks of trees. Rare plant species in the nature reserve are *Galium schultesii, Gladiolus imbricatus, Cnidium dubium*. Protected lichen species *Arthonia bysacea* is very abundant.

2. Threats to habitat and species conservation

- Expansion of invasive species *Heracleum sosnowskyi* on banks of Lisiņa river, as well as in forest gaps and on forest block roads.
- Intensive forest management in the adjoining woodlands. Forests in the nature reserve are very linear (it consists of woodlands in a 100-500 m wide belt along the Lisiņa river). Abiotic and biotic factors in the territory are negatively influenced by clear-felling and fragmentation in the adjacent and surrounding forests.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage forest habitats, except regular mowing of *Heracleum sosnowskyi* on the forest block roads. So far, no reduction in their distribution is observed.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Restriction of the spread of *Heracleum sosnowskyi.*

5. Necessary management and conservation measures

5.1. General measures

Control and elimination of *Heracleum sosnowskyi.*

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	42.7	68.9	Favourable.	Non-intervention.		42.7

Bednes purvs | *Nature Reserve (LV0515800)*

1. Brief description

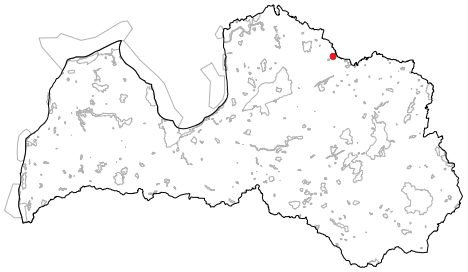
YEAR OF FOUNDATION: 1977.

LOCATION: Valka municipality Zvārtava rural territory.

AREA: 30 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



The main values of Bednes purvs Nature Reserve are transition mires and quaking bogs, as well as bog woodlands. Several protected plant species can be found, such as *Liparis loeselii, Saxifraga hirculus, Galium trifidum, Hammarbya paludosa*, mosses *Hamatocaulis vernicosus* and *H. lapponicus*, as well as several very rare dragonfly species.

2. Threats to habitat and species conservation

There is a culvert located in south-eastern part of the territory; wet habitats and protected dragonfly species are adversely affected due to lowered water level.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Determination of the water level which is optimal for the existence of protected mire habitats, plants and invertebrates (dragonflies, water beetles).
- Evaluation of the necessity of water flow regulator in the south-western part of the territory. Its construction if necessary.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	0.8	2.7	Poor.	Non-intervention.		0.8
9010*	Western Taïga	0.5	1.7	Poor.	Non-intervention.		0.5
7140	Transition mires and quaking bogs	24.5	81.7	Favourable.	Non-intervention.		24.5

Bejas mežs | *Nature Reserve (LV0501300)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Alūksne municipality Jaunalūksne rural territory.

AREA: 59 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Bejas mežs Nature Reserve is important for the protection of old spruce (Picea abies) forests. There are no large woodlands in the immediate vicinity, and small clusters of woodlands are characteristic, laid out in a mosaic with grasslands and arable lands. There are two EU protected habitat types in the territory. Also bear Ursus arctos can be found in the territory.

Protected plant species in the area are Huperzia selago and Lycopodium annotinum, as well as indicator species of woodland key habitats, such as Jamesoniella autumnalis. A protected geological and geomorphological object lies in the territory – a large conical frost-thaw basin "Alpu velna pēda". Part of the territory was once used for grazing, as evidenced by the remains of the barbed fences and individual wide-crowned trees (Fraxinus excelsior, Acer platanoides), which now grow in the young forest.

2. Threats to habitat and species conservation

Decreasing volumes of dead wood and the proportion of old or large trees in the woodland due to forestry activities.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

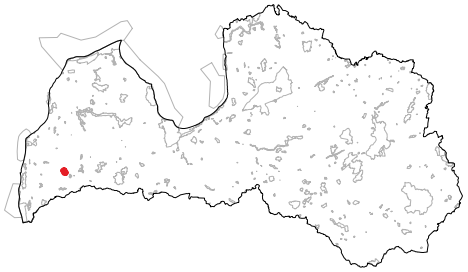
Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	33.1	56.1	Poor.	Non-intervention.		33.1
91D0*	Bog woodland	1.6	2.7	Poor.	Non-intervention.		1.6

Blažģa ezers | *Nature Reserve (LV0525100)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Aizpute municipality Kalvene rural territory; Vaiņode municipality Embūte rural territory; Priekule municipality Priekule rural territory.

AREA: 463 ha.

NATURE MANAGEMENT PLAN: 2008 (2008 – 2023).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Blažģa ezers Nature Reserve is located in Embūte Hillock which is characterized by impressive terrain and a landscape mosaic with woodlands, agricultural lands and water bodies. Most of the nature reserve is occupied by woodlands; many of them have developed as secondary forests in agricultural lands. Seven EU protected habitat types have been found in the territory. In early 1990s, European tree frog Hyla arborea was reintroduced in the nature reserve, as the climate and other conditions of the territory were well-suited for the biological requirements of tree frog. The reintroduction was successful, and species has dispersed also outside the nature reserve. The territory is rich in amphibian and reptile species including Triturus cristatus. Also the bird fauna is rich. For several plant species, the nature reserve is on the border of their distribution range. Such species are *Polygonatum verticillatum, Cardamine flexuosa, Serratula tinctoria*. Important protected mammal species include Pipistrellus nathusii.

There are large areas of grasslands in the territory, including semi-natural, naturalizing, abandoned, cultivated grasslands, and fallow-lands, which provide foraging sites for a large part of bird species of the territory. Currently, EU protected grassland habitats occupy 41 hectares in the nature reserve, and additional 147 hectares can potentially be restored.

2. Threats to habitat and species conservation

- Changes in the hydrological regime associated with the demolition of beaver dams, as the conditions for amphibians, including *Hyla arborea*, are closely related to the beavers and their created inundations.
- The suitability of grasslands and ponds for amphibian spawning can be adversely affected by overgrowth of grasslands and ditches.
- Cessation of grassland management; grassland overgrowth.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected woodlands, mires and aquatic habitats. Small areas of grasslands are managed in the north-eastern part of the nature reserve. According to Rural Support Service Rural Development Programme measure "Maintaining biodiversity in grasslands", 4 % of the total area of semi-natural grasslands was managed in 2014.

4. Priorities of management and conservation

- Restoration and maintenance of grasslands in the maximum possible area.
- Maintenance of hydrological regime and conditions in waterbodies suitable for *Hyla arborea*. Measures include prohibition on demolition of the existing beaver dams. Development of new beaver-inundated areas can be allowed, except in cases if they contribute to erosion of existing roads and flooding or wetting of grasslands which can be managed or restored.
- Maintenance of water discharge into watercourse; promotion of riffle improvement in Vārtāja river.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Development and implementation of grassland restoration and maintenance plan for all grasslands of the nature reserve (about 188 ha) – semi-natural, cultivated, and fallow-lands, including overgrown grasslands. Plan must include:

- The prioritization of grassland restoration and the coordination with necessities of other nature values;
- Assessment of restoration possibilities and costs;
- Evaluation of hydrological regime, and the necessary modifications for the grassland management;
- Assessment of construction, repair and maintenance of the necessary access roads.
- Repair and maintenance of existing roads in the territory for the needs of habitat management.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	1.8	<1	Favourable.	Non-intervention.		1.8
7140	Transition mires and quaking bogs	2.2	<1	Favourable.	Non-intervention. The current lake water level must be maintained.		2.2
6510	Lowland hay meadows	0.4	<1	Bad.	Restoration. Maintenance.	0.4	 0.4
6410	*Molinia* meadows	2.4	<1	Bad.	Restoration. Maintenance.	3.6	 3.6
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.3	<1	Bad.	Restoration. Maintenance.	36.0	 36.0
6120*	Xeric sand calcareous grasslands	1.5	<1	Bad.	Restoration. Maintenance.		 1.5
6000	Grasslands to be restored	146.7	31.7	-	Restoration. Maintenance.	146.7	 146.7
3260	Natural river reaches and river riffles	2.0	<1	Poor.	Vārtāja river – removal or reduction of large woody debris in sites with bank erosion and in reaches with pebbles or boulders in the riverbed (once per 3-5 years).	2.0	
3150	Natural eutrophic lakes	4.5	<1	Poor.	Lake Blažģa – non-intervention. Former fish ponds – improvement of lighting conditions if the pond is shaded (for the attraction of dragonflies).	 1.0	4.5

One-time grassland restoration measures are necessary in an area of at least 41 ha. This area includes EU protected grassland habitats which currently are in bad conservation status. To ensure the sustainable conservation of grassland biodiversity in the nature reserve, additionally at least 147 hectares must be restored. Most of these areas were identified in 2016, and information is stored in the nature management system "Ozols". These are perennial grasslands and fallow-lands which have been abandoned since early 2000s, but where restoration potential is good. Annual grassland management measures are necessary in the entire area of EU protected grassland habitats, and will be necessary in restored grasslands. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Brienamais purvs | *Nature Reserve (LV0507400)*

1. Brief description

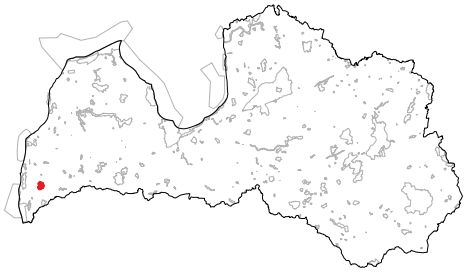
YEAR OF FOUNDATION: 1987.

LOCATION: Grobiņa municipality, Gavieze and Bārta rural territory.

AREA: 585 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



The main values of Brienamais purvs Nature Reserve are raised bogs and bog woodland. There are five EU protected habitat types. Nature reserve is also important for the protection of Myrica gale. Other rare and protected species are: *Trichophorum cespitosum*, *Drosera intermedia, Odontoschisma denudatum*, mosses *Scapania* spp., *Frullania tamarisci* and *Lejeunea cavifolia,* lichen Thelotrema lepadinum, and others. Nature reserve is one of the most important breeding sites for *Circus pygargus* in Latvia. Other rare bird species are also found here, such as *Ciconia nigra*, *Tetrao urogallus, Pluvialis apricaria*, and others.

2. Threats to habitat and species conservation

Habitat conservation status may be negatively affected by hydrological regime changes. There are few ditches excavated in late 19th century; now they are overgrown and do not function.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

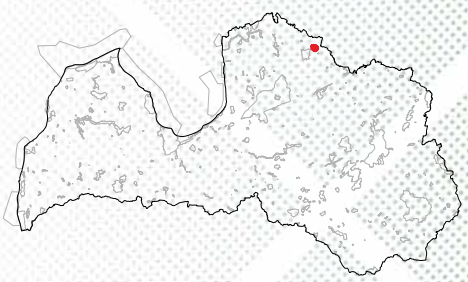
Preservation of hydrological regime which is optimal for natural habitats of mires and wet forests.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	148.2	25.3	Favourable.	Non-intervention.		148.2
9010*	Western Taïga	24.2	4.1	Favourable.	Non-intervention.		24.2
9080*	Fennoscandian deciduous swamp woods	19.6	3.4	Favourable.	Non-intervention.		19.6
7140	Transition mires and quaking bogs	63.6	10.9	Favourable.	Non-intervention.		63.6
7110*	Active raised bogs	260.0	44.4	Favourable.	Non-intervention.		260.0

Burgas pļavas | *Nature Reserve (LV0532600)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Valka municipality Valka rural territory. Nature reserve is located in North Vidzeme Biosphere Reserve.

AREA: 183.3 ha.

NATURE MANAGEMENT PLAN: 2006 (2006–2016).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Burgas pļavas Nature Reserve includes Seda river and its drained floodplains in a 2 km long and 1 km wide section near Lugaži village. Grasslands occupy the most part of the territory (90 %). In small areas there are also woodlands (developed when grasslands overgrew), aquatic habitats and fens. The nature reserve is one of the most important breeding sites of the great snipe *Gallinago media* and corncrake *Crex crex* in Latvia. For *Gallinago media*, it is the second most important territory in North Vidzeme. The nature reserve is also the fifteenth most important Natura 2000 territory for the conservation of habitat type 6450 *Northern boreal alluvial meadows* in Latvia (1.6 % of total habitat area). The territory is important for other protected bird species *Aquila pomarina, Porzana porzana, Tringa totanus, Asio flammeus, Tetrao tetrix*. In the springtime, the territory is important for migratory water birds and waders. After the breeding period and during autumn migration, *Grus grus* are staying in the territory.

2. Threats to habitat and species conservation

- Grasslands are threatened by unsuitable hydrological regime, lack of management, grubbing up, or too intense management.
- The diversity of plant communities in large part of grasslands has decreased due to drainage. The influence is still ongoing.
- The most important threat is soil eutrophication. It occurs due to several factors – peat mineralization after drainage, lack of grassland management at the turn of the 20th and 21st centuries; grass shredding and leaving on site (which was wide-spread from the beginning of the 21st century to 2015).
- The most important threat to *Gallinago media* is drainage – both the fragmentation caused by dense network of ditches and decrease in the length of spring flood period. The duration of floods is important for earthworms which are the main food for *Gallinago media*. Its feeding conditions are adversely affected by grass shredding.

3. Existing management of the protected habitats and its assessment

- The current hydrological regime was established after the drainage in 1930s. After that, semi-natural grasslands partially changed from wet and moist to moist and mesic grasslands, and in some places were completely transformed to intensively managed cultivated grasslands. In 1990s, management was discontinued, and most of the area of current nature reserve overgrew with shrubs.
- Restoration of semi-natural grasslands was started in 2005, in scope of EC LIFE programme project "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198). More than 80 hectares of biologically valuable grasslands were restored (felling of shrubs in 20 ha, shredding of roots 1 ha, first-time mowing 80 ha). The project was successful, and the area of managed grasslands has not decreased since its introduction.
- According to Rural Support Service, in 2014 most of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". The most important habitat type, 6450 *Northern boreal alluvial meadows,* was managed in 96 % of its total area. Of 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae), 68 % were managed. However, there are grassland territories where restoration is necessary. After 2015, the managed area has decreased, which is likely to be attributed to the low support rate (55 EUR per ha) for grasslands which are not repeatedly mapped after 2013, as costs of management of wet areas are much higher.

4. Priorities of management and conservation

- In order to ensure the integrity of habitats, grasslands adjacent to the nature reserve (left bank of Seda river) must be included in the territory.

- Restoration and management of grassland habitats to the maximum possible area; their maintenance in favourable conservation status (including also restoration of grasslands in areas where they were present historically, but now there are shrubs and forests).
- Maintenance and restoration of hydrological regime (especially flood regime) necessary for habitats of *Gallinago media* and grassland-breeding waders, and for the favorable conservation status of grassland habitats.
- Improvement of water quality in drainage basin, in order to reduce the adverse effect when excessive nutrients (more than in a background condition) are transported to grasslands during the floods.
- Extension of nature reserve. Currently, the nature reserve is isolated from other grasslands in floodplain of Seda river from landscape-ecological point of view. To ensure landscape-ecological connectivity and integrity of habitats, Seda floodplain up to Natura 2000 territory "Sedas purvs" must be included in the nature reserve (approx. 135 ha of grasslands which must be restored).
- Evaluation of hydrological regime – in terms of biodiversity conservation and improvement, and in terms of management possibilities. It is also required to specify the necessary hydrological regime changes and the possibilities for their realization. Hydrological regime should be continuously monitored for at least three years.
- Evaluation of grassland habitat restoration possibilities in heavily drained and modified grasslands on peaty substrates with strong eutrophication, as the areas of semi-natural grasslands in the territory suitable for *Gallinago media* must be maximized and their biodiversity must be improved.

5. Necessary management and conservation measures

5.1. General measures

- Update of the nature management plan, including the measures necessary for the conservation of the main nature values.

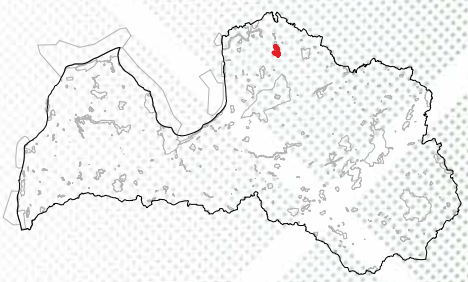
5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	0.1	<1	Bad.	Restoration. Maintenance.	0.1	0.1
6450	Northern boreal alluvial meadows	164	89.5	Poor.	Restoration. Maintenance. Optimisation of hydrological regime.	23.0 164.0	164.0
6430	Hydrophilous tall herb fringe communities	1	<1	Poor.	Non-intervention.	1.0	1.0
6410	Molinia meadows	0.81	0.4	Poor.	Restoration. Maintenance.	0.3	0.8
6000	Grasslands to be restored	5.4	2.9	-	Restoration. Maintenance.	5.4	5.4

One-time grassland restoration measures are necessary in an area of at least 23 hectares, as well as the creation of hydrological regime suitable for *Gallinago media* is necessary in the entire area of nature reserve. For the improvement of *Gallinago media* habitat, it is planned to establish dams on drainage ditches. Also paludification should be prevented, therefore the potential influence of ditch blocking must be evaluated by groundwater table monitoring for at least three years. Habitat of *Gallinago media* will be enlarged and improved by restoration of grassland habitats.
Annual grassland management measures are necessary in the entire area grasslands, in the light of habitat requirements of *Gallinago media*. Management which is unsuitable for *Gallinago media* is grass mowing with shredding, and leaving on site. As a result, expansive plant species start to dominate in grasslands; vegetation becomes too dense and high, and therefore unsuitable also for *Crex crex*. For restoration methods and management specific for *Gallinago media* and grassland habitats, please see Rūsiņa (ed.) 2017.

Burtnieku ezera pļavas | *Nature Reserve (LV0532700)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Burtnieki municipality Burtnieki rural territory.

AREA: 431.9 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 60 of 16 January 2007, Regulation on Individual Protection and Use of Burtnieku Ezera Pļavas Nature Reserve.

Burtnieku Ezera Pļavas Nature Reserve is located in North Vidzeme Biosphere Reserve. The surrounding area of Lake Burtnieki is drained, and Silzemnieki Polder in included in the list of Agricultural territories of national significance.

There are eight EU protected habitat types in the nature reserve. Most of the territory (70 %) is occupied by floodplain grasslands which is an important breeding habitat for the great snipe *Gallinago media* and corncrake *Crex crex*, as well as foraging and breeding habitats for *Asio flammeus*. Landscape-ecologically, grasslands are connected to Vidusburtnieks and Rūjas Paliene Nature Reserves, and together they form a species distribution corridor. Grassland management should be planned in a complex manner for all territories together, considering that Vidusburtnieks and Rūjas Paliene Nature Reserves are among the ten most important Natura 2000 territories for the protection of *Gallinago media*, but Burtnieku Ezera Pļavas is among the ten most important territories for the protection of grassland-breeding waders. There are 16 protected bird and invertebrate species in the nature reserve. In springtime, flooded grasslands at the lake are important for development of dragonfly larvae and for their emerging to adults.

2. Threats to habitat and species conservation

- Floodplain grasslands are adversely affected by drainage which decreases the floods. Due to polder operation, lake water level is lowered, floods are limited: floodplain is flooded in limited volumes, and grasslands are extensively fertilized.
- Cessation of grassland management; unsuitable management (leaving grass on site).
- Expansion of monodominant reedbeds in grasslands at the lake coast; disappearance of open littoral zone (necessary for waders and for fish spawning). Dense stands of emergent macrophytes interfere with the decayed plant mass being washed ashore, promote their accumulation in littoral zone and further paludification of coastal areas. Development of dense reedbeds makes the spawning of pikes difficult or impossible.
- Overgrowth of shores of oxbow lakes; increase of bank shading. Clogging of oxbow lakes with leaf and twig litter causes increased consumption of oxygen and decreases the potential diversity of aquatic organisms.
- Beaver dams and fallen logs in the rivers in nature reserve promote slowdown of the water flow, rise of the water temperature, decrease of dissolved oxygen, shore erosion or paludification (depending on river longitudinal profile), cover of pebbles and boulders with sediments, and disappearance of habitats suitable for oxygen-sensitive invertebrates.
- Regular massive development of blue-green algae in lake reduces water transparency and diversity of aquatic species.

3. Existing management of the protected habitats and its assessment

- In the framework of the LIFE programme project "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), in 2005 and 2006 shrubs in alluvial grasslands were felled in an area of 79 hectares. First-time mowing was carried out in 70 hectares, prescribed burning in 4 hectares and shrub root milling in 2 hectares.
- According to Rural Support Service, in 2014 53 % of the grasslands of nature reserve were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". 29 % of the habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels* were managed; management influence on habitat quality has not been evaluated.
- In scope of UNDP/GEF Project "Biodiversity Protection in the North Vidzeme Biosphere Reserve",

in years 2006 and 2007 the infrastructure for visitors was established (nature trail, observation tower, information boards).

4. Priorities of management and conservation

- Management of grasslands and bird habitats; their restoration up to the maximum possible area, and maintenance in favourable conservation status.
- Removal of monodominant reedbeds from the lake shore. Maintenance and restoration of hydrological regime which is suitable for *Gallinago media* and grassland-breeding waders, as well as for maintenance of grassland habitats in favourable conservation status.
- Undisturbed course of natural processes in forest, outcrop and spring habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of functionality of oxbow lakes.

5. Necessary management and conservation measures

5.1. General measures

- Development of new nature management plan.
- Merging of Burtnieka Ezera Pļavas, Vidusburtnieks and Rūjas Paliene Nature Reserves into one protected nature area, in order to promote integrated and landscape-ecologically justified management and conservation of grasslands.
- Monitoring of grassland habitats, grassland-breeding waders and *Gallinago media*.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	1.7	<1	Favourable.	Non-intervention.		1.7
8220	Siliceous rocky slopes	1.7	<1	Poor.	Partial removal of overgrowth to uncover outcrops and to promote erosion.		1.7
7160	Fennoscandian mineral-rich springs and springfens	0.03	<1	Favourable.	Non-intervention.		0.03
6450	Northern boreal alluvial meadows	141.3	32.7	Favourable.	Restoration. Maintenance.	66.1	141.3
6430	Hydrophilous tall herb fringe communities	16.9	3.9	Poor.	Restoration. Maintenance.	To be specified.	16.9
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	2.8	<1	Favourable.	Restoration. Maintenance.	2.7	2.8
6000	Grasslands to be restored	104.0	24.0	-	Restoration. Maintenance.	104,0	104,0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	142.3	32.9	Poor.	Mowing of aquatic macrophytes, in a mosaic (for ducks, waders, fish spawning). Felling of shrubs and low-value trees in and around oxbow lakes (to avoid accumulation of litter and filling with organic matter). Creation of open littoral zones suitable for aquatic invertebrates (dragonflies, caddisflies, mayflies etc.) emerging to adults.	0.1 on necessity	
3260	Natural river reaches and river riffles	3.0	<1	Poor.	Maintenance of water discharge: removal or reduction of beaver dams and large woody debris in sites where they promote shore erosion, as well as in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality. Once per 5 years.	1.0	

One-time grassland restoration measures are necessary in an area of at least 70 hectares. Measures include felling of shrubs, milling of their roots, limitation of reeds, and subsequent restorative mowing or grazing. In the currently managed alluvial grasslands, quality must be improved after the evaluation of soil fertility reduction possibilities. Approximately 144 hectares are occupied by perennial grasslands which do not correspond to criteria of EU protected grassland habitats, but can be developed to semi-natural grasslands. These grasslands are drained, therefore soil fertility reduction and creation of species composition is necessary.
Annual grassland management measures are necessary in the entire area of EU protected grassland habitats (161 ha). For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Būšnieku ezera krasts | *Nature Reserve (LV0532800)*

1. Brief description

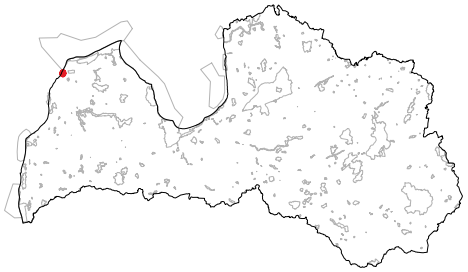
YEAR OF FOUNDATION: 2004.

LOCATION: Ventspils City.

AREA: 51 ha.

NATURE MANAGEMENT PLAN: 2008 (2008–2018).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Būšnieku Ezera Krasts Nature Reserve is located in Ventspils City. Woodlands cover half of the territory, and overgrown and paludified areas of the Lake Būšnieki shore cover the rest of the territory. The territory is established for the conservation of transition mires and quaking bogs, and wooded dunes of the Atlantic, Continental and Boreal region. In these habitats, 17 rare and protected species of vascular plants and four species of moss have been found. The nature reserve is one of the three localities of *Rhynchospora fusca* in Latvia. Protected plant species in mires include *Hydrocotyle vulgaris, Schoenus ferrugineus, Myrica gale*; there is also an abundant locality of *Liparis loeselii*. *Dianthus arenarius* ssp. *arenarius* grows in pine woodlands. Two rare tree species in Latvia are found in the woodlands. *Sorbus meinichii* is Fennoscandian – Baltic endemic species. *Lonicera caerulea* ssp. *pallasii* grows mainly in western Latvia, in Coastal Lowland.

2. Threats to habitat and species conservation

- Birds breeding in quaking bogs are adversely affected by the large number of visitors and increasing anthropogenic load (boat enthusiasts, anglers). Quality of wooded dunes is reduced due to large number of visitors, eutrophication, damping of municipal waste, excessive vehicle use, etc.
- Conditions in transition mire and quaking bogs are changing due to overgrowth with reeds.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Maintenance of hydrological regime optimal for transition mire and quaking bogs by renovation and operating the hydrotechnical structure – overfall – in Lošupe river at its outflow from the Lake Būšnieki.
- Limitation of the areas covered by reeds in transition mire and quaking bogs.

5. Necessary management and conservation measures

5.1. General measures

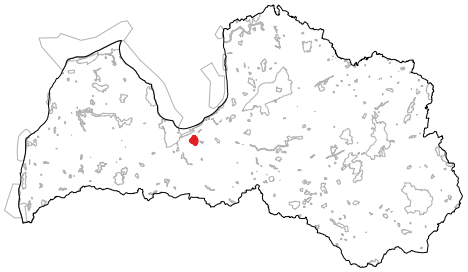
- Construction of restricting barriers at illegal forest roads.
- Cleaning and maintenance of Lošupe river boat channel in order to prevent its clogging which is a threat to the functioning of overfall and to the adjacent road.
- Installation of information signs warning about the prohibition on leaving the boat in the nature reserve area at the Lošupe boat channel.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7140	Transition mires and quaking bogs	4.7	9.2	Favourable.	Felling of *Alnus glutinosa*; mowing of reeds. At least once per 5 years.		4.7
2180	Wooded dunes	40.2	78.8	Bad.	Prevention of anthropogenic load. Restriction of invasive species.		40.2

Cenas tīrelis | *Nature Reserve (LV0519800)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Babīte municipality Babīte rural territory; Mārupe municipality; Olaine municipality.

AREA: 2296 ha.

NATURE MANAGEMENT PLAN: 2005. (2005–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Cenas Tīrelis Nature Reserve occupies a large area in a region which is rich in mires and forests and is located between Olaine town and Lake Babīte. Most of the wetlands in the territory are drained, used for peat extraction or forestry. Before the extraction of peat, Cena Mire was one of the largest raised bogs in Latvia. The most significant asset of the nature reserve is the undisturbed part of the mire – with raised bog, transition mire and natural dystrophic lakes. 95% of the territory is covered by EU protected habitats. This is one of the few mires in Latvia with features both of bogs of eastern and western type. Seven protected plant and mushroom species were found here such as *Trichophorum cespitosum* (found in western Latvia), *Chamaedaphne calyculata* (typical for eastern Latvia), and the rare *Betula nana*.

Surrounding forests are an Important Bird Area. *Anser fabalis, Grus grus, Tringa glareola*, and *Tetrao tetrix* are breeding in this territory. In total, 26 protected bird species were found here. Compared to the 1930s, at the beginning of 21st century, the simplification of bird fauna occurred, and the rarest species disappeared. Also six rare and protected invertebrate species have been found in the nature reserve.

2. Threats to habitat and species conservation

- Peat extraction in the direct vicinity of the nature reserve and associated drainage worsen the hydrological regime in the territory and cause mire habitat degradation.
- Bird breeding disturbance caused by visitors.

3. Existing management of the protected habitats and its assessment

- In 2006, in the framework of the EU LIFE project "Mires", LIFE04 NAT/LV/000196, peat dams were established, in order to reduce drainage effect and to stabilise water level in the mire and in forests on mire edges. In general, peat dams have had a beneficial effect on the bog, the water level has raised, although insufficiently in some places (in highly drained mire edges close to peat extraction fields).
- The most significant water level rise was observed at the Skaista Lake where swamps and standing dead trees developed. In some places, dams were damaged after the project implementation; damages were repaired.

4. Priorities of management and conservation

- Undisturbed course of natural processes in mire and forest habitats slightly influenced by humans, as well as in habitats of species that need undisturbed, natural environment.
- Stabilization and preservation of optimal hydrological regime for natural mire habitats, preventing mire habitat degradation caused by drainage ditches.

5. Necessary management and conservation measures

5.1. General measures

Regular maintenance and restoration of tourism infrastructure (this is an object of national significance).

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	123.4	5.4	Favourable.	Non-intervention.		123.4
7140	Transition mires and quaking bogs	72.7	3.2	Favourable.	Non-intervention – in the slightly affected parts of the mire. Regular examination and repair of dams (108 dams in total). Agreement with peat extraction companies on the coordination of peatland recultivation within the interests of nature protection (water bodies and wetlands).		72.7
7120	Degraded raised bogs	57.3	2.5	Poor.		57.3	
7110*	Active raised bogs	1723.2	75.0	Poor.		1723.2	
3160	Natural dystrophic lakes and ponds	18.5	<1	Favourable.	Non-intervention.		18.5

Cieceres ezera sala | *Nature Reserve (LV0513600)*

1. Brief description

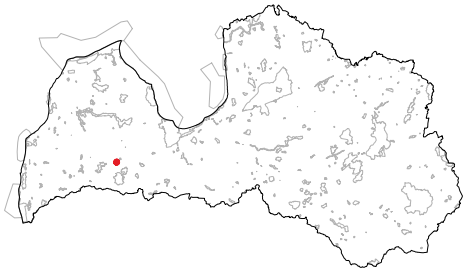
YEAR OF FOUNDATION: 1923.

LOCATION: Brocēni municipality, Brocēni town with rural territory.

AREA: 15 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Lake Ciecere is located in the Saldus hillock, in the subglacial depression. It is narrow and long, resembling a river with high shores. The only island of the lake is the Ozoli Island, and since 1923 it has been in a protected nature area status. Broad-leaved forests and associated rare and protected species are the main nature assets of the island. Such species are, for example, *Bromopsis benekenii* and other indicator species of woodland key habitats. The area is a particularly suitable habitat for the *Dendrocopos medius*.

2. Threats to habitat and species conservation

Excessive visitor flow may adversely affect the nature values of the site.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage the habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in the forest, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Recreational impact assessment and activities to reduce the impact of recreation.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	14.0	93.3	Poor.	Non-intervention.		14.0

Čertoka ezers (Valnezers) | *Nature Reserve (LV0507000)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Aglona municipality Aglona rural territory.

AREA: 55 ha.

NATURE MANAGEMENT PLAN: 2004 (2004–2010).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Čertoka ezers (Valnezers) Nature Reserve established for the conservation of the unique landscape of Lake Čertoks and its surroundings. The main nature value in the area is the lake itself which is a suffosion sinkhole by its origin, located in a deep crater-like depression with steep slopes. Lake is an endorheic basin and its diversity of aquatic plants and animals is low. The lake corresponds to EU protected habitat type 3130 *Oligotrophic to mesotrophic standing waters with vegetation of the* Littorelletea uniflorae *and/or* Isoeto-Nanojuncetea. This is a rare lake type which is sensitive to pollution and eutrophication.

The surrounding area is very hilly, covered with dry pine forests. There are rare and protected plant and insect species; the most important of them are *Pulsatilla patens, Myriophyllum alterniflorum, Diphasiastrum complanatum*, mosses *Lophozia capitata* and *Rhodobryum ontariense,* dragonfly *Leucorrhinia pectoralis*.

2. Threats to habitat and species conservation

- Inflow of organic substances into the lake (due to intentional or accidental actions by people) can cause irreversible ecological changes (anoxic conditions, algal blooms, etc.).
- Forest ground vegetation is degraded due to anthrophogenic load; the area is polluted with municipal waste.
- Volumes of dead wood and proportion of old trees is decreased due to forestry activities.

3. Existing management of the protected habitats and its assessment

- Wooden downwarding trails have been constructed, with aim to reduce ground vegetation trampling, exposure of open soil, and nutrient leaching into the lake. A wooden viewing area is created on the shore of the lake, therefore reducing the possibility for visitors to have direct contact with the lake. Car park is located about 100 meters from the lake, reducing the possibility of lake pollution with petroleum products.

4. Priorities of management and conservation

- Reduction of the negative effects of recreation.
- Maintenance of the oxygen regime favorable for the lake processes, ensuring regular monitoring of the lake and maintenance of the existing infrastructure.
- Undisturbed course of natural processes in natural freshwater and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of localities of *Pulsatilla patens* by informing and educating the public that these plants can not be gathered or dug up.

5. Necessary management and conservation measures

5.1. General measures

- Development of Individual regulations on protection and use, setting a prohibition of commercial felling in forest habitats.
- Managing the flow of visitors by maintenance of existing infrastructure.
- Ensuring regular collection and disposal of waste.
- Installing container-based toilets at car parks, as far away as possible from the lake.
- Local annual monitoring. Water quality parameters are, for example, conductivity, pH, and amount of dissolved oxygen at the lake surface.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9060	Coniferous esker forests	6.3	11.4	Poor.	Non-intervention. Management measures for *Pulsatilla patens*.		6.3
7140	Transition mires and quaking bogs	0.2	<1	Poor.	Non-intervention.		0.2
3130	*Lobelia-Isoetes lakes*	1.9	3.4	Poor.	Non-intervention.		1.9

Daiķu īvju audze | *Nature Reserve (LV0513800)*

1. Brief description

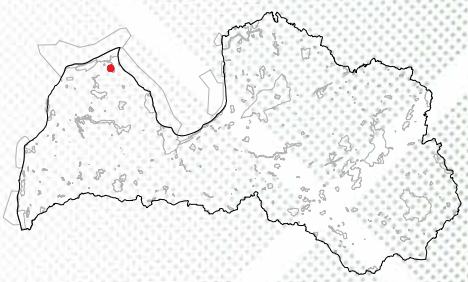
YEAR OF FOUNDATION: 1999.

LOCATION: Dundaga municipality Dundaga rural territory.

AREA: 15 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Daiķu īvju audze Nature Reserve is established for the conservation of European yew *Taxus baccata*. There are periodically waterlogged mixed coniferous and deciduous woodlands with an admixture of broadleaved trees. Woodlands are rich in protected plant species, such as orchids *Dactylorhiza incarnata, Dactylorhiza maculata, Malaxis monophyllos*.

2. Threats to habitat and species conservation

- The existence of habitats of the territory may be adversely affected by hydrological regime changes.
- Natural regeneration of *Taxus baccata* is hindered and adversely affected by shading and the development of subcanopy of spruces (*Picea abies*).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected woodland habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Improvement of growth conditions and regeneration for *Taxus baccata*.

5. Necessary management and conservation measures

5.1. General measures

- Mapping of habitats according to the latest methods.
- Extension of the nature reserve in order to include small mire at the western edge of the territory where shrubs must be felled (with repeated mowing of regrowth), moving and removal of reeds and other herbaceous plants is necessary.

5.2. Specific measures

5.2.1. Species

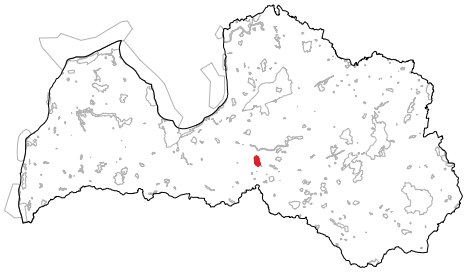
The status of the *Taxus baccata* population is assessed as poor. Trees and shrubs which cause shading in *Taxus baccata* localities must be felled. The exact area for management must be clarified when planning the felling on site.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	0.3	2.0	Poor.	Non-intervention.		0.3
91E0*	Alluvial forests	12.8	85.3	Poor.	Non-intervention. Insolation improvement for *Taxus baccata*, according to expert judgement.	12.8	

Daugava pie Kaibalas | *Nature Reserve (LV0527200)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Lielvārde municipality Lielvārde municipal town with rural territory and Jumprava rural territory; Ķegums municipality Birzgale rural territory.

AREA: 579 ha

NATURE MANAGEMENT PLAN: 2008 – 2018.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 668 of 30 June 2009, Regulation on Individual Protection and Use of Daugava pie Kaibalas Nature Reserve.

Daugava pie Kaibalas Nature Reserve covers a 7 km long section of Daugava River between Dzelmes and Kaibala villages. It includes adjacent grasslands and woodlands, as well as Dzelmju Peninsula. In springs and autumns, islands and shallow reedbeds in this part of Daugava River serve as a stopover and feeding site for migratory birds. During the spring migration, more than 3 000 waterbirds can be observed simultaneously in the river, including *Cygnus columbianus*, various species of geese and ducks. Waders and *Crex crex* are breeding in the low, wet grasslands. Littoral areas in the nature reserve with floating-leaf and submerged vegetation are the largest fish spawning grounds in the entire Ķegums water reservoir. Significant amount of the area is occupied by habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*. Grasslands are an important species dispersal corridor in Daugava valley.

Ķegums water reservoir is created by blocking the river. According to its characteristics this river section is more similar to exorheic lake and does not qualify for EU protected freshwater habitat type.

In total, 38 rare and protected species of plants, invertebrates, fish, lampreys and birds are found in the nature reserve. There are 14 bird species which are protected Latvia and 12 species that are protected in EU; one lamprey species and 30 protected species of fish (incl. one protected in Latvia and four in the EU). Examples of protected plant species are *Alisma gramineum, Callitriche hermaphroditica, Scolochloa festucacea, Circaea lutetiana*. Of invertebrates, there are five rare snail species. Ķegums water reservoir is significant for the protection of fish species *Aspius aspius*.

2. Threats to habitat and species conservation

- Water level fluctuations, created by the activities of Pļaviņas and Ķegums hydroelectric power plants (HPP), contribute to the development of monotonous amphibic plant and animal communities which are resistant to water level changes, and it also adversely affects fish spawning and bird breeding.
- An increase in anthropogenic load, an increase in the number of visitors to the islands and the coast of the Daugava has a negative impact on birds during their breeding and recovery periods.
- Overgrowing of grasslands decreases the quality of the nature reserve as a bird habitat, and increases grassland fragmentation, reducing the functionality of Daugava valley as a species migration corridor.
- Spread of invasive species in grasslands (in particular, *Impatiens glandulifera* and *Rumex confertus*).
- Invertebrates of grasslands are endangered by grass fires in spring.
- Birds during their breeding are endangered by early mowing of grasslands and by recreation.
- Grassland vegetation and habitats of birds are negatively influenced by trampling and by municipal waste in picnic sites.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Part of perennial grasslands which are not recognised as EU protected habitats are managed.

4. Priorities of management and conservation

- Provision of suitable recovery and breeding possibilities for migratory and breeding waterbirds.
- Increase in fish resources in order to improve foraging conditions for birds.

- Restoration and maintenance of grasslands in an area of at least 26 hectares. Bird-friendly management methods and timing should be respected.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Reconstruction of local wastewater treatment system of Dzelmes residential area in order to reduce eutrophication loads.
- Evaluation of a possible merging of Daugavas ieleja and Daugava pie Kaibalas Nature Reserves. Grasslands of EU importance are located between these two territories, and they are a part of landscape-ecological grassland aggregation. If these will not be preserved than the isolation of both Natura 2000 sites will increase, and the functionality of Daugava river as an ecological corridor will decrease.
- Limitation of the human presence during the bird breeding and migration period; provision of control.
- Restriction of the use of personal watercraft in littoral zone.
- Establishment of artificial fish spawning sites; release of juvenile fish. Restrictions in operation of hydroelectric power plant when fish spawning is at its highest level, also ensuring the success of bird breeding – nests do not become flooded or do not become accessible to predators (minks, raccoons, and foxes) due to drought.
- In order to increase the success of fish spawning, it is necessary to reach an agreement with LATVENERGO (a state-owned electric utility company) that the allowed water level fluctuation range is decreased for more than 20 days during the mass spawning of fish.
- Carry out a research on the fish resources of the Ķegums water reservoir. Based on research, development of scientifically-based recommendations for the improvement of fish resources (also applies to protected fish species - *Aspius aspius, Cottus gobio, Cobitis taenia, Silurus glanis* (included in Red Data Book of Latvia)). After research, monitoring of fish resources is necessary in the subsequent years.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	8.4	1.5	Bad.	Restoration. Maintenance.	8.4	8.4
6430	Hydrophilous tall herb fringe communities	8.3	1.5	Bad.	Restoration. Maintenance.	8.3	8.3
6210	Semi-natural dry calcareous grasslands	1.0	<1	Poor.	Restoration. Maintenance.	1.0	1.0
6000	Grasslands to be restored	8.3	1.4	-	Restoration. Maintenance.	8.3	8.3
91E0*	Alluvial forests	22.0	4	Favourable.	Non-intervention.		22.0

Detailed recommendations on grassland management and restoration are provided in Nature management plan of 2008. In addition, restoration of EU protected habitats is necessary in grasslands which do not correspond to criteria of habitat of EU importance. Regarding grasslands on islands, it is recommended in the Nature management plan to cut and remove shrubs once every 2-3 years. However, taking into account that these grasslands belong to a species dispersal corridor connecting Natura 2000 sites, grasslands must be annually mown, and grass must be removed (except sites where it is not possible due to water level fluctuations caused by HPP operation).

Diļļu pļavas | *Nature Reserve (LV0521300)*

1. Brief description

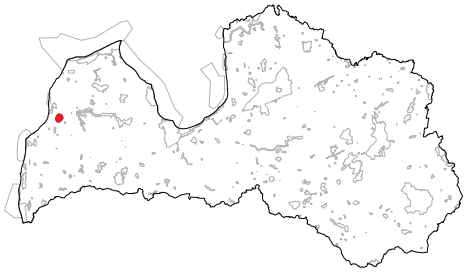
YEAR OF FOUNDATION: 1999.

LOCATION: Alsunga municipality.

AREA: 174 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Diļļu Pļavas Nature Reserve is located at the basal part of the Baltic Ice Lake ancient coastal formations. Here, a complex of moist grasslands and fens with a small proportion of forests has developed in an interaction between natural processes and human activities. There are seven EU protected habitat types in the territory. Most of the area is occupied by 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) which is characteristic in Kurzeme region but has disappeared in many places due to drainage. The nature reserve is important also for the protection of habitat type 5130 Juniperus communis *formations on heaths or calcareous grasslands*. The areas of these habitat types in the nature reserve are respectively 5% and 1.4% of their total area in protected nature territories in Latvia. Part of the territory was earlier used for tufa extraction, and mining pits are preserved.

The territory is a single area of grasslands and calcareous fens which used to be managed but the management was discontinued in the last 10-20 years, and habitat condition has sharply deteriorated. Diļļu grasslands are bordering with grasslands of the middle part of Užava river which are currently not included in the Natura 2000 territory. Both Diļļu grasslands and grasslands of the middle part of the Užava river are an important step in ensuring the landscape-ecological integrity of Užavas augštece and Užavas lejtece Natura Reserves.

There are various orchid species in the nature reserve, such as Dactylorhiza baltica, *Dactylorhiza incarnata, Dactylorhiza maculata*. The most important invertebrate species are Vertigo angustior, *Vertigo geyeri, Lycaena dispar*, and *Euphydryas aurinia*.

2. Threats to habitat and species conservation

- Overgrowth, deterioration and area decrease of grasslands and calcareous fens due to lack of management. Disappearance of characteristic species.
- Habitats may be affected negatively by hydrological regime changes. In particular, in case if a shallow ditch system (which has historically ensured the existence of grasslands and prevented their paludification) completely ceases to function.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 about 40% of the moist grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Juniper formations were managed only in 12 % of the area.

4. Priorities of management and conservation

- Restoration of the low-value and degraded grasslands and juniper formations in the favourable conservation status, as well as maintenance of existing grasslands in favourable conservation status.
- Conservation of calcareous fens and improvement of their conservation status with appropriate management measures.
- Rehabilitation and maintenance of grassland habitats in the maximum possible area, also restoring grasslands which have been overgrown with shrubs for a long time (including maintenance of hydrological regime).

5. Necessary management and conservation measures

5.1. General measures

Development of grassland (including grasslands overgrown with shrubs for a lengthy period) restoration and management plan, involving all stakeholders and evaluating alternative territories in the context of socio-economic constraints, including the possibility of land purchase and transferring its ownership rights to the Nature Conservation Agency.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7220*	Petrifying springs	0.1	⟨1	Poor.	Cutting of shrubs, maintenance of open areas (in complex with grasslands). Shrub cutting, mowing, maintenance of open landscape.	0.1	0.7
7160	Fennoscandian mineral-rich springs and springfens	0.03	⟨1	Bad.	Non-intervention.		0.03
6410	*Molinia* meadows	38.5	22.1	Poor.	Restoration. Maintenance (ensuring also the function of shallow ditch system).	21.4	38.5
6230*	Species-rich *Nardus* grasslands	0.3	⟨1	Poor.	Restoration. Maintenance.		0.3
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	5.9	3.4	Poor.	Restoration. Maintenance.		5.9
5130	*Juniperus communis* formations on heaths or calcareous grasslands	0.7	⟨1	Poor.	Restoration. Maintenance.	0.6	0.7
6000	Grasslands to be restored	89.0	51.1	-	Restoration. Maintenance.	89.0	89.0

One-time grassland restoration measures are necessary in an area of at least 111 hectares (89 of them are overgrown for a lengthy period, but the rest are inventoried in the beginning of 21th century).

Dimantu mežs | *Nature Reserve (LV0532900)*

1. Brief description

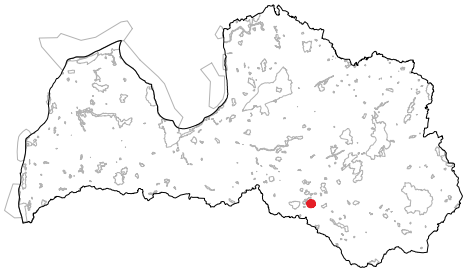
YEAR OF FOUNDATION: 2004.

LOCATION: Jēkabpils municipality, Kalna rural territory.

AREA: 183 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Dimantu mežs Nature Reserve is located in a relatively wooded area. There are both agricultural lands and intensively managed forests in its close proximity. In the south, the reserve borders with drained bog woodlands and small, overgrowing mires. The territory includes outstanding woodlands dominated by *Tilia cordata* and *Quercus robur,* with vegetation characteristic to broadleaved forests. There are also mixed *Populus tremula – Picea abies* woodlands with advance growth of Tilia cordata, as well old swamp woods.

There is a large number of protected and rare plant species in the woodlands, such as mosses *Hylocomium umbratum, Trichocolea tomentella, Bazzania trilobata, Scapania sp., Geocalyx graveolens.* Mushroom species that are very rare in Latvia has been found here – *Xylaria polymorpha* and *Xylobolus frustulatus* (on oak logs). The nature reserve is a breeding site for *Ciconia nigra.*

2. Threats to habitat and species conservation

Removal of dead wood, withering and withered trees can deteriorate the biodiversity of habitats.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of woodland fragmentation. Increasing the area and integrity of protected habitats by providing non-intervention in woodlands which have not yet reached the quality of protected habitat, or improving the structure of *Picea abies* plantations. The development towards protected habitat types *Fennoscandian herb-rich forests with* Picea abies, and *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes* is expected.

5. Necessary management and conservation measures

5.1. General measures

Adjustment of the nature reserve territory by including protected habitats up to their natural borders. Biodiverse mixed *Populus tremula* woodlands and broadleaf woodlands adjacent to the border of the nature reserve should be included in the territory. For example, compartments 15 and 11 of forest block 131, northern edge of block 138, and part of the block 121.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	17.8	9.7	Bad.	Non-intervention.		17.8
9080*	Fennoscandian deciduous swamp woods	24.2	13.3	Favourable.	Non-intervention.		24.2
9020*	Broad-leaved deciduous forests	45.8	25.1	Favourable.	Non-intervention.		45.8
9000	Potential Protected woodland habitat	2.6	1.4	-	Non-intervention (compartment 5, 16 of block 129).		2.6

Draugolis | *Nature Reserve (LV0529400)*

1. Brief description

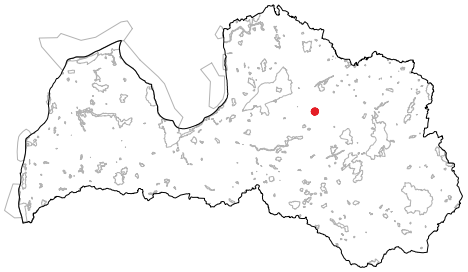
YEAR OF FOUNDATION: 2004.

LOCATION: Vecpiebalga municipality Vecpiebalga rural territory.

AREA: 11 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Draugolis Nature Reserve is located in area rich in hills and woodlands. It includes Lake Draugolis and the area in its immediate proximity – transition mires and quaking bogs on the bank of lake, and small areas of woodlands and grasslands. The purpose of the establishment of nature reserve is the conservation of transition mires and quaking bogs, and natural eutrophic lake. The territory is important for protection of moss species *Hamatocaulis vernicosus*. Also protected plant species *Dactylorhiza incarnata* can be found here.

2. Threats to habitat and species conservation

- Lake eutrophication has increased if compared to 1990s. Compared to this period, eutrophication processes have become more distinctive proved by (mass development) of filamentous algae, as well as by increase of overgrowth with emergent macrophytes (*Carex rostrata* and other species) along the swamps. In recent years, alien species *Zizania aquatica* has established in the lake (transferred from nearby Gailīši Lake). Likely, eutrophication is promoted by the feeding of fish.
- Beaver dams on the watercourse connecting lake and Tūlija river can promote water level rise and changes of environmental conditions in transition mire habitat around the lake.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

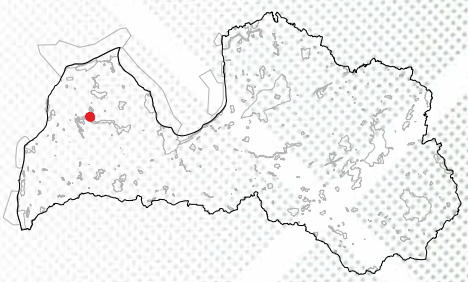
- Undisturbed course of natural processes in forest and mire habitats, as well as in habitats of species that need undisturbed, natural environment.
- Slowdown of eutrophication in Draugolis lake and its coast.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7140	Transition mires and quaking bogs	2.3	20.9	Favourable.	Non-intervention.		2.3
3150	Natural eutrophic lakes	3.1	28.2	Poor.	Non-intervention. Removal of beaver dams in order to ensure free water flow and to decrease paludification of the coastal part as well as the acceleration of lake eutrophication.	0.2 on necessity	3.1
3260	Natural river reaches and river riffles	0.2	1.8	Poor.	Removal of beaver dams.	0.2 on necessity	

Druviņu tīrelis | *Nature Reserve (LV0533000)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Ventspils municipality Usma rural territory.

AREA: 293 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Druviņu tīrelis Nature Reserve is located in an almost undisturbed area rich in forests, between Lake Usma and Abava river. The most important value of the territory is raised bog which is also called Novada or Meķi Mire. At the periphery of nature reserve, there are valuable bog woodlands. Five types of protected habitats of EU interest have been found, covering 83 % of the territory, and 12 of their associated protected bird species have been found as well. In the territory of nature reserve and in its direct vicinity, several micro-reserves are established for the conservation of *Tetrao urogallus* and *Pandion haliaetus*. In mire, *Pluvialis apricaria* is breeding, and there are two *Tetrao tetrix* leks. In adjoining woodlands, *Columba oenas* and *Aegolius funereus* can be found. Protected insect species include *Chalcophora mariana*. Protected plant species *Trichophorum cespitosum* and moss *Odontoschisma sphagni* are characteristic to mires of Western Latvia.

Mire habitats are in good ecological condition; the hydrological regime is relatively natural and little affected. Together with the nearby protected nature territories, the region is significant as a single and continuous complex of nature values.

2. Threats to habitat and species conservation

- The existence of wet habitats of the territory is negatively affected by hydrological regime changes (small, old ditches in the northern part of the nature reserve).
- A potential oil spill from the nearby located Polotsk-Ventspils oil pipeline is a potential threat.
- Logging in the direct vicinity of nature reserve is a threat to breeding and protection of rare bird species.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Non-intervention in middle-aged woodlands which have not yet reached the quality of protected habitat, in order to promote the creation of protected habitats in future and to decrease the fragmentation.
- The continuity of capercaillie *Tetrao urogallus* leks and habitats; their restoration in favourable conservation status. Management in accordance to general guidelines for the maintenance of *Tetrao urogallus* leks, or expert recommendations.

5. Necessary management and conservation measures

5.1. General measures

- Approval of Individual regulations on protection and use including limitations on forestry activities in order to reduce forest habitat fragmentation in future.
- Evaluation of the merging of Druviņu tīrelis and Abavas ieleja Nature Reserves.
- Inventory of potentially valuable adjoining territories.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	98.0	33.5	Favourable to poor.	Non-intervention. Management of *Tetrao urogallus* leks.	12.5	98.0
9080*	Fennoscandian deciduous swamp woods	1.4	<1	Poor.	Non-intervention.		1.4
7150	Depressions on peat substrates	25.9	8.8	Favourable.	Non-intervention.		25.9
7140	Transition mires and quaking bogs	0.6	<1	Favourable.	Non-intervention.		0.6
7110*	Active raised bogs	118.8	40.6	Favourable.	Non-intervention.		118.8

Dubnas paliene | *Nature Reserve (LV0533100)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Vārkava municipality, Vārkava rural territory.

AREA: 377 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Dubnas paliene Nature Reserve includes a reach of the middle part of the Dubna River, and extensive grasslands in the river valley. In total, four EU protected habitat types of grasslands are found in the area, as well as river rapids, natural river reaches and oxbow lakes. The territory is very important for the protection of habitat types 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* and 6450 *Northern boreal alluvial meadows* (nature reserve is one of the 20 territories with the largest proportion of these habitat types in the entire Nature 2000 network). The nature reserve is very important for ensuring the landscape-ecological connectivity of semi-natural grasslands. Its Median of Proximity index is the eighth highest among the Natura 2000 sites in river valleys. It is also an important landscape ecological corridor connecting aggregation sites on semi-natural grasslands in Dagda and Freimaņu hillock (South-eastern Geobotanical District) with aggregation sites in valleys in Daugava River and its tributaries (North-eastern Geobotanical District).

The most important protected plant species are *Gladiolus imbricatus, Gentianella amarella* and *Dactylorhiza incarnata*. Floodplain grasslands are a breeding habitat for birds *Crex crex* and *Porzana porzana*.

Dubna river is characterized by a belt of littoral plants and a zone of mixed macrophyte vegetation in the central part of the river. There is a mix of muddy banks in the littoral part and bed substrate poor in organic matter in the central part of the river that form the invertebrate species complexes which are characteristic for rivers which are rich in aquatic macrophytes: *Ephemeroptera, Odonata (Calopteryx), Trichoptera (Asellus aquaticus), Coleoptera, Mollusca* and others. Several oxbow lakes are present in the territory; they are connected to Dubna river during the spring floods.

2. Threats to habitat and species conservation

- The quality of habitats can be adversely affected by non-point pollution from agricultural areas in the catchment area, as well as by the pollution of incompletely treated household sewage from the Upmalas residential area.
- Inadequate or missing grassland management and overgrowing with shrubs cause fragmentation of grasslands. More than half of the grasslands are overgrowing. This is a critical risk factor for the survival of grassland bird species in the nature reserve. There is an indication of unfavourable changes, for example, by the fact that *Crex crex* have not been found in the territory in the last four years.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 about 20 % of the grasslands of the habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* and 50 % of the habitat type 6450 *Northern boreal alluvial meadows* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- The diversity of grassland habitats and also the number of species is very high, therefore the priorities in the nature reserve are both conservation of habitats and conservation of species habitats in a favourable conservation status.
- Grassland restoration in their maximum possible area. Cutting of trees and shrubs. Balancing the requirements of habitats and bird species.
- Maintenance of semi-natural grassland habitats and grassland bird species populations in a favourable conservation status.
- The Dubna floodplain is a possible habitat for the great snipe *Gallinago media* therefore grassland management should be aimed at this species.
- Increasing the landscape ecological connection of grasslands with other grasslands outside the protected territory in Dubna river valley – towards the upper reaches of the river, at least up to Arendole village. The restoration of semi-natural grasslands will promote their long-term preservation and

conservation. If the grasslands connecting nature reserve with upper reaches of the river will be lost, also the importance of the nature reserve as a landscape ecological corridor will be lost.

5. Necessary management and conservation measures

5.1. General measures

The development of Nature management plan which includes:

- Grassland mapping (grasslands were mapped 17 years ago and this map is outdated),
- Grassland restoration in their maximum area,
- Grassland restoration and conservation plan which takes into account both the requirements of habitats and bird species habitats (especially considering the potential breeding of *Gallinago media* in the territory),
- Research of hydrology and the necessity of its changes for the protection of habitats and bird species,
- Evaluation of the restoration necessity of shallow drainage ditches, together with grassland management possibilities (currently, most of the shallow ditches are overgrowing).

Restoration of the locality of *Gladiolus imbricatus* at Augšmuktu graveyard – one of the best localities of this species (species can be found also in new birch woodland that once was grassland).

It is advisable to develop a LIFE project proposal for the grassland restoration. Project should involve a maximum of possible landowners and operators.

To ensure the free flow of the river, large woody debris must be removed in sites where it promotes shore erosion and sediment accumulation.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	8.0	2.1	Poor.	Restoration. Maintenance.	Up to 8.0	8.0
6450	Northern boreal alluvial meadows	156.7	41.6	Poor.	Restoration. Maintenance.	80.0	156.7
6430	Hydrophilous tall herb fringe communities	5.7	1.5	Poor to favourable.	Restoration. Maintenance.	Up to 5.7	5.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	64.3	17.1	Poor.	Restoration. Maintenance.	50.0	64.3
3260	Natural river reaches and river riffles	10.0	2.6	Poor.	Control of activities of beavers; removal of large woody debris. Removal of aquatic macrophytes in the central part of the river bed.	0.5 2.0	
3150	Natural eutrophic lakes	5.0	1.3	Poor.	Establish the connection between oxbow lakes and Dubna River at Rāmavu and Iraidu farmsteads.	5.0	

Dulbju acs purvs | *Nature Reserve (LV0513700)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Brocēni municipality, Remte rural territory.

AREA: 6 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

In the central part of the Dulbju acs purvs Nature Reserve there is an unusual round-shaped transition mire surrounded by belt of bog woodlands. The mire is small and naturally overgrown. Old drainage ditches are located on its sides. Several rare and protected species of orchids have been found: *Hammarbya paludosa*, *Dactylorhiza russowii*, *Corallorhiza trifida*.

2. Threats to habitat and species conservation

Mire and bog woodlands are adversely affected by previous drainage. However, the mire is overgrowing mainly due to natural succession.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Maintenance of hydrological regime in the mire.
- Undisturbed course of natural processes in forest habitats that develop towards dry coniferous forests, and in the habitats of species which need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	3.2	53.3	Bad.	Non-intervention.		3.2
7140	Transition mires and quaking bogs	1.3	21.7	Bad.	Felling of pines is recommended for the slowing down of succession and for the conservation of open mire.		1.3

Dunika | *Nature Reserve (LV0508300)*

1. Brief description

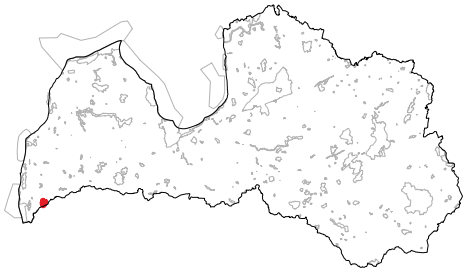
YEAR OF FOUNDATION: 1977.

LOCATION: Rucava municipality Dunika rural territory.

AREA: 1745 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Dunika Nature Reserve is located at the border with Lithuania. This area is the northwest border of a distribution range of *Carpinus betulus* therefore protection of *Carpinus betulus* woodlands is very important in this territory. The most part of the nature reserve is covered by active raised bog – Dunika Mire which is only slightly affected by drainage. In total, there are eight EU protected habitat types, as well as several rare and protected plant and animal species. Important vascular plant species are: *Polygonatum verticillium, Festuca altissima, Lycopodiella inundata, Trichophorum cespitosum*. Important moss species: *Frullania tamarisci*; lichen species: *Pertusaria pertusa*. Rare butterfly species that have been found here: *Apatura ilia* and *Limenitis populi*. *Pluvialis apricaria* is breeding in mire.

2. Threats to habitat and species conservation

Habitats can be affected negatively by changes in hydrology.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Increase of proportion of *Carpinus betulus* in suitable woodland compartments (creation of future habitats - variant 1 (typical) of protected habitat type *Sub-Atlantic and medio-European oak or oakhornbeam forests of the Carpinion betuli*).

5. Necessary management and conservation measures

5.1. General measures

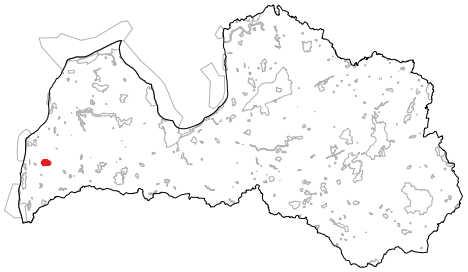
- Development and approval of Individual regulations on protection and use, to ensure stricter habitat conservation (non-intervention) than stated in the existing legal framework.
- Impact assessment and maintenance of the mire trail in case if significant influence on nature values is not found.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	268.6	5.4	Poor.	Non-intervention.		268.6
9160	Oak forests	49.7	2.8	Poor.	Non-intervention.		49.7
9000	Potential Protected woodland habitat (Oak forests)	18.0	1.0	-	Creation of future habitats by felling the planted spruces (*Picea abies*) and promoting the proportion of *Carpinus betulus*.	6.0	12.0
9080*	Fennoscandian deciduous swamp woods	49.9	2.9	Favourable.	Non-intervention.		49.9
7150	Depressions on peat substrates	180.0	10.3	Favourable.	Non-intervention.		180.0
7140	Transition mires and quaking bogs	19.5	1.1	Favourable.	Non-intervention.		19.5
7110*	Active raised bogs	1053.2	60.4	Favourable.	Non-intervention.		1053.2
3160	Natural dystrophic lakes and ponds	4.8	<1	Favourable.	Non-intervention.		4.8
91E0*	Alluvial forests	0.6	<1	Poor.	Non-intervention.		0.6

Durbes ezera pļavas | *Nature Reserve (LV0533200)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Durbe municipality Durbe municipal town with rural territory; Dunalka and Vecpils rural territories.

AREA: 596 ha.

NATURE MANAGEMENT PLAN: development of plan started in 2014.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Durbes ezera pļavas Nature Reserve includes part of Lake Durbe, its floodplain, and the floodplain of a lake inflowing into river Lāņupe which has been drained in the 20th century, establishing a dense network of ditches. The hydrographic network of the nature reserve is formed by Lāņupe with several small tributaries (the largest ones are Dupļupe or Ķeipas Brook and Rasūte river) and the north-eastern part of Lake Durbe.

Grasslands cover more than 50% of the nature reserve; they comprise 2.3 % of the total area of alluvial grasslands in Natura 2000 network (the nature reserve is the ninth most important territory for this habitat type in Latvia). The nature reserve in very important for the maintenance of grassland landscape-ecological connectivity. Its Median of Proximity index is the tenth highest among the Natura 2000 territories in Latvia. It is also an important part of the total area of semi-natural grasslands and bird habitats in western part of the Western Latvia Geobotanical Region.

Rare plant species in grasslands include *Dactylorhiza incarnata* and *Serratula tinctoria* which is a host plant for rare invertebrate species *Agonopterix bipunctosa*.

In total, 28 protected bird species are found in the nature reserve. 14 of them are breeding here, and other species use it during the migration. The territory is important as a breeding, foraging and stopover site for *Anser* spp., *Crex crex*, *Botaurus stellaris*, and others. It is a potential breeding site for *Philomachus pugnax* and *Gallinago media*, which were present in the territory earlier, but currently the condition of habitats is not suitable for their nesting.

A small micro-reserve for the protection of broadleaf forests has been established in the territory.

2. Threats to habitat and species conservation

- Although the watercourses are regulated, the floodplain is still regularly flooding; in some places wet conditions are long-lasting. Ābrama Fen, overgrown with shrubs, is located in an area of Lāņupe inflow into Lake Durbe. Durbe river is outflowing from the lake. Lake water level is significantly lowered after the drainage. The lowering of lake level is promoted also by the eutrophication and pollution from residential areas, agricultural lands and adjoining fish ponds. All these factors have contributed to lake overgrowth and to accumulation of dense sediment layer in lake bottom. The quality of lake habitat is assessed as bad.
- Beavers (*Castor fiber*) are living in the territory, there are extensive beaver inundated areas. Beavers have caused the clogging of Lāņupe river mouth and the paludification and degradation of grasslands at river coast.
- Drainage ditches of the drainage system are located in the nature reserve. In case of changes in their functionality, large agricultural areas outside the nature reserve will be influenced.
- Lake open littoral part overgrows with emergent vegetation; beaches and mineral substrate areas disappear.
- Lake Durbe and Lāņupe river are a part of the Venta River Basin District water object E008. According to Venta river basin management plan for 2016 – 2020, the ecological quality of water object is evaluated as bad. Large loads of biogenes cause eutrophication and promote the development of monodominant reedbeds with low biodiversity.
- The existence of habitats of the territory is adversely affected by the current hydrological regime. There was a project for Durbe river straightening, and it was not fully implemented; the water flow regulator planned in the area of river outflow is not constructed. It has promoted the worsening of Lake Durbe ecological quality as the lake inflow during the summer low-water period is lower than the lake outflow. In such conditions, the lake's water level drops down even by 1 m, thus contributing to the intensification of eutrophication. Currently there is a rock stack in the area of Durbe river outflow, established with the support of municipality, in order to stabilize Lake Durbe level during the summer low-water period.

- Grasslands in the territory of nature reserve are in bad condition. Mostly, they are overgrown, and become increasingly unsuitable for grassland birds.
- Grassland eutrophication has been promoted by drainage (peat mineralization, nitrogen release), intensified by grass shredding and leaving on site (wide-spread in 2007-2013). In result, quality of EU protected grassland habitats is low, and continues to deteriorate.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 60 % of 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* and 40 % of 6450 *Northern boreal alluvial meadows* area was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- The priority of the nature reserve is the preservation and restoration of grassland bird populations, and the maintenance of territory in a condition which is suitable for migratory birds.
- The restoration of grassland quality is a priority in the current and potential (such as old fallow-lands) areas of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*. Restoration priority of habitat type 6450 *Northern boreal alluvial meadows* is lower, due to its current bad quality, high restoration costs and necessary large time investments, and comparatively low expected restoration success.
- Increase of grassland landscape-ecological connectivity by restoration of overgrown grasslands and by evaluation of the possible extension of nature reserve in Lāņupe river valley, in upstream direction, including large grassland areas in Lāņupe river valley.
- Diversification of habitats of waterbirds (mowing of aquatic macrophytes, felling of shrubs, periodic grubbing up in habitats of waders).
- Felling of trees and shrubs in the near-shore areas of the eastern and north-eastern coast of the lake, in order to establish open littoral areas with washed-over ground with minimal admixture of organic matter.
- Construction of water flow regulator in the area of Durbe river outflow.
- Mowing in Lāņupe river mouth and adjoining areas, for the improvement of water exchange.

5. Necessary management and conservation measures

5.1. General measures

- Development of grassland restoration and management plan. Plan must include the assessment of maximum areas which can be restored taking into account the possible contradictions in maintenance of favourable conservation status of grassland habitats and grassland bird populations.
- Evaluation of extension of nature reserve. Possible territories which should be included are:
  - Grasslands near the northern – northeastern border of the nature reserve;
  - Grasslands in Lāņupe river valley in upstream direction, between Vecpils and Dižstroķi residential areas.
- Reduction of non-point pollution in lake: establishment of sedimentation ponds of surface-runoff wetlands on main drainage ditches.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	228.5	38.3	Bad.	Restoration. Maintenance.	136.0	 228.5
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	26.6	4.5	Bad.	Restoration. Maintenance.	11.0	 26.6
6210	Semi-natural dry calcareous grasslands	0.2	‹1	Bad.	Restoration. Maintenance.	0.2	 0.2
6000	Grasslands to be restored	66.0	11.0	-	Restoration. Maintenance.	66.0	 66.0
3150	Natural eutrophic lakes	228.6	38.4	Bad.	Mowing of aquatic macrophytes at inflow of Lāņupe river and in southern part of nature reserve – once per three years. Mowing to create water flow corridors in the lake. Creation and improvement of *Botaurus stellaris* habitat – after the construction of Durbe water flow regulator. Release of juvenile *Anguilla anguilla* – once per 5 years. Development and implementation of project for gyttja extraction outside the nature reserve (for decrease of eutrophication and for improvement of fish wintering conditions).	2.0 0.5	228.0
3260	Natural river reaches and river riffles	3.0	‹1	Bad.	Removal of beaver-created large woody debris (maintenance of discharge; prevention of shore paludification). Cleaning of water courses – for the discharge of Lake Durbe water and for slowdown of eutrophication processes. Mowing of aquatic macrophytes in Lāņupe river and in the area of its inflow. Establishment of water flow regulator on Durbe river – for the slowdown of eutrophication in Lake Durbe.	0.2 3.0 0.1	0.2 0.5

Dūņezera purvs | *Nature Reserve (LV0500500)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Vecumnieki municipality, Valle rural territory.

AREA: 4 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Dūņezera purvs Nature Reserve is a part of a larger forest area and includes part of the mire and the surrounding bog woodlands. A relatively powerful spring discharge is located in the raised bog and flows through the transitional mire. A ditch runs out of the north-eastern part of the mire. The mire naturally overgrows with pines. Territory borders with micro-reserve for *Tetrao tetrix* and its buffer zone. Protected species include, for example, *Dactylorhiza maculata*.

2. Threats to habitat and species conservation

Nature values may be negatively affected by changes in hydrology.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of abundance of trees in the transitional mire.

5. Necessary management and conservation measures

5.1. General measures

- Extension of the nature reserve. Currently, part of the mire is located outside the Natura 2000 territory - it is a part of the micro-reserve. Compartments 11 and 12 of the forest block 181 should be included in the territory.
- The influence of the old drainage system on the protected habitats must be evaluated.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	1.5	37.5	Favourable.	Non-intervention.		1.5
7110 *	Active raised bogs	2.7	67.5	Poor.	Pine logging and removal (every 10–20 years).	2.7	
7160	Fennoscandian mineral-rich springs and springfens	0.3	7.5	Favourable.	Non-intervention.		0.3

Dūņezers | *Nature Reserve (LV0508500)*

1. Brief description

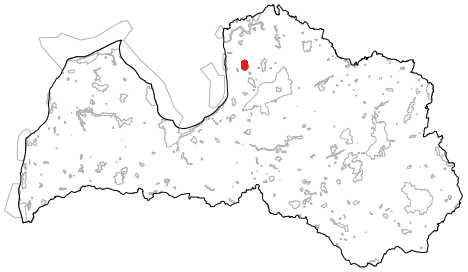
YEAR OF FOUNDATION: 1977

LOCATION: Limbaži municipality Limbaži and Katvari rural territories.

AREA: 169.9 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Dūņezers Nature Reserve borders directly with Limbaži town, and is a part of its urban environment. The nature reserve includes a lake and a small part of its coast, with floodplain with willows, *Alnus incana*, and overgrowing grasslands with *Filipendula ulmaria* and *Carex caespitosa*. Historically, the territory was established for the protection of *Larus ridibundus* and other waterbirds. In the lake, large territories are occupied by *Phragmites australis* and *Typha* spp., which are suitable for foraging and breeding of *Botaurus stellaris, Cygnus cygnus, Pandion haliaetus, Circus aeruginosus, Porzana porzana*. Rare dragonfly *Leucorrhinia caudalis* can be found in the area.

Communal and industrial wastewaters of the town have been discharged into the lake for a long time. It has contributed to rapid overgrowth of the lake, and filling with organic sediments. According to Gauja river basin district management plan, the ecological quality of the lake is medium, the physical and chemical water parameters are evaluated as poor and there is point-source pollution at the lake. The composition of waterbird species has significantly changed with the overgrowth of lake.

2. Threats to habitat and species conservation

For many years, Dūņezers Lake served as a sewage receiver for Limbaži town and its industrial companies. Now, new wastewater treatment plants have been constructed, and wastewater discharged into lake is treated according to regulatory enactments. However, organic compounds which have entered the lake during the previous years, as well as decayed plant mass created in the lake, has promoted the expansion of emergent vegetation and swamps, as well as regular oxygen depletion and fish suffocation in winter. At present, the lake is hyper-eutrophic, and it is considered to be a degraded habitat type 3150 *Natural eutrophic lakes with* Magnopotamion *or* Hydrocharition - *type vegetation*. The return of the habitat in a favorable conservation status is possible only by taking a series of activities in the lake and its shore.

3. Existing management of the protected habitats and its assessment

- So far no targeted measures have been taken to manage protected habitats. Individual actions have been taken to create access to the lake to establish areas free from aquatic macrophytes for boat storage. This activity can be evaluated as positive, as it has promoted the creation of warming up shallow water zones which are beneficial for aquatic invertebrates, juvenile fish and water birds.

4. Priorities of management and conservation

- Improvement of lake ecological quality; prevention of habitat degradation.
- Slowdown of lake overgrowth with emergent vegetation and overall degradation of habitat.
- Maintenance of free water discharge from Lake Dūņezers to Svētupe river; for the slowdown of lake shore overgrowth.
- Creation of openings in the woody cover of the near-shore area, in order to improve aeration.
- Establishment of fish wintering holes, in order to prevent fish suffocation.

5. Necessary management and conservation measures

5.1. General measures

- Development of nature management plan in order to balance the interests of nature conservation and recreation. Facilitate habitat quality improvement measures, as well as solutions for the town's landscape. The following measures must be included:
  - Creation of sedimentation ponds – downstream of Limbaži town wastewater discharge site.
  - Maintenance and promotion of corridors free from emergent vegetation in monodominant massifs of emergent vegetation; creation of open littoral zones in order to increase the biodiversity.

- Promotion of grassland management, reduction of trees and shrubs in the near-shore area, and creation of an open landscape mosaic around the lake.
- Creation and maintenance of corridors free from emergent vegetation and shrubs in eastern side of the lake (Viekaži and Dūņezers villages).
- Maintenance of free water discharge from Dūņezers to Svētupe river, thereby slowing down the paludification of coastal areas and the expansion of monodominant reedbeds.
- Creation of wintering holes for fish, in order to prevent fish suffocation.
- Limitation of beaver activities at the lake, in order to slowdown the paludification and improve lake accessibility.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	135.6	79.8	Bad.	Establishment of fish wintering holes. Evaluation of wintering hole establishment and gyttja extraction compatibility. One-time activity.	2.0	
					Mowing of emergent vegetation, creation of open corridors and access to the lake in its eastern part. One-time activity; continuation on necessity.	2.0	2.0
					Removal of fallen logs and shrubs, western and eastern part of the lake. One-time activity; continuation on necessity.	1.0	1.0
					Mowing of emergent vegetation; deepening of channels between emergent vegetation colonies. One-time activity; continuation on necessity.	3.0	3.0
3260	Natural river reaches and river riffles	0.5	<1	Bad.	Cleaning of swamps of emergent vegetation in Svētupe river outflow area. One-time measure.	1.0	

Dūres mežs | *Nature Reserve (LV0533300)*

1. Brief description

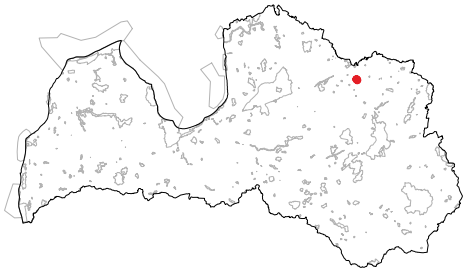
YEAR OF FOUNDATION: 2004.

LOCATION: Gulbene municipality Lejasciems rural territory.

AREA: 44 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Dūres mežs Nature Reserve is located on the edge of a forest massif, near Pilupe river. It includes very important western Taïga woodlands with admixture of old broadleaved trees, and swamp woods. Also woodlands adjacent to nature reserve are of high biological value.

There are rare and protected plant species in the territory such as *Carex disperma, Cinna latifolia, Glyceria lithuanica*, and others.

2. Threats to habitat and species conservation

Forestry activities resulting in reduction of volume of dead wood and proportion of mature, old or large trees in woodlands.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage mire and forest habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest fragmentation and increase of areas and integrity of protected habitats by ensuring non-intervention in woodlands which have not yet reached the quality of protected habitats. Their development toward habitat types 9050 *Fennoscandian herb-rich forests with* Picea abies, 9010* *Western Taïga*, 9020* *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes* is expected.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	1.3	2.9	Favourable	Non-intervention.		1.3
9010*	Western Taïga	16.0	36.4	Favourable.	Non-intervention.		16.0
9000	Potential Protected woodland habitat	24.0	54.5	-	Non-intervention.		24.0

Dvietes dumbrāji | *Nature Reserve (LV0522900)*

1. Brief description

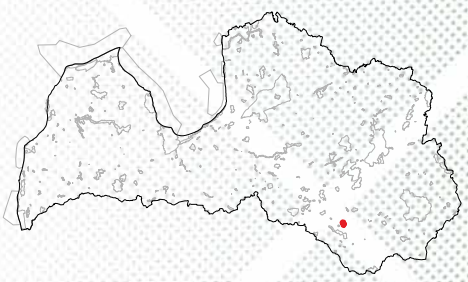
YEAR OF FOUNDATION: 1999.

LOCATION: Ilūkste municipality Dviete rural territory.

AREA: 121 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Dvietes dumbrāji Nature Reserve consists of two areas located at Daugava river, on the edge of a large forest massif, close to each other. The most important values of the territory are the protected forest habitats – deciduous swamp woods and western Taïga. A large part of the nature reserve is occupied by swamp woods dominated by *Betula* spp. and *Alnus glutinosa*. There are rare and protected vascular plant and moss species, such as *Poa remota, Botrychium multifidum* in the territory. Important bird species are *Ciconia nigra, Bucephala clangula*.

2. Threats to habitat and species conservation

- Biodiversity of the territory can be deteriorated by removal of dead wood, withered and withering trees.
- Wet habitats may be affected negatively by hydrological changes in nature reserve and in adjoining areas.
- A new road was built between the two parts of the nature reserve. It decreases the possibilities of migration (for example, for amphibians).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Evaluation of influence of drainage on the territory (there is one functioning drainage ditch between the nature reserve and agricultural lands).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	87.4	72.2	Favourable.	Non-intervention.		87.4
9010*	Western Taïga	15.3	12.6	Poor.	Non-intervention.		15.3

Dzelves–Kroņa purvs | *Nature Reserve (LV0523300)*

1. Brief description

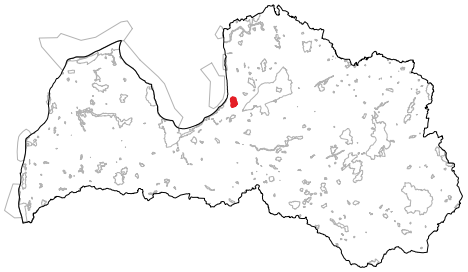
YEAR OF FOUNDATION: 1999.

LOCATION: Sēja municipality.

AREA: 2133 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Dzelves–Kroņa purvs Nature Reserve is located in the Coastal Lowland, in south-western part of Vidzeme Region. It borders with Ādaži military training area and Ādaži Protected Landscape Area. The territory is important for the protection of various wet habitats and their associated species. Eight EU protected habitat types have been found in the territory, with the largest area being covered by active raised bogs and bog woodlands. There are rare bird species breeding in the area. In the mire there is a complex of small lakes where a large number of geese and cranes reside after the breeding and during migration. A colony of *Larus argentatus* can be observed in the lake in the southern part of the territory. The most important bird species in the area are *Bonasa bonasia, Ciconia nigra, Pernis apivorus, Tetrao tetrix, Tetrao urogallus*. Dragonfly *Anax imperator* is present in the territory. In the northern part of the nature reserve near the peat extraction fields that are outside the nature reserve, a significant influence of drainage can be observed. Also parts of forests in the western part of the area have been drained in the past.

2. Threats to habitat and species conservation

- Nature values of the territory can be affected negatively by changes in hydrology caused by maintenance of the ditches in areas bordering to peat extraction fields and peat extraction in areas (outside the nature reserve) which were prepared for peat extraction in the Soviet times.
- The territory is actively used for recreation by quadricycle riders and off-road vehicles.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in the forest and mire habitats which are slightly influenced by humans, as well as in habitats of species that need undisturbed, natural environment.
- Rewetting and maintenance of hydrological regime that is optimal for wet habitats.

5. Necessary management and conservation measures

5.1. General measures

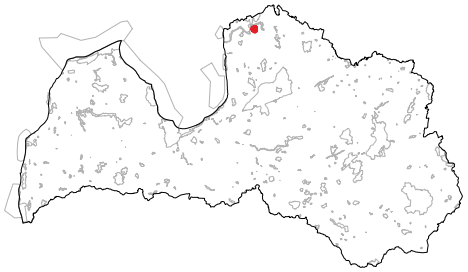
- Habitat mapping throughout the territory of the nature reserve is necessary as the information on about ~ 460 ha (most of them covered by forests) is insufficient.
- Hydrology of the whole mire complex must be researched taking into account also the conditions and activities outside the nature reserve; possibilities and necessity of rewetting must be evaluated. Hydrological assessment is also necessary in the drained forests of the western part of the territory. Construction project must be prepared for the rewetting and water level stabilization in mire and forest areas which are influenced by drainage.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	712.1	33.4	Poor.	Non-intervention except rewetting (ditch damming or filling up).	According to research results.	712.1
9080*	Fennoscandian deciduous swamp woods	60.5	2.8	Favourable.	Non-intervention.		60.5
9010*	Western Taïga	18.3	<1	Favourable, poor	Non-intervention.		18.3
7150	Depressions on peat substrates	48.4	2.3	Poor.	Non-intervention.		48.4
7120	Degraded raised bogs	14.6	<1	Poor.	Rewetting (ditch damming or filling up); logging. Reduction of influence of peat extraction: waterproofing membranes in ditches (preliminary research and the evaluation of expected efficiency is necessary).	14.6	
7110*	Active raised bogs	345.6	16.2	Poor.	Non-intervention.		345.6
3260	Natural river reaches and river riffles	0.3	<1	Poor.	Non-intervention.		0.3
3160	Natural dystrophic lakes and ponds	4.0	<1	Favourable.	Non-intervention.		4.0

Dzērves purvs | *Nature Reserve (LV0509500)*

1. Brief description



YEAR OF FOUNDATION: 1987.

LOCATION: Aloja municipality Staicele rural territory and Aloja rural territory.

AREA: 488 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Dzērves purvs Nature Reserve is located in a woody area between Salaca and Iģe rivers. It is established for the protection of eastern-type raised bog with Trichophorum cespitosum, as well as bog woodland which surrounds the mire. There are eight EU protected habitat types in the territory. The most important protected bird species are *Aquila pomarina, Bonasa bonasia, Tetrao tetrix, Pluvialis apricaria, Tringa glareola, Strix uralensis, Alcedo atthis* and others. The mire borders with Iģe river valley where sandstone outcrops can be found. This is a habitat for *Lutra lutra* and *Unio crassus*. Iģe river is a spawning site for *Salmo trutta* and a potential site for *Margaritifera margaritifera* reintroduction.

2. Threats to habitat and species conservation

- Sediment accumulation caused by large woody debris in Iģe river promotes deterioration of spawning grounds of *Salmo trutta* and *Lampetra* spp., and burial of habitats suitable for *Unio crassus*.
- Degradation of raised bog is stimulated by drainage in the northern part of mire.
- Agricultural activities including cleaning of drainage ditches at the south-eastern side of the nature reserve can cause changes in hydrological regime.

3. Existing management of the protected habitats and its assessment

In 2008, removal of fallen logs in river riffle reaches was organised by Mazsalaca municipality. As a result, the amount of large woody debris in river decreased, water discharge as well as migration possibilities of aquatic organisms were improved.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Improvement and conservation of the existing hydrological regime in degraded raised bogs in the north-west and north-east part of the nature reserve.
- Ensuring migration and spawning possibilities for salmonids and lampreys, as well as suitable habitats for *Unio crassus*.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps (developed in 2008), especially along Iģe river where additional areas of protected woodland habitats are expected.
- Hydrological research of entire mire complex; evaluation of possibilities of rewetting. Development of construction project for rewetting and for stabilisation of water table in drained parts of the mire and in bog woodlands.
- Development of monitoring program and methods for the evaluation of restoration success.
- Extension of nature reserve by including part of Iģe river which is located between the borders of Dzērves purvs Nature Reserve and Salacas ieleja Nature Park.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	64.6	13.2	Poor	Non-intervention.		64.6
9010*	Western Taïga	1.1	<1	Favourable.	Non-intervention.		1.1
8220	Siliceous rocky slopes	0.03	<1	Favourable.	Non-intervention.		0.03
7150	Depressions on peat substrates	33.4	6.8	Favourable.	Non-intervention.		33.4
7140	Transition mires and quaking bogs	26.8	5.5	Favourable.	Non-intervention.		26.8
7120	Degraded raised bogs	75.4	15.4	Poor.	Rewetting (ditch blocking or filling up); logging.	75.4	
7110*	Active raised bogs	222.1	45.5	Favourable to poor.	Non-intervention.		222.1
3260	Natural river reaches and river riffles	0.2	<1	Poor.	Removal or decrease of large woody debris in sites where they promote erosion and also in riffle areas with pebble-bed or boulder-bed reaches.	0.2	
3160	Natural dystrophic lakes and ponds	1.5	<1	Favourable.	Non-intervention.		1.5

Dzilnas dumbrāji | *Nature Reserve (LV0533400)*

1. Brief description

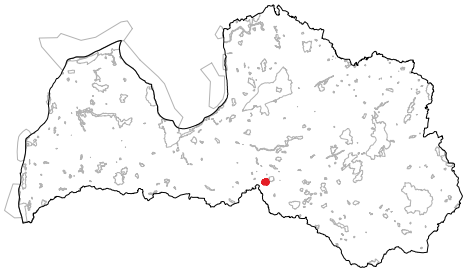
YEAR OF FOUNDATION: 2004.

LOCATION: Nereta municipality Mazzalve rural territory.

AREA: 215 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Dzilnas dumbrāji Nature Reserve includes wet forests next to the Dzilna river, in a wide massif of forests between Jaunjelgava town and Nereta village.

The most important nature values of the territory are outstanding swamp woods, as well as bog woodlands and old-growth forests, and their associated rare and protected plant and invertebrate species.

Rare plant species in swamp woods include *Carex disperma* and *Poa remota*. Rare moss and lichen species include mosses *Trichocolea tomentella, Geocalyx graveolens* and *Jungermannia leiantha, lichens Arthonia vinosa, Menegazzia terebrata,* and others.

Two micro-reserves for the protection of habitat types 9080* Fennoscandian deciduous swamp woods are established in south-eastern part of the nature reserve. Habitats are in good conservation status.

2. Threats to habitat and species conservation

- Quality of woodland structural elements may be deteriorated by selective felling.
- Large woody debris in the river promotes slowdown of the river flow, covering sand and gravel riverbed with sediments, and the disappearance of riffle areas.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types *Fennoscandian herb-rich forests with* Picea abies and *Fennoscandian deciduous swamp woods* is expected.
- Preventing creation of beaver (*Castor fiber*) inundated areas and dams in reaches where riverbed is covered by pebbles and boulders.

5. Necessary management and conservation measures

5.1. General measures

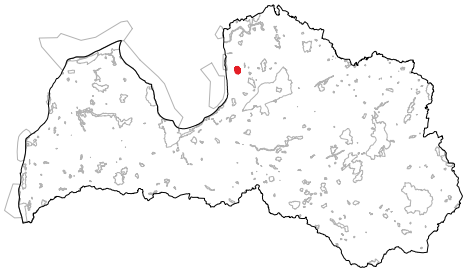
Development and approval of Individual regulations on protection and use in order to ensure non-intervention in woodlands.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	10.5	4.9	Favourable.	Non-intervention.		4.9
9080*	Fennoscandian deciduous swamp woods	149.8	69.7	Favourable.	Non-intervention.		149.8
9010*	Western Taïga	6.2	2.9	Poor.	Non-intervention.		6.2
9000	Potential Protected woodland habitat	45.0	20.9	-	Non-intervention.		45.0
3260	Natural river reaches and river riffles	2.0	<1	Poor.	Provision of water discharge. Removal of large woody debris – or their reduction in sites where riverbed is covered with pebbles or boulders. Once per 10 years.	0.5	2.0

Dziļezers un Riebezers | *Nature Reserve (LV0508700)*

1. Brief description



YEAR OF FOUNDATION: 1977.

LOCATION: Limbaži municipality, Limbaži rural territory.

AREA: 351.7 ha.

NATURE MANAGEMENT PLAN: 2007 (2008–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 381 of 17 May 2011, Regulation on Individual Protection and Use of Dziļezers and Riebezers Nature Reserve.

Dziļezers un Riebezers Nature Reserve is established for the protection of lake system in the subglacial tunnel valley, and their surrounding landscape with forests on slopes. Lakes Dziļezers and Riebezers are separated by 3-5 m high belt of land. Vitrupe river flows out of the Riebezers, and the small Reiņupe river flows into the lake. Dziļezers Lake is one of the deepest lakes in Latvia. Areas surrounding Riebezers from western, southern and south-eastern sides are used for agriculture. A belt of mixed-coniferous forests borders with Lake Dziļezers in the eastern side.

Five EU protected habitat types of grasslands and forests have been found in the nature reserve, as well as potentially biologically valuable grasslands. Also, the lakes correspond to the criteria of protected aquatic habitats.

There are 42 protected and rare species in the nature reserve - six species of plants, two mushroom, eight invertebrate, three fish, 15 bird and eight mammal species (including six species of bats). Examples of protected plant species are *Allium ursinum, Arctium nemorosum*, several orchid species, such as *Orchis mascula*, mushrooms *Hapalopilus croceus* and *Boletus calopus*, European crayfish *Astacus astacus*, and others.

2. Threats to habitat and species conservation

- Pollution from the rainbow trout farm has remained which was previously located in the northern part of Lake Dziļezers.
- Eutrophication of lakes occurs from discharges of agricultural drainage system which is located on the west coast of the lake. Areas of the western coast of the lake are 100% drained.
- Lakes being enriched with nutrients - eutrophication, and the associated (occasional) algal blooms.
- Improper management of grasslands or discontinuation of their management threatens the cenopopulation of *Orchis mascula*, decreases the area of suitable breeding places for *Crex crex* and reduces the quality of *Aquila pomarina* foraging sites.
- Renovation of buildings decrease the number of summer residences for bats.

3. Existing management of the protected habitats and its assessment

- The open littoral zone on north-eastern coast of Dziļezers (recreation site near "Priedītes") is being maintained.
- Fallen logs are removed from Dziļezers nature trail and placed near the trail. The impact of this activity on insect fauna is not evaluated.
- A small part of the grasslands is managed, others are highly overgrown.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Removal of swamps in the outflow of Vitrupe river in order to ensure water circulation and to maintain and improve the current water quality.
- Restoration of grassland habitats in their historical area; re-naturalisation of currently cultivated grasslands and fallow-lands.

5. Necessary management and conservation measures

5.1. General measures

- Improvement of water quality by installing underground storage tanks and sinks in public spaces and in newly built buildings; installation of soil filters at the existing buildings.
- Development of regulations for building renovation to maintain summer residences for bats.

- Update of habitat maps (especially for forests).
- Development of grassland restoration and management plan including the evaluation of restoration of grasslands in areas overgrown with forest, and establishment of semi-natural grasslands (current agricultural land in the western part of nature reserve). The territory is located in an area which is very poor in semi-natural grasslands therefore it is important to promote the conservation and maintenance of semi-natural grasslands in all the area of nature reserve.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	47.1	13.4	Poor.	Non-intervention.		47.1
6510	Lowland hay meadows	0.8	<1	Bad.	Restoration. Maintenance.	0.8	0.8
6450	Northern boreal alluvial meadows	1.9	<1	Bad.	Restoration. Maintenance.	1.9	1.9
6410	*Molinia* meadows	Up to 0.8 (in complex with 6510, 6270*)	<1	Bad.	Restoration. Maintenance.	0.8	0.8
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.8	<1	Bad.	Restoration. Maintenance.	0.8	0.8
6000	Grasslands to be restored	Up to 90 ha	25.6	-	Restoration. Maintenance.	Up to 90 ha	Up to 90 ha
3150	Natural eutrophic lakes	133.2	37.9	Bad.	Installation of underground storage tanks, sinks and soil filters for the reduction of inflow of biogenes into Lake Reibezers. Felling of shrubs on the north-eastern coast of Lake Dziļezers.	~10 locations 0.5 ha	

One-time grassland restoration measures are necessary in an area of at least 15 hectares, as well as grassland creation in the current agricultural lands (their area exceeds 90 ha) in the western and southern part of nature reserve.

Eglone | *Nature Reserve (LV0530100)*

1. Brief description

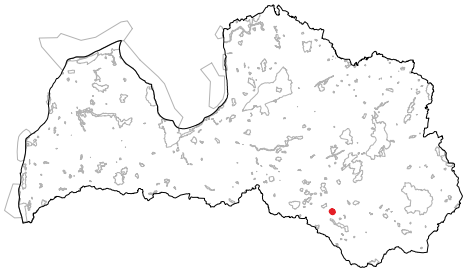
YEAR OF FOUNDATION: 2004.

LOCATION: Jēkabpils municipality Dunava rural territory.

AREA: 159 ha.

NATURE MANAGEMENT PLAN: 2013 (2013–2025).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Eglona Nature Reserve is located in a large forest area near the river Eglona. In the past, this area was covered by water from river Daugava. The territory is important for the conservation of mixed broadleaf forest with rare and protected lichen species. There are mixed deciduous forests and spruce (*Picea abies*) forests, often with species-rich ground vegetation. Lowland hay meadows are located in river valley, as well as wooded meadows. There are several noble trees (large trees whose size meet the criteria set in Regulation of the Cabinet of Ministers) in overgrowing meadows and forest edges. The territory is one of the national-level perspective sites for the restoration of wooded grasslands, as there is a large number of old, wide-crowned oaks (*Quercus robur*).

There are nine protected habitat types of EU importance in the territory, as well as 11 protected species of invertebrates, 13 protected bird, 10 lichen, 13 vascular plant species. The most significant protected species are vascular plants *Gladiolus imbricatus* and *Dentaria bulbifera, polypore Xylobolus frustulatus,* invertebrates *Lycaena dispar* and *Osmoderma barnabita*, birds *Dendrocopos leucotos, Dendrocopos medius, Aquila pomarina*, lichens *Lobaria pulmonaria, Menegazzia terebrata, Cetrelia olivetorum, Thelotrema lepadinum,* and others.

The nature reserve is influenced by drainage. The hydrological regime is changed and the river channel of Eglona river is modified, causing the decrease in biodiversity and landscape scenery. The aim of the hydrological modification was to reduce floods and to promote intensification of agriculture in surrounding territories. Before the establishment of nature reserve, deciduous forests were felled in some sites, and clear-cut areas were later planted with spruces.

2. Threats to habitat and species conservation

- Fragmentation, management cessation or grubbing of semi-natural grasslands.
- Felling, particularly felling of old, large trees; removal of dead wood.
- Formation of clogs caused by beaver dams and large woody debris, which obstruct water discharge and promote the acceleration of eutrophication in river.
- Overgrowth of oxbow lakes; increase of shading on their shores. Clogging of oxbow lakes with oxygen-consuming twig litter decreases their biodiversity and reduces the possibility of occurrence of rare invertebrate species, such as *Aeshna viridis*.
- Lack of suitable habitats for *Osmoderma eremita,* development of shrubs and young trees around suitable trees; overgrowth of wooded meadows.

3. Existing management of the protected habitats and its assessment

- In the framework of LIFE programme project "Management of Fennoscandian wooded meadows (6530*) and two priority beetle species: planning, public participation, innovation" (LIFE09/NAT/LV/000240), shrubs were felled in wooded meadows in an area of 0.9 ha.
- According to Rural Support Service, in 2014 only 14 % of the habitat type 6510 *Lowland hay meadows* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Structure improvement in spruce plantations in order to increase biodiversity and value of woodlands which are degraded due to forestry activities.
- Reduction of forest habitat fragmentation; increase of area and integrity of protected habitats by providing non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat type *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* is expected.

- Restoration of grassland habitats (including wooded meadows) in their historical territories and in maximum possible area; maintenance in favorable protection status. Taking into account the latest information on the grassland restoration priority areas, their restoration is of similar priority as the conservation of other nature values in the nature reserve.
- Management of *Osmoderma barnabita* habitats – maintenance of suitable, well-insolated oaks (*Quercus robur*) by regular removal of shrubs and new trees below their crown.

5. Necessary management and conservation measures

5.1. General measures

- Research and evaluation of rewetting possibilities. It is necessary to clarify the possible influence of rewetting on the nature values of the territory, and find technical solutions which do not adversely influence the habitats and species.
- Inventory of all grasslands which are located in the nature reserve but are not mapped and evaluated in nature management plan of year 2013. Evaluation of the possibilities to develop and maintain them as EU protected grassland habitats. Restoration of grasslands.
- Extension of nature reserve to north-east and east (95.0 ha) by incorporation of highly biodiverse adjacent areas (six EU protected habitat types and eight protected bird species have been found here).
- Evaluation of the inclusion of grasslands of Eglone river valley in the nature reserve – territories located south and north-west, as well as grasslands adjoining the potential extension area (indicated in nature management plan).
- Improvement of insolation conditions for oxbow lakes in order to increase the diversity of aquatic organisms, at the same time also preventing or decreasing the accumulation of clog-forming twig and leaf litter in oxbow lakes.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	10.1	6.3	Poor.	Non-intervention.		10.1
9020*	Broad-leaved deciduous forests	82.6	51.9	Favourable.	Non-intervention.		83.0
9010*	Western Taïga	0.8	<1	Poor.	Non-intervention.		0.8
9000	Potential Protected woodland habitat	10.8		-	Non-intervention. Selective felling to increase the proportion of broadleaved trees.	12.5	10.8
6530*	Fennoscandian wooded meadows	1.74	1.1	Poor.	Restoration. Maintenance.	Up to 1.74	1.74
6510	Lowland hay meadows	6.39	4.0	Poor.	Restoration. Maintenance.	Up to 6.39	6.39
6450	Northern boreal alluvial meadows	0.49	<1	Bad.	Restoration. Maintenance.	Up to 0.49	0.49

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6410	*Molinia* meadows	1.66	1.0	Poor.	Restoration. Maintenance.	Up to 1.66	1.66
3260	Natural river reaches and river riffles	4.0	2.5	Poor.	Removal or reduction of large woody debris in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality.		On necessity.
3150	Natural eutrophic lakes	1.1	<1	Poor.	Removal or reduction of large woody debris in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality.	1.1	

One-time grassland restoration measures are necessary in an area of at least 13 hectares. First, the inventory is necessary as these areas are not indicated as restoration areas in nature management plan of 2013.
Annual grassland management measures are necessary in the entire area of EU protected grassland habitats (10.3 ha). For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Eiduku purvs | *Nature Reserve (LV0526500)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Krustpils municipality Atašiene rural territory.

AREA: 588 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Eiduku purvs Nature Reserve is part of a large bog complex consisting of Teiči Mire, Lielais Pelečāres Mire and Eiduki Mire. Eiduku Mire is separated from Teiči Mire by a road which has caused hydrological changes in the adjoining territories. In the eastern part of Eiduku Mire, peat was previously extracted in small volumes. Western part of the mire is drained. The straightened Mārsna river flows out of the Jaunišu (Virsuļu) lake. The territory is important for the protection of habitats of mires, bog woodlands and dystrophic lakes. Five EU protected habitat types have been found.

The most important bird species are *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Pluvialis apricaria, Tringa glareola, Strix uralensis, Caprimulgus europaeus.* Mammals Lutra lutra and *Castor fiber* live in rivers.

2. Threats to habitat and species conservation

Mire and bog woodland are adversely affected by drainage. In the periphery of the mire there are relatively old ditches that have contributed to the degradation and overgrowth of mire. Peat used to be extracted in eastern part of the mire.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Rewetting and drainage impact mitigation in a raised bog and adjoining bog woodlands.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Mapping of protected habitats in accordance to the newest methods and approaches. Clarification of types and areas of mire and grassland habitats is particularly important.
- Hydrological regime research for the entire territory. Evaluation of drainage impact mitigation possibilities. Development of the construction project for rewetting.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	58.4	9.9	Poor.	Rewetting or improvement of hydrological regime – in complex with raised bog. Mitigation of the influence of road ditch in the western part of territory, along motorway P26 – establishment of regulators or boulder piles (according to expert recommendations).	58.4	
7150	Depressions on peat substrates	7.16	1.2	Favourable.	Non-intervention.		7.16
7110*	Active raised bogs	478.59	81.4	Poor.	Rewetting (ditch blocking or filling). Felling of trees in the overgrown parts of mire in the vicinity of ditches.	150 50	278.59
3260	Natural river reaches and river riffles	2.0	<1	Poor.	Removal of fallen logs (on necessity) if they promote paludification of Mārsna river banks and subsequent increase of the network of paths created by anglers.	0.1	2.0
3160	Natural dystrophic lakes and ponds	6.6	1.1	Favourable.	Non-intervention.		6.6

Ellītes purvs | *Nature Reserve (LV0500300)*

1. Brief description

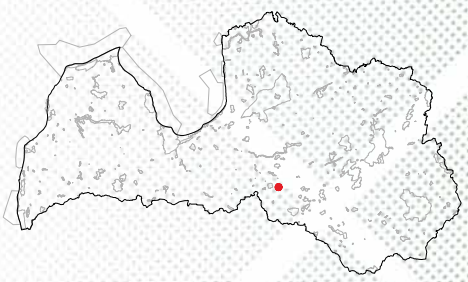
YEAR OF FOUNDATION: 1977.

LOCATION: Jaunjelgava municipality, Daudzese rural territory.

AREA: 4 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ellīte Spring, called also Daudzeses Poķu Spring, is located in the massif of wet forests south of Daudzese village. It is an ancient religious site. This is one of the few sites of sulphur springs in Latvia.

Springs are located in the southern part of the territory; however, hydrogen sulphide-rich water discharge sites are located also outside the nature reserve. In total, two EU protected habitat types have been found in the territory. Rare and protected plant species grow in the wet forests of the nature reserve, such as *Poa remota* and *Dactylorhiza fuchsii*.

2. Threats to habitat and species conservation

Changes in the hydrological regime both in the nature reserve and adjoining territory, including restoration of drainage systems; deepening of ditches in the territory adjacent to the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats. Infrastructure for the visitors is established and maintained such as trail, boardwalks, information board; dolomite pieces are placed at the spring. The number of visitors is low.

4. Priorities of management and conservation

- Undisturbed natural processes in natural mire and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of the current hydrological regime.
- Maintenance of the existing tourism infrastructure around the spring; establishment of new infrastructure objects is not desirable.

5. Necessary management and conservation measures

5.1. General measures

The extension of the nature reserve must be considered and spring discharge sites must be surveyed in the surrounding forests because hydrogen sulphide-rich spring discharges are located in larger area than the territory of nature reserve.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	0.7	17.5	Favourable.	Non-intervention.		0.7
7160	Fennoscandian mineral-rich springs and springfens	0.6	15.0	Favourable.	Non-intervention.		0.6

Gaiļu kalns | *Nature Reserve (LV0512700)*

1. Brief description

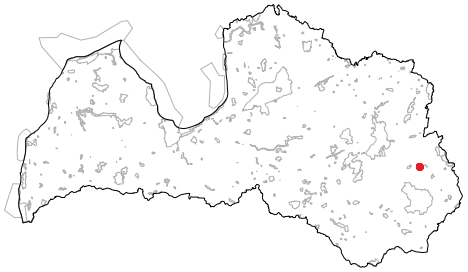
YEAR OF FOUNDATION: 1987.

LOCATION: Rēzekne municipality Lendži rural territory.

AREA: 2 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Gaiļu kalns Nature Reserve is located on a hilly terrain near Lake Cirma. The territory includes habitat types: 5130 Juniperus communis *formations on heaths or calcareous grasslands*, and 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates*. In Latvia, Juniper formations are found only in 14 Natura 2000 territories; therefore nature reserve is important for the conservation of this habitat type on a national scale.

2. Threats to habitat and species conservation

- Lack of management of juniper formations; withering of junipers.
- Overgrowth of grasslands and juniper formations in the adjoining territories.
- Frequent topsoil disturbances due to rooting by wild pigs (*Sus scrofa*).
- Insufficient area for sustainable conservation of habitat in case if grasslands in the adjoining areas are destroyed or transformed.

3. Existing management of the protected habitats and its assessment

- Since 1990s, the density of juniper formations has increased. Some parts of the stand are dense, and trees and shrubs grow next to junipers, creating shading and competition for nutrients and light.
- Grasslands in juniper formations are not mown. Open grasslands (about 50% of the nature reserve) are mown.

4. Priorities of management and conservation

Provision of favourable conservation status for grasslands and juniper formations by appropriate management in the entire area of nature reserve. Extension of nature reserve area to 10 ha, but optimally up to 100 hectares, in order to ensure sustainable conservation of habitats.

5. Necessary management and conservation measures

5.1. General measures

- Development of grassland restoration and management plan which should include evaluation of juniper stand vitality and the necessary optimal management, as well as management recommendations for open grasslands.
- Extension of nature reserve by including EU protected grassland habitats and perennial grasslands (which potentially can be developed to semi-natural grasslands) which are adjoining the northeast and southern parts of the nature reserve. It is an area of approximately 25 hectares that includes semi-natural dry grasslands on calcareous substrates, and juniper formations. Also further extension should be evaluated by inclusion of semi-natural grasslands in the vicinity of Lake Seldziers and between Seldziers and Cirma lakes.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6210	Semi-natural dry calcareous grasslands	0.7	35	Poor.	Restoration. Maintenance.	0.0	0.7
5130	*Juniperus communis* formations on heaths or calcareous grasslands	0.3	15	Bad.	Restoration. Maintenance.	0.3	0.3

One-time grassland restoration measures are necessary in juniper formations. Restoration measures include removal of juniper suppressing trees and shrubs, and thinning of junipers (only in accordance to restoration plan developed by habitat expert). Felled trees and shrubs must be removed from the territory. In the area of potential extension of nature reserve (up to 100 hectares) the restoration of both juniper formations and open grasslands is necessary.
The information on the conservation status of open grasslands is not available, therefore they must be inventoried, and grasslands must be restored, if necessary.

Gaiņu purvs | *Nature Reserve (LV0525400)*

1. Brief description

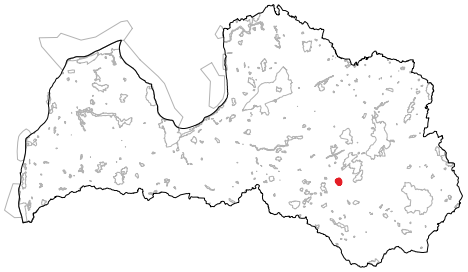
YEAR OF FOUNDATION: 1977.

LOCATION: Līvāni municipality Turki rural territory.

AREA: 1577 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Gaiņu purvs Nature Reserve is located in an area of intensively managed agricultural lands where large mires have formed in terrain depressions. The nature reserve is important for the conservation of raised bogs, bog woodlands and swamp woods. Wet *Populus tremula – Alnus glutinosa* and *Betula* spp. and coniferous forests are located here. The most important species for which the species plan is developed are *Bonasa bonasia* and *Tetrao tetrix*.

2. Threats to habitat and species conservation

Habitats of mires and woodlands are negatively affected by past drainage; the mire is rather overgrown with trees.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Restoration and maintenance of the hydrological regime optimal for mire habitats.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps.
- Hydrological regime research; development of rewetting project. Measure includes also the development of a monitoring programme and methods, in order to evaluate restoration success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	57.01	3.6	Poor.	Rewetting (ditch blocking or filling). Felling of trees.	57.01	
9080*	Fennoscandian deciduous swamp woods	8.6	<1	Poor.	Non-intervention.		8.6
9010*	Western Taïga	11.04	<1	Favourable.	Non-intervention.		11.04
7110*	Active raised bogs	702.4	44.5	Bad.	Rewetting (ditch blocking or filling). Felling of trees.	According to research results.	
7120	Degraded raised bogs	51.6	3.3	Bad.	Rewetting (ditch blocking or filling). Felling of trees.	According to research results.	

Gargrodes purvs | *Nature Reserve (LV0506400)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Sala municipality Sala rural territory.

AREA: 683 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Gargrodes purvs Nature Reserve is located in area rich in mires and woodlands, south of Jēkabpils town, near the Rožu Purvs Nature Reserve. The territory was established for the protection of raised bogs and bog woodlands. There are several islets with a mineral ground in the bog, covered with mixed and deciduous woods. Some islets were logged earlier, and now there are spruce plantations. The area is very important for rare bird species, which are breeding and foraging here. The most significant bird species are *Pandion haliaetus*, *Pernis apivorus, Tetrao tetrix, Aquila pomarina, Pluvialis apricaria, Numenius arquata, Caprimulgus europaeus, Grus grus* and others. In forests, indicator species of woodland key habitats, rare and protected species of mosses, mushrooms and lichens can be found, such as *Anastrophyllum hellerianum* and *Phellinus ferrugineofuscus*, shrub *Euonymus verrucosa*. In the bog, protected butterfly species *Oeneis jutta* and *Coenonympha hero* can be found.

Peat extraction continues in the part of Gargrode Mire which ir located outside the nature reserve.

2. Threats to habitat and species conservation

- The habitats of mires and bog woodlands can be adversely affected by hydrological regime changes. Currently, nearby occurring peat extraction does not have much effect on the nature reserve as it is naturally bordered by terrain elevation.
- Nature values may be influenced negatively by anthropogenic pressure such as accumulation of municipal waste, unorganised campfires, and use of quadricycles.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

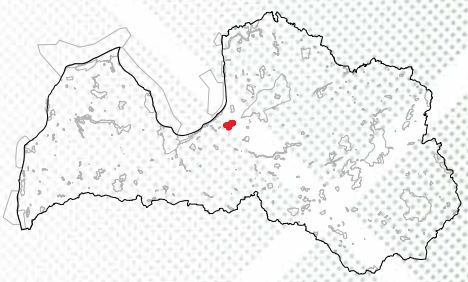
- Undisturbed course of natural processes in natural mire and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of optimal hydrological regime in mire habitats.
- The diversification of even-aged *Picea abies* plantations by creating gaps and openings, with aim to promote the development of protected forest habitat in the future. The development towards habitat type *Western Taïga* is expected.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	74.6	10.9	Poor.	Non-intervention.		74.6
9000	Potential Protected woodland habitat	10.0	1.5	-	Stand structure diversification in middle-aged *Picea abies* forests.	10.0	
9020*	Broad-leaved deciduous forests	2.7	⟨1	Favourable.	Non-intervention.		2.7
91D0*	Bog woodland	200.3	29.3	Favourable.	Non-intervention.		200.3
7110*	Active raised bogs	162.7	23.8	Favourable.	Non-intervention.		162.7
7120	Degraded raised bogs	111.7	16.3	Poor.	Non-intervention.		111.7

Garkalnes meži | *Nature Reserve (LV0527400)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Garkalne municipality, Inčukalns rural territory.

AREA: 1819 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2009), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 930 of 06 December 2011, Regulation on Individual Protection and Use of Garkalnes Meži Nature Park.

Garkalnes meži Nature Reserve is located between Gauja and Krievupe rivers and it includes a massif of wooded dunes and Krievupe river floodplain. Part of nature reserve is located to the south-east of Garkalne village, and part – to north-west. Habitats are fragmented due to Rīga-Valka railway and the Rīga-Veclaicene motorway, which cross the territory. The nature reserve includes 13 micro-reserves which are established for the protection of *Coracias garrulus* and *Columba oenas*.

The territory is important due to the high density of protected birds, and important for the conservation of bird species diversity. The diversity of bird species is determined by the diversity of habitats found in the territory – large areas of old western Taīga woodlands, swamp woods, alluvial grasslands and dry heaths. The dominating habitat type is 2180 *Wooded dunes of the Atlantic, Continental and Boreal region*. For the conservation of habitat type 2320 *Dry sand heaths with* Calluna *and* Empetrum nigrum, this is the second most important territory at a national scale, according to the total area of the habitat in Natura 2000 territories.

There are at least 16 specially protected bird species, as well as six rare and protected invertebrate species and several rare vascular plant species. The area is also an important foraging site of the European roller *Coracias garrulus* – four breeding pairs, which is 27 % of their total population in Latvia (data of 2016). The breeding of *Coracias garrulus* is ensured by the combination of rare conditions – many old trees with cavities are located in the direct vicinity of dry open areas. A large forest area that burned in 1992 and areas of former military base used to be important foraging sites. In a course of succession, open areas (dry heaths) gradually develop into young pine (Pinus sylvestris) woodlands.

The large number of old pines with cavities created by *Dryocopus martius* is suitable for nesting of large numbers of *Columba oenas* pairs. Other important bird species in the territory are *Aegolius funereus, Lullula arborea, Anthus campestris, Caprimulgus europaeus,* and others. Protected plant species *Pulsatilla patens* and *Diphasiastrum complanatum* grow in forests. Krievupe river is defined as suitable for salmonids.

2. Threats to habitat and species conservation

- The removal of old, large-sized trees; removal of dead wood.
- Overgrowth of heath and grassland habitats.
- Building construction; transformation of natural habitats for other land use purposes.
- Decrease and deterioration of habitats suitable for *Coracias garrulus* foraging and breeding.
- Establishment of beaver (*Castor fiber*) dams in Krievupe river; obstacles for migration of fish and lampreys caused by beavers.
- Overgrowth of coasts of oxbow lakes; increase of shading. Clogging of oxbow lakes with leaf and twig litter.

3. Existing management of the protected habitats and its assessment

In total, 100 nestboxes for *Coracias garrulus* have been installed; results have not been evaluated.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Prevention of overgrowth of *Coracias garrulus* foraging habitats – heaths, grasslands, burned areas by targeted management. Overgrowth of the large burned area (*Coracias garrulus* foraging site) is the main reason of decrease in their amount in Garkalne.

- Conservation of heaths and dry grasslands (*Semi-natural dry grasslands and scrubland facies on calcareous substrates*) in favorable conservation status; increase of their areas instead of low-value pine woodlands.
- Restoration and maintenance of alluvial grasslands. Although they are not the most suitable foraging habitats for *Coracias garrulus*, their total area is large enough to maintain characteristic plant and animal species composition of alluvial grasslands which are very fragmented and disappearing in the vicinity of Rīga city.

5. Necessary management and conservation measures

5.1. General measures

- Development of new nature management plan. It must include a plan for the management of C*oracias garrulus* foraging and breeding habitats.
- Development of Individual regulations on protection and use. Regulations must include the use of prescribed burning as the most suitable management measure for the maintenance of *Coracias garrulus* foraging habitats.
- Development of Coracias garrulus species conservation plan.
- Inventory of Lake Buļļezers which is adjoining the nature reserve, in order to clarify if *Lobelia-Isoëtes* complex has remained here. In case if *Lobelia-Isoëtes* vegetation is found, the evaluation of possible merging of both territories is necessary. In case if these plants are not found in the nature reserve – decision on the conservation status change for Buļļezers Nature Reserve.
- Restoration of the old burned area; provision of sufficient volumes of dead wood.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	1.4	<1	Poor.	Non-intervention.		1.4
9010*	Western Taïga	229.4	12.6	Bad.	Non-intervention.		229.4
6450	Northern boreal alluvial meadows	14.3	<1	Bad.	Restoration. Maintenance.	14.3	14.3
6120*	Xeric sand calcareous grasslands	0.5	<1	Bad.	Restoration. Maintenance.	0.5	0.5
3150	Natural eutrophic lakes	0.1	<1	Bad.	Mowing of remained connections between the oxbow lakes and river (every 5 years).		0.02
3260	Natural river reaches and river riffles	3.0	<1	Poor.	Removal or reduction of beaver dams in sites where they promote shore erosion, and in sites of riverbed with gravel or pebbles.	1.7 (on necessity)	
2320	Dry heaths	91.8	5.0	Poor.	Restoration. Maintenance.	91.8	91.8
2180	Wooded dunes	772.5	42.5	Poor.	Non-intervention.		772.5

Gasparsona purvs | *Nature Reserve (LV0500200)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Jaunjelgava municipality, Daudzese rural territory.

AREA: 26 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Gasparsona purvs Nature Reserve is located in a large forest massif between Birzgale and Daudzese villages, on the edge of the broad area of wet forests, and it includes small overgrowing mire. The territory is important for the protection of bog woodlands. Old bog woodlands are found also in the surrounding forests. Examples of rare and protected species in the nature reserve are *Picoides tridactylus* and *Dendrocopos major,* as well as invertebrate *Boros schneideri*.

2. Threats to habitat and species conservation

- Bog woodlands may be affected negatively by past drainage and changes in hydrological regime, as well as by possible road construction and ditch cleaning in the bordering area.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of hydrological regime which is optimal for wet forests.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	26.0	100	Poor.	Non-intervention.		26.0

Gaujienas priedes | *Nature Reserve (LV0501000)*

1. Brief description

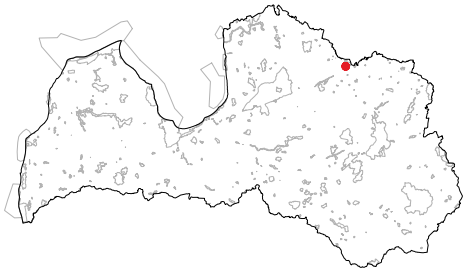
YEAR OF FOUNDATION: 1987.

LOCATION: Ape municipality, Gaujiena rural territory.

AREA: 51 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Gaujienas priedes Nature Reserve is located between the Gauja River and Sloku Purvs Nature Reserve near Gaujiena village. Historically, the territory of nature reserve has served as the burial place of the Baron Vulfs (Wulf) family living in the Gaujiena Manor.

The territory is important for the protection of old boreal forests (*Western Taïga*), particularly for the protection of 175-235-year-old pine (*Pinus sylvestris*) woodlands. Forests occupy 99% of the total area of nature reserve. Rather dense *Corylus avellana* grow in understory. Invasive woody species *Amelanchier spicata* and *Sorbaria sorbifolia* are spreading in nature reserve. Flora of boreal coniferous forests is characteristic for the territory, with an admixture of elements characteristic for deciduous forests. Protected lichen *Lobaria pulmonaria* grows on trunks of broadleaved trees.

Several protected and important bird species are breeding in the territory – *Picus canus, Dryocopus martius, Strix uralensis, Ficedula parva*. Rare invertebrate species include *Saturnia pavonia* and *Callimorpha dominula*.

2. Threats to habitat and species conservation

- Forestry activities (selective ("sanitary") felling). Old or withering trees, snags and fallen logs are removed. This affects the quality of the habitat negatively.
- The conditions in the territory are not suitable for pine regeneration. In the future, development towards habitat type *Fennoscandian herb-rich forests with* Picea abies is expected.

3. Existing management of the protected habitats and its assessment

- In 2007, understory and deciduous advance growth was felled after the wind-throw, and felling residues were burned. The measure was carried out mostly for the visual appearance, and influence on the habitat was negative.
- In 2016, potentially dangerous trees were felled along trails. Part of trees was removed, but part – left on site. Also understory was felled along the central trail from the gate to the chapel, and trees were removed around the chapel.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	30.0	58.8	Bad.	Non-intervention.		30.0

Gaviezes āmuļi | *Nature Reserve (LV0507300)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Grobiņa municipality Gavieze rural territory.

AREA: 107 ha.

NATURE MANAGEMENT PLAN: 2004 (2005 – 2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Gaviezes āmuļi Nature Reserve is important for the protection of old broad-leaved forests and mistletoe *Viscum album*. This is one of the most abundant localities of *Viscum album* in Latvia. *Viscum album* has been a protected species in Latvia since 1957, and it is found only in a small area in south-western part of the country. It grows mainly on old trees with sufficiently thick bark and wounds of broken branches.

The configuration and age of woodlands indicate that forests were rather intensively managed until 1960s. The shape of compartments is narrow, linear. Mixed deciduous woodlands with broadleaved trees in advance growth have developed in result of natural regeneration. Part of the territory is occupied by old broadleaved and oak (*Quercus robur*) woodlands. Several small brooks are located in southern part of the territory.

There are 11 rare plant and lichen species found in the territory, such as *Festuca altissima, Bromopsis benekenii, Circaea lutetiana, lichen Pertusaria pertusa*, and others. Door snails *Clausiliidae*, as well as other invertebrates are abundant in the territory. There are 10 protected invertebrate species, such as *Liocola marmorata* and *Limenitis camilla*. Protected amphibian species include *Hyla arborea*.

The nature reserve is small and therefore it is not rich in protected bird species. However, the territory is important for several species breeding in the territory, for example, *Dendrocopus medius*.

2. Threats to habitat and species conservation

- Natural structures in woodlands and habitats of rare species may be adversely affected by forestry activities resulting in reduction of dead wood volumes and the proportion of old and large trees in the woodland.
- Rare butterfly species are threatened by the overgrowth of forest block roads (*stigas*).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types 9050 *Fennoscandian herb-rich forests with* Picea abies and 9020 *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes* is expected.
- Maintenance of conditions suitable for *Viscum album* and rare invertebrate species.

5. Necessary management and conservation measures

5.1. General measures

Update of nature management plan. Plan must include the newest information on management of protected woodland habitats.

5.2. Specific measures

5.2.1. Species

- *Viscum album:* one-time felling in new and middle-aged woodlands, in order to increase the proportion of broadleaved trees; 25.0 hectares.
- Protected butterfly species: maintenance of open forest block roads (*stigas*) on necessity; felling of shrubs along the ditches.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	2.5	2.3	Favourable.	Non-intervention.		2.5
9020*	Broad-leaved deciduous forests	14.7	13.7	Favourable.	Non-intervention.		14.7
9000	Potential Protected woodland habitat	60.5	56.5	-	Non-intervention. Selective felling for the increase of proportion of broadleaved trees.	25.0	35.5

Grebļukalns | *Nature Reserve (LV0510700)*

1. Brief description

YEAR OF FOUNDATION: 1957.

LOCATION: Zilupe municipality, Pasiene rural territory.

AREA: 237 ha.

NATURE MANAGEMENT PLAN: 2001 (2001–2007).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Ģrebļukalns Nature Reserve includes one of the most expressive eskers in Latvia, and two lakes at its foot – Pintu and Šešku Lakes. The surrounding area has been inhabited and was used intensively in agriculture in the past. Now, woodlands cover the adjoining areas of the eastern part of the territory. The nature reserve is important for the conservation of forests on eskers and natural eutrophic lakes and their rare plant species. At the foot of the esker there are swamp woods and bog woodlands.

Onobrychis arenaria, Pulsatilla patens, Lithospermum officinale, Cotoneaster nigra, Euonymus verrucosa, butterfly *Agrodiaetus damon*, and bird species *Bonasa bonasia* are the most important species in the territory.

Woodlands are characterized by a rather dense shrub layer, which creates increased shading and creates unsuitable conditions for light-demanding species characteristic for forests on eskers. In the southern part of the nature reserve, a subcanopy of *Picea abies* and the groundcover typical for boreal forests has developed. At the beginning and the end of the 1960s, quarries were established in both the southern and northern ends of the esker. Their further use was stopped soon. In 1975 a slow overgrowth of quarries was observed. They are an important element for the nature diversity, for the conservation of *Onobrychis arenaria* and its associated insect species, as well as for the preservation of genotypes of other forest herbaceous species. It is likely that the establishment of quarries has influenced the disappearance of *Dracocephalum ruyschiana*, *Pulmonaria angustifolia* and *Gentiana cruciata* from the territory.

2. Threats to habitat and species conservation

- As a result of succession, due to the absence of disturbance of the groundcover and the shrub layer, the well-insolated pine forest is transformed into a more shadowy forest, and characteristic species disappear.
- Input of plant nutrients from the drainage basin and massive development of algae in Pintu Lake, as well as intensified overgrowth of Šešku Lake contribute to the deterioration of the overall quality of the habitat in both lakes of the nature reserve.
- Plusona River modification has affected and changed not only the hydrological regime, but also destroyed the vegetation of semi-natural wet grasslands in the nature reserve , and their botanical value is lost. The regulated river is still accelerating the drainage of the water and it is draining the former floodplains.

3. Existing management of the protected habitats and its assessment

- In 2012, understory was felled on eskers in area of 2.4 ha. Cut shrubs are rapidly regrowing, and rare species have survived only in some sites, indicating that more active management measures are necessary in a wider area.
- In 2017, a project supported by Latvian Environmental Protection Fund is being implemented. It includes inventory and mapping of *Agrodiaetus damon* habitats and planning of management which would prevent overgrowth.

4. Priorities of management and conservation

- Maintenance of the structures and light conditions specific for forests on eskers; reduction of understory and its negative impact on groundfloor.
- Undisturbed course of natural processes in forest, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of the water flow in Šešku Lake, with aim to reduce the overgrowth and water quality deterioration of Šešku Lake.

5. Necessary management and conservation measures

5.1. General measures

- Development of a new water protection plan.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	4.3	1.8	Favourable.	Non-intervention.		4.3
9060	Coniferous esker forests	72.6	30.6	Bad.	Felling of *Picea abies* in advance growth and in subcanopy. Removal of felling residues or burning on site. Non-intervention.		69.6
9010*	Western Taïga	4.2	1.8	Poor.	Non-intervention.		3.6
91E0*	Alluvial forests	3.6	1.5	Poor.	Non-intervention.		3.6
6430	Hydrophilous tall herb fringe communities	0.1	<1	Favourable.	Non-intervention.		0.1
3150	Natural eutrophic lakes	76.0	32.1	Poor. (Lake Pintu)	Pintu lake – mowing of emergent macrophytes once per 3 years; reopening of littoral zone/and mineral bottoms.		0.1
				Bad. (Lake Šešku)	Šešķu Lake – mowing of emergent macrophytes once per 5 years at the mouth of Patmalīšu river, with the aim to slow down eutrophication processes.	0.4	

Gruzdovas meži | *Nature Reserve (LV0526100)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Viļaka municipality Susāji rural territory.

AREA: 618 ha.

NATURE MANAGEMENT PLAN: 2003 (2003–2008).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Gruzdovas meži Nature Reserve is located on the southern edge of an extensive forest massif. It includes almost uninfluenced wet spruce (*Picea abies*) and deciduous woodlands. The territory is not drained. In the south, the nature reserve borders with the railroad Rīga-Pitalova, which was constructed in the early 20th century. The construction of railroad track bed influenced the hydrological regime – it slowed down the runoff, and contributed to paludification and development of wet habitats. Later, forest was drained in the area north of the railroad.

The territory is important for conservation of bog woodlands, western Taïga and swamp woods. Woodlands are rich in structural elements that are promoting biodiversity – logs, decaying wood, cavity trees, etc., and they are highly suitable for woodpeckers and owls. There are also three micro-reserves, established for *Tetrao urogallus, Ciconia nigra,* and *Picoides tridactylus*. Micro-reserves for the protection of rare species are established also in the surrounding forest. In the end of 20th century, this was the only location of the Siberian flying squirrel (Pteromys volans) in Latvia. Now, the species has disappeared.

Woodlands are rich in rare and protected plant species such as *Cinna latifolia, Glyceria lithuanica, Salix myrtilloides*. Several rare sedge species can be found in wet forests, as well as rare moss, mushroom and lichen species, such as moss *Bazzania trilobata,* lichen *Thelotrema lepadinum, polypore Fomitopsis rosea,* and others.

There are 15 rare and protected bird species, such as *Bonasa bonasia, Ciconia nigra, Haliaeetus albicilla, Pernis apivorus, Tetrao urogallus, Strix uralensis*, and others.

2. Threats to habitat and species conservation

- Habitats of the nature reserve may be adversely influenced by drainage in adjoining territories.
- Forestry activities. Removal of biologically-old trees and dead wood.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of area and integrity of protected habitats by non-intervention in woodlands which have not yet reached the quality of protected habitats.

5. Necessary management and conservation measures

5.1. General measures

Development of a new nature management plan. Update of habitat maps according to the latest methods.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	38.0	6.1	Favourable.	Non-intervention.		38.0
9010*	Western Taïga	62.0	10.0	Favourable.	Non-intervention.		62.0
91D0*	Bog woodland	290.0	47.0	Favourable.	Non-intervention.		290.0
9000	Potential Protected woodland habitat	35.0	5.7	-	Non-intervention.		35.0

Gudenieki | *Nature Reserve (LV0520200)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Kuldīga municipality Gudenieki rural territory.

AREA: 106 ha.

NATURE MANAGEMENT PLAN: 2001 (2002–2006).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Gudenieki Nature Reserve was established for the conservation of habitat which is rare in Latvia – Juniperus communis *formations on heaths or calcareous grasslands*. Based on the size of the area covered by this habitat type this is the second most important Natura 2000 territory in Latvia for its protection. Juniper formations cover territories which were previously used as agricultural lands. People's economic activities – pasturing, mowing, felling of trees and shrubs – plays a major role in the maintenance of this habitat type. In wet sites there are bog woodlands with several orchid species, such as *Dactylorhiza baltica, Dactylorhiza maculata, Dactylorhiza incarnata*. *Serratula tinctoria* grows in heaths, and Crex crex is breeding here. This is an ancient area of grasslands, which has not been significantly modified even during the intensification of agriculture in the second half of 20th century. Therefore, it has a high cultural and scientific value.

From landscape-ecological point of view, the nature reserve creates a connection between grasslands of Užava river valley along its entire length (crossing Ventava and Piemare Plains; adjoining grasslands of Diļļu Pļavas Nature Reserve in the middle part), and grasslands of Rīva and Tebra valleys (in both valleys, these grasslands are not included in Natura 2000 territories).

2. Threats to habitat and species conservation

- Grasslands are threatened due to overgrowth with shrubs and trees.
- Beavers create inundations which result in changed hydrological regime and negative influence on juniper formations, grasslands and heaths, and cause withering of junipers.
- Shallow ditch systems are not functioning, therefore in some areas management is not possible due to increased moisture.

3. Existing management of the protected habitats and its assessment

In the most part of the nature reserve, no management measures have been carried out. Only a relatively small *Nardus* grassland is regularly managed. With the support of municipality, grazing was ensured in the beginning of 21th century in an area of 40 hectares. Since 2016, grazing has not been continued. Although it was successful, it did not contribute to improving the vitality of junipers, due to the grazing regime that was not suitable for this particular habitat type.

4. Priorities of management and conservation

- Restoration and maintenance of the juniper formations and grassland habitats in the maximum possible area (historically, in the middle of the 20th century, the area of woodlands in the territory was very small), and also in areas of the current secondary forests.
- Habitat type 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) is found in small areas. Its management by mowing (which is the only optimal way for the conservation of habitat) is not a priority. In case if grazing is introduced in the whole area, it is allowed also in this habitat. The conservation of forests as undisturbed habitats is also not a priority, and establishment of pastures in woodlands is permissible.

5. Necessary management and conservation measures

5.1. General measures

- Development of grassland restoration and management plan (including also areas which are long-overgrown with shrubs and trees), involving all stakeholders and evaluating alternative territories in the context of socio-economic constraints. Considering the possibility of transferring the land under the supervision of Nature Conservation Agency.
- Implementation of unified management in the nature reserve, ensuring complex supervision of the entire area, aimed at restoration and maintenance of open grasslands and juniper formations. Grazing by sheep is the most suitable, but also grazing by cattle can be used for the restoration of favorable status of nature reserve. If pasturing is not possible due to socio-economic reasons, then the introduction of mowing should be considered. It is a suboptimal method both from the aspect of maintenance of the habitat and from the economical point of view, as in places with high juniper stand density it can be done only manually.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	3.2	3.0	Bad.	Non-intervention.		3.2
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	7.3	6.9	Bad.	Restoration. Maintenance.	7.3	7.3
6230*	Species-rich *Nardus* grasslands	2.5	2.4	Bad.	Restoration. Maintenance.	2.5	2.5
5130	*Juniperus communis* formations on heaths or calcareous grasslands	6.1	5.8	Bad.	Restoration. Maintenance.	6.1	6.1
6510	Lowland hay meadows	2.6	2.5	Bad.	Restoration. Maintenance.	2.6	2.6
4030	European dry heaths	0.5	<1	Bad.	Restoration. Maintenance.	0.5	0.5
6000	Grasslands to be restored	80	75.5	-	Restoration. Maintenance.	80	80

Gulbinkas purvs | *Nature Reserve (LV0510800)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Cibla municipality, Zvirgzdene rural territory.

AREA: 114 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Gulbinkas purvs Nature Reserve includes small transition mire and surrounding forests, consisting of mature *Betula* spp. woodlands. The area is important for the conservation of transitional mires and quaking bogs, and bog woodlands. The territory is surrounded by the main ditch which has a significant drainage effect on wet habitats in the nature reserve. Near the nature reserve there are meliorated agricultural lands, and Lake Cirma which receives the drainage waters. Over the past 20 years, drainage has promoted the increase in the proportion of shrubs in the open areas of mire.

The most important species in the nature reserve is moss *Hamatocaulis vernicosus*. In transition mire – orchid *Hammarbya paludosa*. Invertebrate *Lasius fuliginosus* has been found in forests. Extensive colonies of protected species *Lycopodium annotinum* and *Huperzia selago* are probably related to drainage influence.

2. Threats to habitat and species conservation

Hydrological regime changes in nature reserve and its adjoining area. Deepening of the main ditch which is surrounding the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Reducing the impact of drainage.

5. Necessary management and conservation measures

5.1. General measures

In case of restoration of the main ditch (surrounding the territory) or its sections, the substrate removal must be minimal; also the flow gradient must be minimal. Ditch berm must be placed on the opposite side of the nature reserve; the ground must be smoothed.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	11.76	10.3	Poor.	Drainage impact mitigation by filling ditch in southern part (at the inflow in the main ditch) – according to expert recommendations.	11.76	
7140	Transition mires and quaking bogs	33.0	28.9	Poor.	Felling of shrubs (at least every 3 years); ring-barking of large deciduous trees (*Alnus glutinosa, Betula* spp.) Drainage impact mitigation by filling ditch in southern part (at its inflow in the main ditch) – according to recommendations by the expert.	33.0	33.0

Gulbju un Platpirovas purvs | *Nature Reserve (LV0510400)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Cibla municipality Līdumnieki rural territory.

AREA: 1612 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Gulbju un Platpirovas purvs Nature Reserve is located at the Latvian-Russian border, in a south-western edge of a large cross-border massif of forests and mires. The territory is important for the conservation of raised bogs, transition mires with quaking bogs, and bog woodlands, as well as natural dystrophic lakes. It includes two mires and Lake Lebednica.

Protected species *Betula nana* grows here, as well as several orchid species and *Carex paupercula* in transition mires. The habitat is particularly suitable for living and breeding for *Grus grus, Bonasa bonasia, Tetrao tetrix, Tetrao urogallus*, and other rare bird species.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

Semi-natural grasslands occupy only insignificant areas, therefore their restoration and management in the territory is not a priority.

5. Necessary management and conservation measures

5.1. General measures

Update of maps of EU protected habitats.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	307.5	19	Poor.	Non-intervention.		307.5
9080*	Fennoscandian deciduous swamp woods	5.9	<1	Poor.	Non-intervention.		5.9
9010*	Western Taïga	15.8	1	Poor.	Non-intervention.		15.8
7150	Depressions on peat substrates	7.1	<1	Favourable.	Non-intervention.		7.1
7140	Transition mires and quaking bogs	3.25	<1	Favourable.	Non-intervention.		3.25
7110*	Active raised bogs	1198.1	74.3	Favourable.	Non-intervention.		1198.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.7	<1	Bad.	Restoration. Maintenance.	1.7	1.7
6230*	Species-rich *Nardus* grasslands	0.3	<1	Bad.	Restoration. Maintenance.	0.3	0.3
3160	Natural river reaches and river riffles	7.6	<1	Favourable.	Non-intervention.		7.6

Ģipka | *Nature Reserve (LV0528300)*

1. Brief description

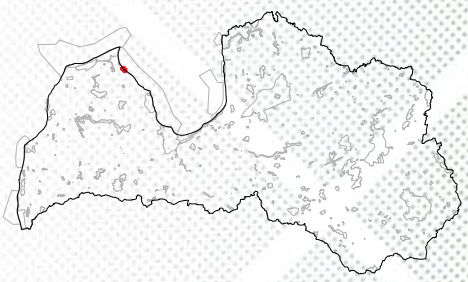
YEAR OF FOUNDATION: 2004.

LOCATION: Roja municipality, Roja rural territory.

AREA: 161 ha.

NATURE MANAGEMENT PLAN: 2004 (2004-2014).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ģipka Nature Reserve is established for the protection of brown beaksedge *Rhynchospora fusca* which is a very rare species in Latvia (only 3 localities), as well as for the protection of a peculiar landscape with old pine woodlands of the coast of the Gulf of Rīga.

The territory includes a very varying landscape of coastal habitats: complex of wooded dune ridges and interdune depressions (*kangaru-vigu ainava*) with transitional mires with very rare plant species, including abundant stands of *Myrica gale*, wooded dunes, grey dunes, white and embryonic dunes, and beach, which is a significant habitat for natterjack toad *Bufo calamita*. Sand pink *Dianthus arenarius* subsp. *arenarius* grows in grey and wooded dunes. In transitional mires, protected orchid species *Liparis loeselii*, as well as other rare species such as *Juncus bulbosus* and *Juncus balticus* can be found.

2. Threats to habitat and species conservation

- The area and quality of white dunes (*Shifting dunes along the shoreline with* Ammophila arenaria) have decreased due to their overgrowth with trees and shrubs in the course of succession.
- The moisture in humid dune slacks is decreasing, open mire areas overgrow with pines (*Pinus sylvestris*), and thus the existence of very rare plant species in Latvia is threatened.
- Increased trampling of beach, embryonic shifting dunes and white dunes occurs because of the car park and public beach which are established in the northern part of nature reserve. As a result, coastal habitats and species are adversely affected.

3. Existing management of the protected habitats and its assessment

In order to reduce the anthropogenic load, an infrastructure (footbridges, barriers, toilets, fireplaces, etc.) was constructed 10 years ago, and it is constantly maintained. It helps to reduce the human impact on coastal ecosystems.

4. Priorities of management and conservation

- Provision of optimal conditions and stability of *Rhynchospora fusca* population by felling trees in humid dune slacks, on necessity.
- Restoration and maintenance of grey dune habitats in good quality; suitable conditions for *Dianthus arenarius* subsp. *arenarius*.
- Provision of coastal sections with minimal human intervention in natural processes where undisturbed habitats of beaches, lagoons and embryonic dunes are preserved.

5. Necessary management and conservation measures

5.1. General measures

- Development and approval of functional zoning and Individual regulations on protection and use for the nature reserve; update of Nature management plan.
- Extension of nature reserve in the direction of Žocene village where biologically valuable humid dune slacks are concentrated.
- Regular monitoring of *Rhynchospora fusca* population, evaluation the hydrological regime in humid dune slacks.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	34.7	21.5	Favourable.	Non-intervention.		34.7
2190	Humid dune slacks	28.6	17.8	Poor.	Felling and removal of trees for the restoration and maintenance of optimal hydrological regime for *Rhynchospora fusca*, as well as for conservation of *Myrica gale* population in some areas.	28.6	
2180	Wooded dunes	79.3	49.2	Favourable.	Non-intervention, except in sites where dry pine woodlands on poor substrates (*Cladinosa-Callunosa*) must be conserved, and are transforming in the course of succession.		79.3
2140*	Decalcified fixed dunes with *Empetrum nigrum*	0.1	<1	Poor.	Restoration and maintenance of grey dunes. Felling of trees and shrubs, creation of bare sand patches, removal of pine seedlings.	0.1	
2130*	Grey dunes	0.3	<1	Poor.	Restoration and maintenance of grey dunes. Felling of trees and shrubs, creation of bare sand patches, removal of pine seedlings.	0.3	
2120	White dunes	6.0	3.7	Poor.	Non-intervention.		6.0
2110	Embryonic dunes	13.8	8.6	Poor.	Non-intervention.		13.8
1210	Annual vegetation of drift lines	0.2	<1	Poor.	Non-intervention.		0.2
1310	Annuals colonising mud and sand	0.5	<1	Poor.	Non-intervention.		0.5

Ģipkas lankas | *Nature Reserve (LV0528400)*

1. Brief description

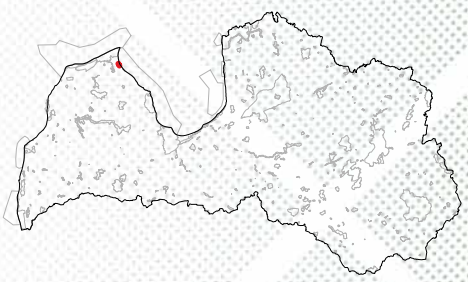
YEAR OF FOUNDATION: 2004.

LOCATION: Roja municipality Roja rural territory, Dundaga municipality Dundaga rural territory.

AREA: 111 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ģipkas lankas Nature Reserve is located in elongated, wet terrain depression, between the contemporary dune ridge and Baltic Ice Lake coastal formation, in floodplain of Lieknsupe river. Lieknsupe floodplain is drained in the nature reserve territory and partly overgrown with secondary deciduous woodlands. South of the nature reserve, the river channel is unmodified, with meanders. In ditches there are beaver (*Castor fiber*) dams and inundations. Part of the trees in the floodplain is withered.

The territory is important for the conservation of bird breeding sites. The most important bird species found here are *Porzana parva, Dendrocopos leucotos, Picoides tridactylus, Gallinago gallinago, Scolopax rusticola*, and others.

2. Threats to habitat and species conservation

The remained grasslands, as well as wet *Alnus glutinosa* woodlands in the floodplain are destroyed or threatened by activities of beavers. However, beavers have caused suitable conditions for waders, woodpeckers and other birds. The restoration of alluvial grasslands is not possible without the improvement of drainage system and adjusting it for the necessities of grassland management. However, these activities would threaten the existence of wet habitats and beaver impoundments which ensure the conservation of currently most important nature values of the territory. Only grasslands which are located on relatively higher positions in terrain can be restored without large investments. However, their area is so small that it can not ensure favourable conservation status in the long term.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Considering the current poor condition and low restoration potential of grasslands, their restoration is not a priority.
- To minimize the impact of grassland extinction on the biodiversity of grasslands and the heritage of cultural history in the region, it is necessary to ensure the conservation of an equivalent grassland area. Perspective grasslands for the conservation are located between Pilsupe river mouth (Pūrciems) and Lauži farmstead.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	21.0	18.9	Poor.	Non-intervention.		21.0
6450	Northern boreal alluvial meadows	10.2	9.2	Bad.	Allow natural succession.		10.2
2180	Wooded dunes	10.7	9.6	Poor.	Non-intervention.		10.7

Indzera ezera salas | *Nature Reserve (LV0500900)*

1. Brief description

YEAR OF FOUNDATION: 1926.

LOCATION: Alūksne municipality Alsviķi rural territory.

AREA: 7 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Indzera ezera salas Nature Reserve is established for the protection of three islands in Lake Indzers. Most of the islands are covered by western Taïga, there are mostly biodiverse forests dominated by *Picea abies*. *Alnus incana* forests grow in Cepurītes Island, in some places there are also Quercus robur woodlands. Protected plant species *Nuphar pumila* grows in the lake. *Huperzia selago* and *Lycopodium annotinum* grow in forests.

2. Threats to habitat and species conservation

A colony of cormorants *Phalacrocorax carbo* in Cepurītes Island.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Limitation of *Phalacrocorax carbo* colony according to expert recommendations.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	2.0	28.6	Favourable.	Non-intervention.		2.0
9010*	Western Taïga	3.1	44.3	Poor.	Non-intervention.		3.1

Istras ezers | *Nature Reserve (LV0510200)*

1. Brief description

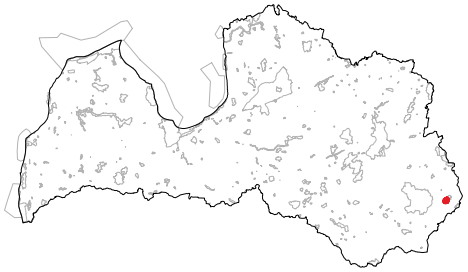
YEAR OF FOUNDATION: 1977.

LOCATION: Ludza municipality Istra rural territory.

AREA: 316 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Istras ezers Nature Reserve is located in a scenic area which is rich in lakes. It includes Lake Istra with several islands, expressive peninsulas and shore area. There are four islands in the lake: Panu (8.2 ha), Pabērzu (0.54 ha), Liepu (0.11 ha) and Mazā Island (0.001 ha). The territory is scenically attractive. It is important for the conservation of natural eutrophic lake and surrounding bog woodlands, grasslands and western Taïga. The most important animal species in the territory are *Lutra lutra, Osmoderma barnabita*, as well as bat *Myotis dasycneme*. Clubmosses, such as Huperzia selago can be found in forests. Vascular plants have been inventoried in the islands. In total, 154 species were found in Panu Island, 97 in Pabērzu, 57 in Liepu, 17 in Mazā Island.

Together with Istras pauguraine Nature Reserve, this is a very important area for the conservation of habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia), variant which is characteristic only for Eastern Latvia. Together with grasslands which are located between the both protected nature areas, the site is an important aggregation site for semi-natural grasslands in eastern part of Latgale Upland.

2. Threats to habitat and species conservation

- Rapid overgrowth of open littoral zone with dense colonies of emergent macrophytes (*Phragmites australis, Schoenoplectus lacustris*) and plants with floating and submerged leaves (*Nuphar lutea, Nymphaea* spp., *Potamogeton* spp.) caused by biogene pollution from individual households.
- There is a colony of grey herons (*Ardea cinerea*). Currently also cormorants (*Phalacrocorax carbo*) live here. Withering of trees is promoted by droppings of cormorants and herons.
- Semi-natural grasslands overgrow due to lack of management or are degraded due to unsuitable management (grass shredding, leaving on site, late mowing, overgrazing); their areas decrease.
- Fragmentation of semi-natural grasslands.

3. Existing management of the protected habitats and its assessment

- So far, only a few indirect habitat management measures have been carried out such as removal of aquatic macrophytes in littoral zone in order to maintain bathing sites and to ensure free access to lake. The creation of an easily warmed-up and productive zone was beneficial to juvenile fish and to bird breeding.
- According to Rural Support Service, in 2014 60 % of the total area of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands", while other habitats were not managed.

4. Priorities of management and conservation

- Slowdown of lake eutrophication processes.
- Restoration of semi-natural grasslands; their maintenance in favourable conservation status.
- Increase of the area of semi-natural grasslands; promotion of their connectivity.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Reduction of point-source and nonpoint-source biogene pollution from residential areas at the lake shore.
- Restoration and maintenance of semi-natural grasslands in their historic areas where currently they are partially or completely overgrown with forest (have not been evaluated as habitats of EU importance so far).

- Extension of nature reserve: inclusion of grasslands directly adjoining the nature reserve in order to ensure their favorable conservation status; particular attention must be paid to the very rare and priority grassland habitat type 6120* *Xeric sand calcareous grasslands* (adjoining nature reserve in the north and northeast).
- Evaluation of extension of nature reserve by inclusion of grasslands located between Istras ezers and Istras pauguraine Nature Reserves (or merging both nature reserves in one). These grasslands are important for the reduction of grassland fragmentation and for the provision of landscape-ecological integrity.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	4.0	1.3	Poor.	Non-intervention.		4.0
9020*	Broad-leaved deciduous forests	2.5	<1	Favourable.	Non-intervention.		2.5
9010*	Western Taïga	7.3	2.3	Poor.	Non-intervention.		7.3
91E0*	Alluvial forests	10.5	3.3	Poor	Non-intervention.		10.5
6510	Lowland hay meadows	0.8	<1	Bad.	Restoration. Maintenance.	0.8	0.8
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	10.8	3.4	Poor.	Restoration. Maintenance.	6.8	10.8
6210	Semi-natural dry calcareous grasslands	0.3	<1	Bad.	Restoration. Maintenance.	0.3	0.3
3150	Natural eutrophic lakes	137.0	43.3	Poor.	Mowing of emergent macrophytes and reopening of littoral zone/ and mineral bottoms (in areas of planned building construction, according to spatial plan). Once per 2-3 years. Creation of openings (wind corridors) at the lake coast; once per 5 – 10 years.	3 0.3	

Īslīce | *Nature Reserve (LV0502900)*

1. Brief description

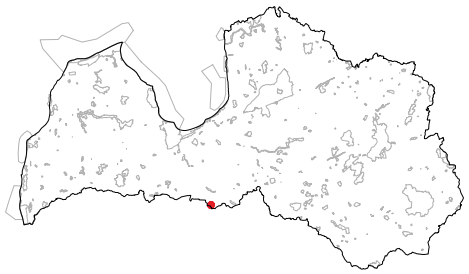
YEAR OF FOUNDATION: 1987.

LOCATION: Bauska municipality Īslīce rural territory.

AREA: 2 ha.

NATURE MANAGEMENT PLAN: 2008 (2008–2023).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Īslīce Nature Reserve was established for the protection of one the few localities of European fire-bellied toad *Bombina bombina* in Latvia. Nature reserve is located in a territory of a farmstead, at Latvian-Lithuanian border, and it includes several ponds. The territory is not drained but it is surrounded by extensive drained agricultural areas. There are no protected habitats or protected plant species in the nature reserve, and the main nature value is the large diversity of amphibian species. Three amphibian species protected in Latvia can be found here – *Bombina bombina, Bufo viridis*, and *Triturus cristatus*.

2. Threats to habitat and species conservation

- Overgrowth of ponds, promoted also by organic fertilizers from the adjacent barn.
- Introduction of local and invasive species in ponds. Fish are feeding on *Bombina bombina* tadpoles and are competitors for food. Particularly dangerous for *Bombina bombina* in Latvia is invasive fish species Chinese sleeper *Perccottus glenii*.
- Invasive parasitic fungi. *Batrachochytrium dendrobattidis* and *B. salamandrivorans* are invasive parasites of amphibians, and could be lethal to *Bombina bombina* populations.

3. Existing management of the protected habitats and its assessment

- In framework of LIFE programme project "Management of fire-bellied toads in the Baltic region" (NAT/DE/000028), habitats were managed in 2006. Two ponds were deepened and cleaned, *Bombina bombina* species conservation plan was developed.
- In 2007, three cloth cages were placed in the pond for *Bombina bombina* spawning. Part of the eggs was placed in the aquarium, therefore significantly increasing the amount of surviving fire-bellied toads. After the metamorphosis, 11 juvenile toads were released back into nature reserve.

4. Priorities of management and conservation

Conservation or extension of existing areas of water bodies and grasslands, preserving the nature reserve as a territory important for *Bombina bombina*.

5. Necessary management and conservation measures

- Prevention of ditch and grassland overgrowth: shrub felling, restoration of water bodies suitable for amphibians (shallow ditches with gently-sloping banks), mowing or grazing, by construction of slurry/manure storage vessel.
- Regular (once per three years) fish control in ponds using pots and trapnets; survey of local residents. In case of finding fish - measures for their elimination in *Bombina bombina* ponds (preferably: drainage before winter and filling with water in spring).
- Public education on the necessity to keep ponds free from fish, as well as on the necessity to avoid transfer of substrate and amphibians from one pond to another pond (information board at ponds, information on the Internet, a seminar, booklets).
- Regular (once per three years) fungal control of *Bombina bombina* using DNA analysis. In case of finding parasitic fungus, annual control of population condition in spring. On necessity: population supplementation with captive bred animals. For all manipulations with *Bombina bombina* and with components of their environment in each pond, individual rubber gloves and boot swabs must be used and later disposed.
- Prohibition of the release of terrarium animals in nature.

Jaša | *Nature Reserve (LV0536400)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Preiļi municipality Aizkalne and Pelēči rural territories.

AREA: 69 ha.

NATURE MANAGEMENT PLAN: 2007 (2007 – 2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Jaša Nature Reserve includes a tortuous part of the middle section of Jaša river, with outstanding *Tilio-Acerion* forests of slopes, screes and ravines on its banks. The territory is particularly important for the conservation of woodland habitats in Eastern Latvia, as well as for the protection of springfens, river riffles and river reaches with boulders. There is a specific microclimate in the deep valley of Jaša river. Increased air humidity promotes a great diversity of epiphytic mosses, door snails (*Clausiliidae*), and other snails. The length of the Jaša River in the nature reserve territory is 3.4 km.

There are two small hydroelectric power stations on Jaša river. Korna HPP is located in the upstream and Pelēči HPP is in the south-west part of the territory; part of the impoundment is located in the nature reserve. In result, river discharge is changed. Millpond is established before the Pelēči HPP. Water discharge in the river depends on the condition of Kastīre dam-regulator, as well as on the guaranteed discharge of Korna HPP and Pelēču HPP.

There are 35 protected and rare species in the nature reserve. The most important plant species are *Ranunculus lanuginosus, Anthriscus nitida, Allium ursinum*, moss *Geocalyx graveolens*. Snail *Ena montana* can be found. *Ciconia nigra* is foraging in river. Moss species new in Latvia *Fissidens gracilifolius* is found in the nature reserve. Characteristic complex of species in river riffles include *Gammarus sp, Plecoptera sp.* and *Trichoptera sp.* Dragonflies *Calopteryx splendens* and *Calopteryx virgo* can often be found.

2. Threats to habitat and species conservation

- Species whose existence is depending on constant moisture and water level (especially water invertebrates) are adversely affected by rapid water fluctuations caused by HPP.
- Also slope forests are negatively influenced. When sluice gates are opened in summer, in the low-water period, water level is rapidly rising, river bank is saturated with water. After closure of sluices, water level decreases, the increase in hydrodynamic pressure in the basal part of slope causes slumping and uprooting of trees.
- The trees that have fallen into Jaša river promote coastal erosion, and further arrival of trees and soil particles into the river. This promotes the accumulation of soil particles in river riffles, their clogging and covering with sandy substrates, and the disappearance of riffle areas.

3. Existing management of the protected habitats and its assessment

To ensure the operation of the hydroelectric power plant, fallen trees are regularly removed from the reservoir. It is carried out by the owners in accordance with the rules of HPP operation.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Removal of large woody debris in Jaša river; maintenance of river riffles in high quality.

5. Necessary management and conservation measures

5.1. General measures

- Maintenance of the guaranteed water discharge in hydroelectric power plants located in the nature reserve (according to the operating rules).
- Regular removal of fallen trees in Korna and Pelēči HPP reservoirs and downstream, to prevent coastal erosion.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	59.4	86.1	Favourable.	Non-intervention.		59.4
7220*	Petrifying springs	0.28	<1	Favourable.	Non-intervention.		0.28
7160	Fennoscandian mineral-rich springs and springfens	0.15	<1	Favourable.	Non-intervention.		0.15
3260	Natural river reaches and river riffles	3.4	4.9	Poor.	Regular removal of logs which have fallen into the river due to activities of beavers or erosion. Establishment of bank-stabilising and erosion-decreasing bars of boulders downstream to HPP.	0.1	0.4

Jašas-Bicānu ezers | *Nature Reserve (LV0530900)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Riebiņi municipality Rušona rural territory.

AREA: 311 ha.

NATURE MANAGEMENT PLAN: 2017 (2017–2027).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Jašas – Bicānu ezers Nature Reserve includes Jašas and Bicānu Lakes with islands. On islands, there are some of the most diverse oak (*Quercus robur*) and mixed woodlands in Southern Latvia. Lakes cover the largest part of the nature reserve – 83 %. Woodlands occupy about 17 %, grasslands – 0.28 %. There are five EU protected habitat types, as well as several rare and protected species of plants, mushrooms and lichens. The most important protected plant species are moss *Dicranum viride*, lichen *Lobaria pulmonaria*, mushroom *Hericium coralloides*, vascular plant *Digitalis grandiflora,* invertebrate *Leucorrhinia pectoralis*. In Lake Bicānu, colonies of *Hydrilla verticillata* have been found.

Water quality in lakes is mainly determined by runoff from the catchment area which is dominated by agricultural lands, mainly by pastures and meadows. Water quality is adversely affected by input of pollutants from barns, farmsteads and guesthouses.

Water level regulator was constructed on Jaša river in Kastīre village in 1950s. In 1962 it was partially washed out, then partially restored several times. Lakes Jašas and Bicānu are located in the influence area of this regulator; constant water level in both lakes has been maintained.

The territory is popular among vacationers and anglers. In Gelenova Park, Zeinišķu Peninsula and other sites, campfires, trails, illegal roads, excessive trampling, waste can be observed.

2. Threats to habitat and species conservation

- Grassland habitats are adversely affected by management cessation.
- Habitats of nature reserve are adversely affected by vacationers and anglers (trails, illegal roads, municipal waste, fireplaces), as well as by increasing construction of buildings and private recreational facilities, which contribute to pollution of lakes and their surroundings with municipal waste. Eutrophication is promoted by input of biogene elements.
- Reconstruction of the unfinished water level regulator on Kastīre river is a risk factor because water level in lakes might be lowered, which would negatively affect the quality of habitats.
- Structural quality of woodland habitats is adversely affected by removal of dead wood for campfires.
- Lake water quality is mainly determined by drainage from the catchment area. Catchment area of Lakes Bicānu and Jašas ir dominated by agricultural lands, mainly pastures and meadows. The development of intensive farming without adequate maintenance of the protective zones is a potential threat, as well as establishment of water-consuming structures (recreation-related structures, food production sites) without the appropriate wastewater treatment.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Grassland restoration and management.
- Felling of shrubs for the conservation of *Digitalis grandiflora* locality in Zeinišķu Peninsula.
- Maintenance of continuous water level in Jašas and Bicānu Lakes (by ensuring continuous operation of water flow regulator on Kastīre river).
- Maintenance of lake water quality:
  - wastewater treatment or storage in existing or newly-created recreation facilities; only adequately treated wastewater can be discharged into lake;
  - creation of mosaic of emergent vegetation, creation of open littoral zones in order to promote decayed plant mass being washed ashore.

5. Necessary management and conservation measures

5.1. General measures

- Continuous operation of water flow regulator on Kastīre river.
- Thinning and mowing of emergent vegetation in belts in order to restore open littoral zones (suitable conditions for invertebrates, juvenile fish, ducks; maintenance of bathing sites). Mowing in floating-leaf vegetation zone in Lake Bicānu must be avoided as it is a potential locality of *Hydrilla verticillata*. This species grow in monodominant colonies up to a depth of 3 m.
- Mowing and "opening" of open littoral zones in order to promote lake aeration and decayed plant mass being washed ashore.
- Recording of licensed angling results in Lake Jašas and Lake Bicānu (the total potential fishery productivity of the most important species in Jaša and Bicānu lakes is 45 - 50 kg/ha).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	27.6	8.8	Favourable.	Non-intervention.		27.6
9020*	Broad-leaved deciduous forests	14.3	4.6	Favourable.	Non-intervention.		14.3
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.9	⟨1	Bad.	Restoration. Maintenance.	0.9	 0.9
3150	Natural eutrophic lakes	260.5	83.7	Poor.	Mowing of emergent vegetation in belts; restoration of open littoral zone (for the slowdown of eutrophication), ~ 10 hectares, 1-2 times per year, changing the mown sites every year. Prevention of *Hydrilla verticillata* locality damage or destruction. Mowing and "opening" of open littoral zones in order to promote lake aeration and decayed plant mass being washed ashore. Prevention of overgrowth of "channel" (N, NW from Zenišķu Peninsula), in order to ensure water exchange between the two lakes.		1.0 On necessity, according to expert recommendations.
91E0*	Alluvial forests	1.3	⟨1	Favourable.	Non-intervention.		1.3

Jaunanna | *Nature Reserve (LV0525900)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Alūksne municipality Jaunanna rural territory.

AREA: 1325 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 456 of 08 August 2017, Regulation on Individual Protection and Use of Jaunanna Nature Reserve.

Jaunanna Nature Reserve includes a section of the Pededze River and surrounding western Taïga and bog woodlands. Mature woodlands cover most of the area. The nature reserve is important for the conservation of woodland and river (*Water courses of plain to montane levels with the* Ranunculion fluitantis *and* Callitricho-Batrachion *vegetation*) habitats, and their associated rare species. There are three micro-reserves, established for the protection of capercaillie *Tetrao urogallus* leks and *Dendrocopos leucotos* nesting sites. River is an important foraging site for rare species of bats. Old trees are particularly suitable for various invertebrate species. Semi-natural grasslands in the territory are important for the reduction of their fragmentation.

The nature reserve is rich in rare and protected species – there are 14 protected species of vascular plants, nine moss, five lichen, 17 bird, eight bat, 17 protected invertebrate species. The most important protected vascular plant specie are *Cinna latifolia, Festuca altissima*. Mosses – *Dicranum viride* and *Geocalyx graveolens*. Insects – *Lycaena dispar, Leucorrhinia pectoralis*. Pededze river is a habitat for *Cottus gobio, Cobitis taenia, Lutra lutra, Unio crassus,* and *Lampetra planeri*. Important species of birds include *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Aegolius funereus*.

Jaunanna Hydroelectric Power Plant (HPP) is located in Jaunanna village, downstream of the nature reserve. It has reduced the water discharge in river. Water upstream of HPP is stagnant; bank erosion is promoted by water level fluctuations. It adversely affects the river and its shores, and also changes the ecosystems of oxbow lakes. Large woody debris are regularly formed in the river. Also activities of beavers can be observed.

The landscape has changed significantly during the last decades due to overgrowth of grasslands.

2. Threats to habitat and species conservation

- Water level fluctuations caused by operation of Jaunanna HPP.
- River riffle area in Pededze river (habitat of rare species of invertebrates) is particularly adversely affected by beavers (*Castor fiber*).
- Cessation of grassland management; overgrowth.
- Krassiku Mire has been negatively affected by drainage for a long time; dense woodlands of pines (*Pinus sylvestris*) have developed particularly in mire edges.
- The formation of dead wood is interrupted due to forest management.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Restoration and maintenance of conditions optimal for freshwater habitats; improvement of the quality (maintenance of hydrological regime, reduction of number of beavers, removal of large woody debris).
- Management of habitats which are suitable for rare species of birds.
- Increase of dead wood volumes in protected woodland habitats.
- Rewetting in *Tetrao urogallus* micro-reserve.
- Increase of grassland habitat connectivity. Improvement of their quality; restoration and maintenance in favourable conservation status in maximum possible area, by restoring also grasslands which are overgrown during the last decades. Semi-natural grassland habitats were not the reason for the foundation of nature reserve. They are highly fragmented, and are not particularly

highlighted in the nature management plan of 2016. However, Pededze river is an important species dispersal corridor in North-eastern Geobotanical District. Therefore, the grassland restoration and maintenance in favorable conservation status is a priority which is equivalent to other priorities of conservation of nature values in the nature reserve.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of the possible extension of nature reserve – inclusion of Pededze river floodplain grasslands at northern border of the territory, up to Mālupe Bridge.
- Hydrological regime research in Krasika Mire. Rewetting in accordance to requirements of regulatory acts.
- Maintenance of water discharge in Pededze river (Salmonid river) by removal of large woody debris.
- Removal or reduction of beaver dams and large woody debris in sites where they promote bank erosion, in sites where riverbed with gravel or pebbles indicate on river riffles of high quality (suitable for *Lampetra planeri, Salmo trutta fario, Cottus gobio, Cobitis taenia, Unio crassus*). This will also prevent the negative influence of beaver activities on grasslands and on habitats of rare invertebrate species.

5.2. Specific measures

5.2.1. Species

There are 5-10 males in *Tetrao urogallus* leks. Leks must be maintained in accordance to monitoring results and expert recommendations.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	196.9	14.9	Poor.	Increase of dead wood volumes. Selective felling. Non-intervention. Rewetting in *Tetrao urogallus* leks.	39.8 46.3 According to research results.	 110.8
9010*	Western Taïga	299.3	22.6	Poor.	Increase of dead wood volumes. Non-intervention.	8.0	 291.3
91F0	Riparian mixed forests	5.6	<1	Favourable.	Increase of dead wood volumes. Non-intervention.	3.0	 2.7
9080	Fennoscandian deciduous swamp woods	21.3	1.6	Favourable.	Non-intervention.		21.3
9160	Oak forests	2.3	<1	Poor.	Non-intervention.		2.3
9020*	Broad-leaved deciduous forests	0.6	<1	Poor.	Non-intervention.		0.6

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9050	Herb rich spruce forests	45.4	3.4	Poor.	Increase of dead wood volumes. Selective felling. Non-intervention.	4.0 6.5	 34.9
7120	Degraded raised bogs	70.0	5.3	Bad.	Rewetting (ditch blocking or filling) – in complex with bog woodlands.	70.0	
7160	Fennoscandian mineral-rich springs and springfens	0.8	<1	Favourable.	Non-intervention.		0.8
6510	Lowland hay meadows	2.3	<1	Poor.	Mowing (with haymaking), grazing.		2.4
6450	Northern boreal alluvial meadows	15.3	1.1	Bad.	Restoration. Maintenance.	15.3	 15.3
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	3.7	<1	Poor.	Mowing (with haymaking), grazing.		3.7
3260	Natural river reaches and river riffles	15.3	1.1	Poor.	Maintenance of water discharge: removal or decrease of beaver dams and large woody debris in sites where they promote shore erosion, as well as in reaches with riverbed with boulders or pebbles.	12.9	15.3
3150	Natural eutrophic lakes	0.8	<1	Poor.	Creations of connections between oxbow lakes and Pededze river. Repeating every 10 years. Mowing in the existing connecting channels; cleaning of sediments, for the maintenance of fish and aquatic organism migration.	0.8	0.8

One-time grassland restoration measures are necessary in at least 15.3 hectares – in habitats which were identified as EU protected grassland habitats before the 2016, but are defined as disappeared in nature management plan of 2016. According to available cartographic material, these grasslands are not completely overgrown, and still can be restored as grasslands of EU importance. Annual restoration measures are necessary in the whole area of semi-natural grasslands – 21.3 ha. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Jaunciems | *Nature Reserve (LV0524600)*

1. Brief description

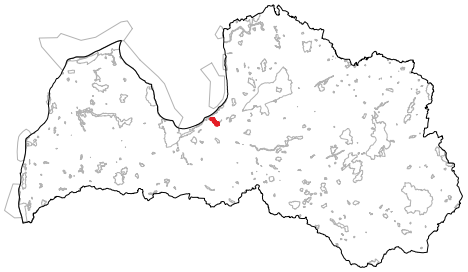
YEAR OF FOUNDATION: 1999.

LOCATION: Rīga city

AREA: 332 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2026).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 125 of 21 February 2012, Regulation on Individual Protection and Use of the Jaunciems Nature Reserve.



Jaunciems Nature Reserve is located in the Northern District of Rīga city, on the northern and eastern shores of Lake Kīšezers. It consists of three separate territories (according to the Nature management plan – territories I, II and III). Lake Ķīšezers occupies 48% of the territory, and 58% of the territory is land. It is included in the Flood risk area of national significance, and Flood risk management plan has been developed for the territory. According to this plan, part of the south-eastern territory will be enclosed with flood protection dams.

In 1993, the protected area was established by the decision of Rīga municipality. First Nature management plan was developed in 1998. The territory is important for the protection of mesic and wet grasslands, as well as forests on the coast and surroundings of Lake Ķīšezers. It is very important for the conservation of nature diversity in the Rīga city and for provision of ecosystem services for residents of the city. There are 10 EU protected habitat types in the nature reserve, covering 57.5 % of the total area of the nature reserve . Also 12 protected species of plants, 10 fish, one lamprey and 18 bird species have been found.

Aquatorium of Lake Ķīšezers (also used for non-commercial fishing) with a belt of aquatic macrophytes is a biologically valuable territory and important for birds. Due to the proximity of the sea and after the construction of channel connecting Daugava and Gauja Rivers, Ķīšezers lake is an important fish migratory corridor to basin of Jugla river. This is a spawning site for *Esox lucius, Perca fluviatilis, Stizostedion lucioperca* arriving from the Gulf of Riga. Lake Ķīšezers is the most productive lake in Latvia in terms of fishery, and it provides also a feed base for rare bird species that feed on fish. Unfortunately, the ecological potential of Lake Ķīšezers is estimated as poor (according to the river basin management plan of the Daugava River Basin). This is caused by wastewater pollution from residential areas such as Suži.

Several rare plant species such as *Polygonum mite* can be found on shores of the lake and in swamps. The nature reserve is an important area for a number of rare bird species, such as *Botaurus stellaris, Crex crex, Podiceps auritus, Remiz pendulinus*, and others. Rare mushroom species *Fistulina hepatica* is found in Ozoli Woodland (former Mangaļi Park).

Grasslands of the nature reserve are an important stepping stone facilitating grassland species dispersal in the area of Rīga and its agglomeration which is generally a barrier for species exchange between Western Latvia and Eastern Latvia and between the west and east coast of the Gulf of Riga. *Gladiolus imbricatus, Triglochin maritimum*, orchids such as *Dactylorhiza baltica*, rare *Alopecurus arundinacea* can be found in moist and periodically flooded grasslands. This is one of the few areas in Latvia where Armeria maritima can be found; this is an important area of the distribution of this species in Latvia. Unfortunately, the common reed *Phragmites australis* is spreading rapidly in the coastal meadows. Biologically valuable terrestrial areas are fragmented, owned by different owners, therefore their management is complicated.

2. Threats to habitat and species conservation

- Lack of grassland management, promoting degradation and overgrowth, fragmentation, causing disappearance of breeding sites for protected bird species.
- Eutrophication in forest habitats, overgrowing with *Amelanchier spicata* and *Acer* spp.; removal of natural structural elements (logging, removal of logs).
- Lake eutrophication.
- Municipal waste in habitats; unauthorized landfills in allotment gardens and in reedbeds.
- Recreation, fishing and use of watercraft along the shipping routes in Ķīšezers during the breeding season adversely affects the breeding success of birds.
- Expansion of emergent vegetation, in particular the expansion of reedbeds; disappearance of open littoral zone.

- During the wind-induced water level changes (on average 14 times per year), water level oscillates to a level of 0.7 m. This promotes washing of mechanical pollution into the lake and covering the coastal grasslands with slowly decomposing mass of emergent plants.
- Concentrations of heavy metals (such as Cd, Pb, Hg, Ni, Cr, Cu and Zn, also As) in the sediments of Ķīšezers exceed the environmental standard values significantly. However, none of the heavy metal concentrations are higher than the value of B or the precautionary threshold, which causes danger to existence of aquatic organisms.
- The construction and use of the port whose construction is planned on the northeast of the lake may have a significant impact on breeding success.
- Household waste, especially in territory III.

3. Existing management of the protected habitats and its assessment

- Grassland restoration and management was planned in the first Nature management plan. In 2016, during the development of next plan, measures were assessed as partly fulfilled.
  - It was planned to restore 3.7 ha of meadows. Shrubs were cut in territory I. Grasslands were mown in territories I and II – in Liepu Peninsula.
  - Maintenance of grasslands in area of 96 ha was planned. It is implemented partially, in some land properties.
- Reed mowing was planned in 61 ha on Ķīšezers shore – implemented partially.
- Elimination of *Heracleum sosnowskyi* is regularly carried out.
- Some landowners create open littoral parts by mowing and cleaning of the lake adjacent to their properties.
- Operation rules for Lake Ķīšezers were developed in 2011.

4. Priorities of management and conservation

- Grassland restoration and management at least in their current area.
- Slowdown of lake eutrophication by reducing or stopping the inflow of untreated wastewater.
- Mowing of emergent macrophytes; creation of open littoral zone. This will increase fish spawning success and attract waders.
- Protection measures for bird populations.
- Removal of mechanical pollution, especially in Territory III.
- Abatement of invasive species.
- Establishment of habitat structures favourable to *Botaurus stellaris* in the territories I and III.
- Prevention of significant disturbances for the colony of *Larus ridibundus* in Pils Kakts (the most important ornithological value in the territory III). Establishment in microreserves in sites of *L. ridibundus* colonies will also attract other rare gull, tern and duck species.

5. Necessary management and conservation measures

5.1. General measures

- The status and origin of habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels* must be clarified. According to Nature management plan of 2016, its area is disproportionally large. It is possible that these grasslands developed in abandoned floodplain grasslands or lowland hay meadows. In such case, the conservation of habitat type 6430 is not the priority, and previous habitat types should be restored.
- Review of the borders of nature reserves. Evaluation of nature values of surrounding territories and their conservation.
- Development and implementation of visitor infrastructure project which will ensure both nature protection and visitor education and recreation.
- Requirements for the conservation of habitats and species of nature reserve should be included in various spatial planning documents (thematic plans, etc.).
- If necessary (if conservation of habitats and species protection is compromised), the issue of land purchase from private landowners and transferring into the possession of State must be addressed.
- Investigation of breeding habitats of birds, fish spawning places, flood-risk areas, watercraft routes; polluted and potentially polluted places; elaboration of recovery plans; coordination and integration of the requirements of these plans in Ķīšezers terms of exploitation.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	1.4	<1	Poor.	Non-intervention.		1.4
9020*	Broad-leaved deciduous forests	3.5	1.0	Bad.	Felling of trees and shrubs around the large, wide-crowned trees. Elimination of invasive species (*Heracleum sosnowskyi, Impatiens* spp.)	0.37	1.22
9160	Oak forests	2.0	<1	Bad.	Elimination of invasive species (*Impatiens* spp.)		2.0
1630*	Coastal meadows	1.6	<1	Poor.	Restoration. Maintenance.	1.6	1.6
6430	Hydrophilous tall herb fringe communities	13.26	4.0	Bad.	Restoration. Maintenance.	13.26	13.26
6450	Northern boreal alluvial meadows	30.39	9.2	Poor.	Restoration. Maintenance.	8.6	8.6
6230*	Species-rich *Nardus* grasslands	1.14	<1	Poor.	Restoration. Maintenance.	0.32	0.32
6120*	Xeric sand calcareous grasslands	3.94	1.2	Bad.	Restoration. Maintenance.	3.94	3.94
2180	Wooded dunes	4.0	1.2	Poor.	Felling of trees and shrubs (*Acer* spp.). Elimination of invasive species (*Amelanchier spicata*).	4.0	4.0
3150	Natural eutrophic lakes	143	43.1	Bad.	Mowing of emergent vegetation in fragmented belts in 61 ha large area; restoration of open littoral areas for the improvement of fish spawning success and for the attraction of waders.	61.0	1.0 - 5.0 (once a year, changing the places of mowing.)

One-time restoration measures are necessary in 69.4 ha of grassland habitats. Before the development of Nature management plan, there were 69.4 hectares of grasslands known. Area specified in the plan is 50 hectares large. There is no information on 19.4 hectares – whether they are irreversibly damaged or their restoration is possible.

Ječu purvs | *Nature Reserve (LV0530400)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Nīca municipality Nīca rural territory.

AREA: 282 ha

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Ječu purvs Nature Reserve is located in an area rich in forests and mires, close to several other protected nature territories. The territory is important for the protection of alkaline fens and bog woodlands. Ječi mire is one of the four largest alkaline fens in Latvia. There are significant colonies of *Myrica gale* in the territory. Rare plant species *Schoenus ferrugineus* and *Trichophorum cespitosum* can be found in the entire area of mire. In the past, the mire has probably been used for haymaking; several long-established shallow ditches have remained. The mire is more drained in the northern part and also in the adjoining territories where outlet of the regulated Vārnupīte river is located. Part of the mire is overgrowing with pines (*Pinus sylvestris*). Overgrowing occurs over a long period of time. Possibly, this process is partly natural and partly promoted by drainage.

Rare and protected species of the territory include *Dactylorhiza incarnata, Dactylorhiza ochroleuca, Carex buxbaumii, Pinguicula vulgaris*, and others. Moss species typical for spring discharges *Trichocolea tomentella* grows in northern part of mire.

2. Threats to habitat and species conservation

- Long-term existence of habitats of the territory is adversely affected by ditches (the influence decreases by their natural overgrowth but is still present); ditches promote the overgrowth of the mire.
- Unauthorized use of motorized vehicles (quadricycles).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage mire habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Elimination of drainage influence in the northern part of the mire.

5. Necessary management and conservation measures

5.1. General measures

Complex research of hydrological regime in Ķirbas purvs, Ječu purvs and Rucavas īvju audze Nature Reserves; search for a complex management solution. The conclusions should be based on water level fluctuations throughout the year.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	59.9	20.2	Poor.	Non-intervention.		59.9
9080*	Fennoscandian deciduous swamp woods	2.5	<1	Favourable.	Non-intervention.		2.5
9010	Western Taïga	1.4	<1	Favourable	Non-intervention.		1.4
7230	Alkaline fens	134.2	47.6	Poor.	Construction of dams on ditches in northern part of mire.	According to hydrological research results.	

Jumurdas ezers | *Nature Reserve (LV0511300)*

1. Brief description

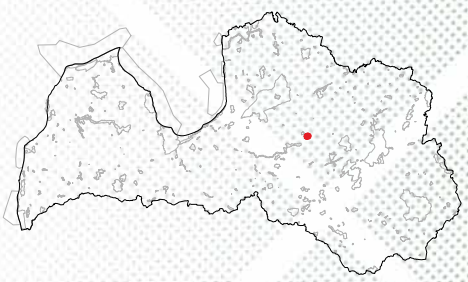
YEAR OF FOUNDATION: 1957.

LOCATION: Ērgļi municipality Jumurda rural territory.

AREA: 353 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Jumurdas Ezers Nature Reserve includes Lake Jumurda with three islands, the surrounding woodlands and agricultural lands. The territory is important for the Lake Jumurda, which is a naturally eutrophic lake, its peculiar surroundings – Vidzeme Upland landscape, and three islands of the lake. Forests are dominated by coniferous trees and by *Betula* spp. Štutēna Mire and Bezdibeņa Mire have been drained previously, therefore mires overgrow with trees. Only small areas of mires have remained in nature reserve, including transition mires in surroundings of Sārtupīte river which is inflowing in the Lake Jumurda.

The most important habitats on the islands are old broadleaved forests, as well as bog woodlands and mixed woodlands on lake shores. Rare and protected animal species include mammals *Lutra lutra* and *Myotis dasycneme*, fish *Cobitis taenia* and *Misgurnus fossilis*. Rare moss species *Hylocomium umbratum* and *Rhytidiadelphus subpinnatus* are found in forests.

There is a recreational complex on the west side of Lake Jumurda.

2. Threats to habitat and species conservation

- Wet habitats can be adversely affected by hydrological regime changes. Degradation of mires continues due to past drainage.
- Volumes of structures important for forest biodiversity are reduced due to removal of biologically-old trees and dead wood.

3. Existing management of the protected habitats and its assessment

- Mowing of emergent vegetation has been carried out in littoral zone at Jumurdas Muiža guesthouse and also in small areas in several small bathing sites. A negative influence of these measures on quality of lake habitats and landscape is not observed. In regularly mowed coastal littoral zones, conditions are suitable for aquatic invertebrates and juvenile fish.
- Other measures to manage protected habitats have not been taken so far.

4. Priorities of management and conservation

- Maintenance and extension of open littoral zone in order to establish a warming-up shallow water zone which is suitable for aquatic invertebrates, juvenile fish, crayfish, waders and ducks.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types 9010* *Western Taïga* and 91D0* *Bog woodland* is expected.

5. Necessary management and conservation measures

5.1. General measures

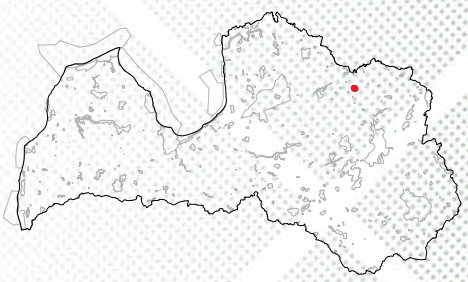
- Update of habitat maps.
- Development and approval of Individual regulations on protection and use which would provide the non-intervention regime in woodlands which have not yet reached the quality of protected woodland habitats.
- In case of establishment of new guesthouses, other objects associated with recreation, wastewater collection and treatment must be planned.
- Creation and maintenance of viewpoints and landscape openings (southern part of the lake at motorway V839 between Andrupīte river mouth and road to „Aizbetnes"). The measure will also contribute to lake aeration and self-purification capacity.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	2.2	<1	Poor.	Non-intervention.		2.2
91D0*	Bog woodland	24.9	7.1	Poor.	Non-intervention.		24.9
9080*	Fennoscandian deciduous swamp woods	0.2	<1	Poor.	Non-intervention.		0.2
9010*	Western Taïga	1.1	<1	Poor.	Non-intervention.		1.1
9000	Potential Protected woodland habitat	18.7	5.3	-	Non-intervention.		18.7
7140	Transition mires and quaking bogs	1.1	<1	Favourable.	Non-intervention.		1.1
7110*	Active raised bogs	0.3	<1	Poor.	Non-intervention.		0.3
3150	Natural eutrophic lakes	169.8	48.1	Poor.	Removal of emergent vegetation in littoral zone. Once per 1-3 years.		1.0

Kadājs | *Nature Reserve (LV0527700)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Gulbene municipality Lejasciems rural territory.

AREA: 329 ha.

NATURE MANAGEMENT PLAN: 2005 (2005.-2015.).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 253 of 24 March 2009, Regulation on Individual Protection and Use of the Kadājs Nature Reserve.

Kadājs Nature Reserve includes wet and old woodlands at Pilupe river. The territory is important for the protection of western Taïga and bog woodlands. The history of the territory is the main precondition for the integrity and a high number of species in the territory. Woodland burned down in a large wildfire, and then developed without a significant human economical activity for a long period of time (~ 100 – 140 years). Part of the territory was drained in 1970ties, but drainage impact is considered to be insignificant because the ditches are overgrown and do not function. Pilupe river in the nature reserve is not modified.

The nature reserve is an important territory of biologically valuable woodlands with localities of very rare mushroom, lichen and vascular species; there are at least 35 protected species. For several endangered species, this is an important locality not only in Latvia but also in Baltic and Scandinavian regions. There are protected plant species *Cinna latifolia, Listera cordata, Carex disperma, polypores Fomitopsis rosea, Phellinus nigrolimitatus,* lichens *Parmeliella triptophylla, Hypogymnia vittata*, as well as 13 rare and protected invertebrate species.

Woodlands are also suitable habitats for Russian flying squirrel *Pteromys volans*.

2. Threats to habitat and species conservation

- Fragmentation (logging was continued until 2000).
- Decrease of proportion of old *Populus tremula* (aspen) in the future can cause a disruption in the continuity of microhabitat availability for several rare and protected species associated to aspen.
- Groundwater table rise due to beaver dams in areas adjacent to the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation by increasing the area and integrity of protected habitats. Ensuring non-intervention in woodlands which have not reached the quality of protected habitat. Structure improvement in *Picea abies* plantations by targeted thinning – increasing the proportion of deciduous trees, especially *Populus tremula*. The development towards habitat types 9050 *Fennoscandian herb-rich forests with* Picea abies and 9010* *Western Taïga* is expected.

5. Necessary management and conservation measures

5.1. General measures

- Extension of the nature reserve territory, to include both shores of Pilupe river. River valley provides suitable conditions for rare vascular plant and invertebrate species (such as *Ena montana*). River valley also serves as species dispersal corridor.
- Regular monitoring of influence of beavers on protected woodland habitats. In case of influence, insertion of pipes or closed wooden trays into the beaver dams. The functioning of trays must be inspected several times a year.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	86.6	26.3	Poor.	Non-intervention.		86.6
9080*	Fennoscandian deciduous swamp woods	3.5	1.1	Favourable.	Non-intervention.		3.5
9010*	Western Taïga	100.5	30.5	Favourable.	Non-intervention.		100.5
9000	Potential Protected woodland habitat	66.0	20.1	-	Non-intervention. Structure improvement in *Picea abies* plantations by targeted thinning; increasing of proportion of deciduous trees, especially *Populus tremula*.	36.0	30.0
3260	Natural river reaches and river riffles	0.3	<1	Favourable.	Limitation of beaver activities in Pilupe river in cases when areas on the banks of the river are flooded.		0.3

Kadiķu nora | *Nature Reserve (LV0513900)*

1. Brief description

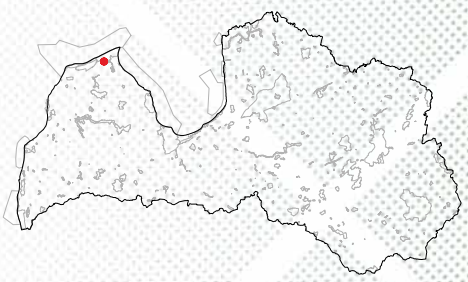
YEAR OF FOUNDATION: 1987.

LOCATION: Dundaga municipality, Dundaga rural territory.

AREA: 4 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kadiķu Nora Nature Reserve is located at the border of Slītere National park, in the upper part of Baltic Ice Lake coastal formations. The territory is established for the conservation of habitat types which are very rare in Latvia - *Juniperus communis* formations on heaths or calcareous grasslands, and Fennoscandian lowland species-rich dry to mesic grasslands. Habitats have developed as a result of long-term human economic activities – mowing and pasturing. These activities are also the main precondition for the further existence of the habitats.

The territory has been used as a meadow and pasture since 1930s. After management cessation, it overgrows. Juniper formations suffer from competition with native trees and shrubs, their shading, as well as from wildlife damage. Protected plant species *Dentaria bulbifera* can be found in nature reserve and also in surrounding forests.

The territory is located in an area which is poor in semi-natural grasslands. Therefore it is important as a stepping stone for the distribution of semi-natural grassland plant and animal species.

2. Threats to habitat and species conservation

- Grasslands overgrow due to lack of suitable management.
- Juniper growth ability is reduced due to wildlife damage.

3. Existing management of the protected habitats and its assessment

- In early 2000s, trees and shrubs other than junipers were felled in nature reserve. However, mowing or pasturing was not carried out, therefore the management was not successful. In 2014, the conservation status of the territory with particular attention to invertebrates was evaluated (LVAF project Nr. 1-08/169/2013). It was concluded that the role of the nature reserve for the conservation of rare and protected invertebrate species is low; invertebrate species associated with junipers were not found in the nature reserve.
- In the current condition, the nature reserve has not lost its value of nature conservation. Considering that grasslands with juniper formations are found only in 14 Natura 2000 territories in Latvia and this habitat type is one of the most threatened in Latvia, the elimination of the nature reserve can not be allowed. Juniper formations develop in the result of prolonged grazing, and they can be restored after the implementation of suitable management. Another important nature value of the territory is the grassland where juniper formation develops. It can be restored faster.

4. Priorities of management and conservation

- Alternative 1. Restoration of semi-natural grasslands and juniper formation habitats in all of the territory of nature reserve, and extension of nature reserve so that the area of grasslands after the restoration reaches at least 10 hectares. Areas suitable for restoration are located on the southern border of nature reserve, south of Grūži farmstead, Here, a few small grasslands and a shallow ditch system (significance of culture and history) are still preserved.
- Alternative 2. Elimination of nature reserve after the establishment of new nature reserve, with appropriate size, for the conservation of habitat types 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* (or 6230* *Species-rich* Nardus grasslands, *on siliceous substrates in mountain areas (and submountain areas, in Continental Europe))* and 5130 Juniperus communis *formations on heaths or calcareous grasslands*. This alternative also does not guarantee that landowners will continue the grassland management after the establishment of nature reserve, and grasslands will not be abandoned. Therefore, the basic precondition for the creation of a new nature reserve is to arrange ownership in a way that ensures proper management of grasslands in the long term.

- Alternative 3. Leaving the territory to natural development processes, ensuring the creation of protected woodland habitats in the long term. This alternative can only be realized if a new nature reserve is simultaneously established for the compensation of the lost area (see alternative 2).
- The choice of alternatives depends on the further development of nature conservation policy concerning semi-natural habitats (semi-natural grasslands, heaths, juniper formations, wooded grasslands). Alternative 1 would be the most appropriate for the current situation.

5. Necessary management and conservation measures

5.1. General measures

- Alternative 1: habitat restoration according to habitat management plan included in nature management plan of 2005 (after its adjustment to the current situation).
- Reparation of the access road for its use throughout the year.
- Alternatives 2 and 3: the first step is to find an appropriate territory where nature reserve can be created, and long-term management suitable for the particular nature values can be ensured. Only after the creation of new nature reserve, the current nature reserve can be eliminated (alternative 2), or left to the natural processes (alternative 3).

5.2. Specific measures – habitats (alternative 1)

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.3	32.5	Bad.	Restoration. Maintenance.	1.3	1.3
5130	*Juniperus communis* formations on heaths or calcareous grasslands	1.7	42.5	Bad.	Restoration. Maintenance.	1.7	1.7

Kaigu purvs | *Nature Reserve (LV0528500)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Jelgava municipality Līvbērze and Kalnciems rural territories.

AREA: 583 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Kaigu purvs Nature Reserve is located in an area rich in forests and mires, between Jelgava town and Jūrmala city. Nature reserve includes the northern part of Kaigu Mire. In the largest part of the mire (southern part), peat extraction is ongoing. In the southern part, nature reserve borders with areas where peat extraction is completed. In the eastern part it borders both with completed peat extraction fields and with completed clay quarries. From all sides, the nature reserve is surrounded by drained forests and agricultural areas, as well as by areas previously prepared for peat extraction. There are also several drainage ditches. Most part of the nature reserve is occupied by raised bog with hollows. In some places, particularly on mire edges, it is overgrowing with pines (*Pinus sylvestris*).

The area is very important for the protection of nesting sites of *Tringa glareola* and *Pluvialis apricaria*. The open part of the mire and the bog woodlands are particularly suitable as staging sites for Anser fabalis and *Anser albifrons*, during their autumn migration, as well as for staying of *Tetrao tetrix* and *Tetrao urogallus*. Protected plant species include *Betula nana*, *Trichophorum cespitosum*, various orchid species, and others.

2. Threats to habitat and species conservation

- The existence of wet habitats of the territory is adversely affected by drainage.
- The breeding of rare bird species in mire can be influenced by peat extraction in the direct vicinity of nature reserve (noise, disturbance).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Rewetting; maintenance of hydrological regime which is optimal for wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Detailed hydrological investigation of mire and its adjoining territory; development of plan for the improvement of mire hydrological regime.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	26.8	4.5	Favourable.	Rewetting (ditch blocking or filling), in complex with mire habitats. Non-intervention.	According to hydrological research results.	
7120	Degraded raised bogs	120.6	20.7	Bad.	Rewetting (blocking of ditches in NA part of mire). Felling of trees.	According to hydrological research results.	
7110*	Active raised bogs	421.4	72.3	Bad.	Rewetting (blocking of ditches in NA part of mire). Felling of trees.	According to hydrological research results.	

Kalēju tīrelis | *Nature Reserve (LV0503000)*

1. Brief description

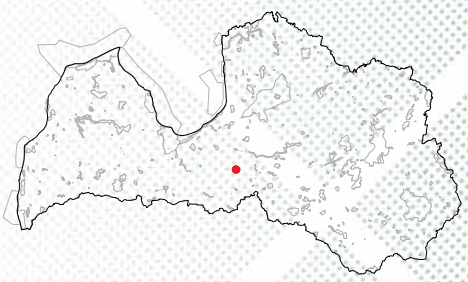
YEAR OF FOUNDATION: 1977.

LOCATION: Vecumnieki municipality Vecumnieki rural territory.

AREA: 41 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kalēju Tīrelis Nature Reserve is located between Vecumnieki village and Baldone town, in the southern edge of an extensive forest massif. The territory is established for the conservation of bog woodlands (which cover 60 % of the territory) and transition mires. There are protected species of orchids – *Dactylorhiza incarnata* and *Dactylorhiza maculata*.

2. Threats to habitat and species conservation

The existence of wet habitats of the territory is adversely influenced by hydrological regime changes.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Rewetting; maintenance of hydrological regime suitable for wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Semi-natural grasslands cover only small areas therefore their restoration is not a priority.

5. Necessary management and conservation measures

5.1. General measures

Hydrological regime research.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	25.1	61.2	Poor.	Hydrological regime research in complex with mire habitats; measures in accordance to research results.	25.1	
9080*	Fennoscandian deciduous swamp woods	0.6	1.5	Poor.	Non-intervention.		0.6
7140	Transition mires and quaking bogs	2.9	7.1	Poor.	Felling of trees; hydrological regime research; blocking of old ditches on necessity.	2.9	
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.4	1.0	Bad.	Restoration. Maintenance.	0.4	0.4

Kalna purvs | *Nature Reserve (LV0533700)*

1. Brief description

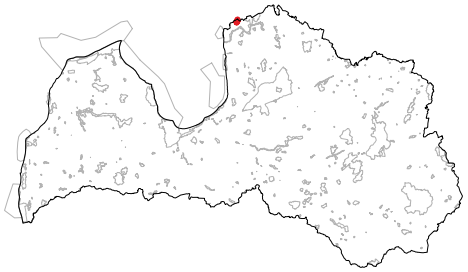
YEAR OF FOUNDATION: 2004.

LOCATION: Salacgrīva municipality, Ainaži town with its rural territory; Aloja municipality, Staicele town with its rural territory.

AREA: 352.8 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kalna purvs Nature Reserve is a part of large cross-border complex of woodlands and mires in North Latvia. It is established for the protection of raised bogs and nearby bog woodlands; these habitats cover 78 % of the territory. Western Taïga, deciduous swamp woods and degraded raised bogs still capable of natural regeneration cover smaller areas. The most important protected species is *Tetrao urogallus*; micro-reserve is established here for its protection. Rare plant species such as *Viola uliginosa* can be found in mires and wet forests of the nature reserve.

2. Threats to habitat and species conservation

Wet forests of the nature reserve may be influenced negatively by hydrological regime changes. Previously, drainage ditches were established in the surroundings of the territory, and they are still functioning. Two regulated watercourses of national significance begin in the southern part of the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting; maintenance of hydrological regime which is optimal for wet habitats.
- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological research of the entire mire complex is necessary, as well as evaluation of the possibilities of rewetting.
- Development of building project for complex rewetting in wet habitats and for water level stabilization in those parts of mires and bog woodlands which are influenced by drainage.
- Development of monitoring program and methods for the evaluation of habitat restoration success.

5.2. Specific measures

5.2.1. Species

Necessary management measures must be evaluated for the protection of Tetrao urogallus leks in area of 210 hectares.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	118.5	33.5	Poor.	Non-intervention, except rewetting, in complex with mires.		118.5
9080*	Fennoscandian deciduous swamp woods	9.0	2.5	Poor.	Non-intervention.		9.0
9010*	Western Taïga	25.1	7.1	Poor.	Non-intervention.		25.1
7150	Depressions on peat substrates	8.9	2.5	Favourable.	Rewetting (ditch blocking or filling up).	8.9	
7120	Degraded raised bogs	19.5	5.5	Bad.	Rewetting (ditch blocking or filling up).	19.5	
7110*	Active raised bogs	153.3	43.5	Favourable, poor.	Rewetting (ditch blocking or filling up).	153.3	

Kalnciema pļavas | *Nature Reserve (LV0528600)*

1. Brief description

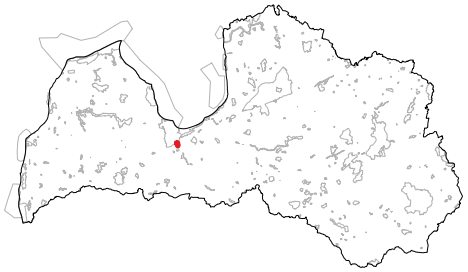
YEAR OF FOUNDATION: 2004.

LOCATION: Jelgava municipality Valgunde rural territory; Kalnciems town with its rural territory.

AREA: 170 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kalnciema pļavas Nature Reserve includes one of the best remained sectors of floodplain grasslands of Lielupe River, with the characteristic terrain – levees and moist depressions, where natural processes associated with spring floods have remained. The border of the nature reserve with Lielupe River is 2.7 km long. There are drainage ditch systems in grasslands. Part of the nature reserve is located in Vecbērze Polder which is included in the list of flood risk areas of national importance. The natural part of floodplain becomes flooded in springs. However, reedbeds cover the territory which is separated from natural floodplain by Kaļķi-Kalnciems road embankment. This area was once affected by beavers.

From the ecological point of view, the territory forms a complex with Kaļķu and Odiņu grasslands of the Ķemeri National Park. It is also an important bird concentration and breeding site. The territory is important for reduction of grassland fragmentation – it is a species dispersal corridor between Zemgale and Piejūra Geobotanical Districts. There are five protected plant species; the locality of *Gladiolus imbricatus* is particularly large.

The nature reserve is an Important Bird and Biodiversity Area. There are species typical of meadows and open areas, such as *Crex crex*, as well as several species of scrubby habitats, such as *Remiz pendulinus*. Several species are associated with wetlands and reedbeds, such as *Circus aeruginosus*. In total, 23 protected bird species have been found in the territory. Breeding species include *Tringa totanus, Tringa glareola*, and *Philomachus pugnax*, and others. Bird species are affected by the same factors as grassland habitats – overgrowth and increase of sward. Most species are negatively affected by grassland overgrowth and increase of sward. Influence of spring floods and increased moisture during the breeding are beneficial.

The area is rather intensively used by anglers.

2. Threats to habitat and species conservation

- Lack of grassland management; overgrowth with shrubs and reedbeds; eutrophication.
- Activities of beavers, causing moisture increase in grasslands. Short-time inundated areas develop which later dry out, but biodiversity decreases as grassland can not be restored without specific management.
- Birds are disturbed by visitors (anglers) in their early breeding season.
- The belt bordering with Lielupe river is overgrowing with reeds. As a result, river becomes inaccessible and unsuitable for breeding of waders and ducks.
- Fish (*Esox lucius, Abramis brama*) spawning becomes difficult or even impossible due to overgrowth of distributaries and small water bodies with dense emergent vegetation.

3. Existing management of the protected habitats and its assessment

- In 2006, in the framework of the EC LIFE program "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), about 90 hectares of grasslands in the territory were restored by mowing and cutting shrubs.
- According to Rural Support Service, in 2014 about 65 % of the total area of grassland habitats was managed in the scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Mowing with shredding and leaving grass on site has been carried out, which may have had a negative effect and promoted eutrophication. However, the managed area has decreased in recent years, and management was discontinued in alluvial grasslands due to excessive moisture.

4. Priorities of management and conservation

- The largest value of the nature reserve are plant communities of the grasslands, as well as habitats and waders, therefore the priority is grassland management and restoration up to the maximum possible area and their maintenance in favourable conservation status by using management methods which are beneficial for grassland-breeding waders and *Crex crex*.

- Maintenance and restoration of a hydrological regime that is necessary to ensure a favourable conservation status for grassland habitats and bird species populations.

5. Necessary management and conservation measures

5.1. General measures

- It is necessary to update the Nature management plan and evaluate the actual condition of semi-natural grasslands. Hydrological regime must be investigated and the necessity of changing it must be evaluated (including construction of culverts and cleaning of ditches). The optimal scenario for the current management of reedbeds must be evaluated – whether to maintain wetlands, or restore semi-natural grasslands using drainage. An ornithologist should be involved. The maintenance of the wetland should include the possibility to ensure restoration and management of semi-natural grassland in the rest of the territory and the maintenance of populations of grassland-breeding waders in a favourable conservation status. Grasslands between the river and the road must be restored, creating a habitat suitable for waders.
- It is necessary to balance the needs of nature protection and flood risk mitigation. Using financial support of EU fund and state resources, the reconstruction of Vecbērze Polder pumping station was carried out and completed from 2008 to 2010, in order to reduce flood risk in the area. To reduce flood risk, it is also necessary to ensure the water flow in the bypass channel of Vecbērze Polder (Kauguru Kanāls) and in drainage ditches.

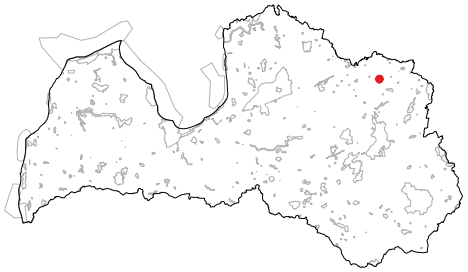
5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	3.9	2.3	Poor.	Restoration. Maintenance.	2.0	3.9
6450	Northern boreal alluvial meadows	85.7	50.4	Poor.	Restoration. Maintenance.	56.0	85.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	3.7	2.2	Poor.	Restoration. Maintenance.	1.3	3.7

One-time restoration measures are necessary in at least 60 ha large area of grassland habitats. The area must be clarified. Due to activities of beavers, hydrological situation has changed since 2005 when Nature management plan was developed. Also the grassland management situation has changed.

Kaļķu gārša | *Nature Reserve (LV0533600)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Alūksne municipality, Alsviķi rural territory.

AREA: 13 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Kaļķu gārša Nature Reserve is located in a woody area among several lakes. It includes woodlands, as well as small areas of overgrowing grasslands. The territory is important for the conservation of oak forests which are rare in north-east of Latvia. The territory was covered with forest already in the 18th century, but it was probably also used for pasturing. The woodland structure indicates that oaks (*Quercus robur*) were dominating species in the past. Nowadays, oaks are 91 – 160 years old, and gradually other tree species have established. The development towards mixed deciduous tree-spruce forest is expected in the course of succession.

The most important rare protected species in the territory are plants, such as *Carex montana* and polypores *Xylobolus frustulatus*.

2. Threats to habitat and species conservation

- Removal of old trees and dead wood.
- In the course of natural succession the regeneration of oak woodlands does not occur; transformation of habitat type 9160 *Sub-Atlantic and medio-European oak or oakhornbeam forests of the* Carpinion betuli to another protected habitat type is possible in the future.
- Overgrowth of grasslands.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Update of habitat maps according to the newest approaches.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	7.7	59.2	Bad.	Non-intervention.		7.7
9080*	Fennoscandian deciduous swamp woods	0.3	2.3	Poor.	Non-intervention.		0.3
6510	Lowland hay meadows	1.7	13.1	Bad.	Restoration. Maintenance.	1.7	1.7

Kaļķupes ieleja | *Nature Reserve (LV0514100)*

1. Brief description

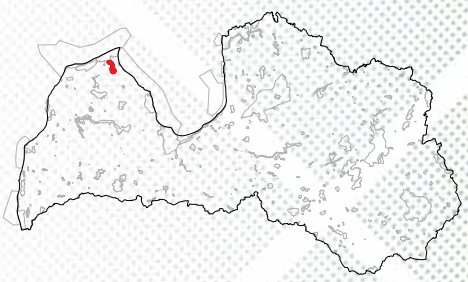
YEAR OF FOUNDATION: 1977.

LOCATION: Dundaga municipality Dundaga rural territory.

AREA: 740 ha.

NATURE MANAGEMENT PLAN: 2009 (2009–2019).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kaļķupes ieleja Nature Reserve is located in an area rich in forests, on the border between the Coastal Lowland and Kursa Upland. It includes a slope of Baltic Ice Lake coastal formations, with side-ravines, as well as valleys of Lorumupe, Pilsupe, Kaļķupe, and several other small rivers. The territory is very important for the conservation of Tilio-Acerion *forests of slopes, screes and ravines, Siliceous rocky slopes with chasmophytic vegetation*, and *Caves not open* to the public. Ten EU protected habitats have been found in the territory.

In total, 94 rare and protected species of plants and animals have been found in the nature reserve – 34 rare moss species, 20 bird, 15 invertebrate, 17 vascular plant species, as well as fish, mammal and cyclostome species. Nature reserve is one of the few territories in Latvia where *Taxus baccata* is found. Rare plant species of the territory include *Circaea lutetiana, Festuca altissima, Hordelymus europaeus, Orchis mascula Corydalis intermedia*, mosses *Scapania lingulata, Anastrophyllum minutum*, and others. Rare species of invertebrates include D*endroxena quadrimaculata*, *Ena obscura, Osmoderma eremita, Euphydryas aurinia*.

The nature reserve is one of the largest concentration sites of the red-breasted flycatcher (*Ficedula parva*) during the breeding period. *Crex crex* are breeding in grasslands. Other important bird species are *Bonasa bonasia, Ciconia nigra, Pernis apivorus, Glaucidium passerinum*, and others.

2. Threats to habitat and species conservation

- The quality of river riffles is reduced due to large woody debris in rivers. Beaver dams and fallen logs promote slowdown of the water flow, rise of the water temperature, decrease of dissolved oxygen, shore erosion or paludification (depending of the type of river longitudinal profile), cover of sand and gravel with sediments, and disappearance of habitats suitable for *Lampetra planeri* and salmonids.
- Grassland habitats are negatively affected by abandonment and lack of management, as well as by inappropriate management.
- The long-term existence of grassland habitats is threatened by their fragmentation and isolation, especially in the northern part of the territory (the current area of EU protected grassland habitats can not ensure the sustainable existence of grassland habitats and species).
- Forest habitats can be negatively affected by forestry activities, such as removal of dead wood.
- Nature values of outcrops can be threatened by trampling and scratching caused by visitors.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage protected habitats.
- According to Rural Support Service, in 2014 only small part of the grasslands were managed in scope of Rural Development Programme measure “Maintaining biodiversity in grasslands”.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and outcrop habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of grasslands will increase the overall biodiversity of the territory.
- It is necessary to prevent the development of beaver (*Castor fiber*) dams and inundations in riffle areas where riverbed is covered by pebbles and boulders, in order to ensure suitable conditions for migration and spawning of salmonids and *Lampetra planeri*.

5. Necessary management and conservation measures

5.1. General measures

- Review and update of forest habitat maps in accordance with the newest methods and approaches. Review of projects of Functional zoning and Individual regulations on protection and use.
- To ensure the sustainable conservation of grassland habitats, the increase of their total area must be considered by restoration of overgrown grasslands and establishment of grasslands in areas of former cultivated grasslands and fallow-lands. The possibility of including adjoining grasslands in the nature reserve should be evaluated.
- Removal of large woody debris from rivers and demolition of beaver dams in reaches where riverbed is covered by pebbles or boulders is necessary in order to maintain migration and spawning conditions and habitats for salmonids and Lampetra planeri.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	0.6	<1	Favourable.	Non-intervention.		0.6
91D0*	Bog woodland	13.8	1.8	Favourable.	Non-intervention.		13.8
9180*	Slope forests	505.7	68.3	Favourable.	Non-intervention.		505.7
9010*	Western Taïga	150.5	20.3	Favourable.	Non-intervention.		150.5
8310	Caves not open to the public	<0.1	<1	Favourable.	Non-intervention.		<0.1
8220	Siliceous rocky slopes	0.5	<1	Favourable.	Non-intervention.		0.5
6510	Lowland hay meadows	4.9	<1	Bad.	Restoration. Maintenance.	1.3	4.9
6410	*Molinia* meadows	3.0	<1	Bad.	Restoration. Maintenance.	1.7	3.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	7.1	1.0	Bad.	Restoration. Maintenance.	7.1	7.1
7220*	Petrifying springs	0.03	<1	Favourable.	Non-intervention.		0.03
7160	Fennoscandian mineral-rich springs and springfens	0.09	<1	Favourable.	Non-intervention.		0.09
3260	Natural river reaches and river riffles	14.0	1.9	Poor.	Removal or decrease of large woody debris (in order to ensure water flow rate).		0.5

Kapu ezers | *Nature Reserve (LV0530700)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Lubāna municipality Indrāni rural territory.

AREA: 17 ha.

NATURE MANAGEMENT PLAN: 2006 (2007–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Kapu ezers Nature Reserve is important for the conservation of oligo-mesotrophic lake an for the protections of its habitats - *Isoëtes lacustris, Sparganium gramineum*, and *Nuphar pumila* colonies. Most part of the nature reserve is occupied by Kapu lake and by woodlands. Shores of the lake are mostly muddy. Surroundings of the lake are visually impressive, with wooded banks, which can be both steep and gently sloping. Although the lake is a popular bathing place, this is one of the few clear-water (oligo-humic) lakes in Latvia without a pronounced recreational influence. Previously there was a duck farm at the lake, which is does not operate anymore, but it is possible that it has left an impact on lake water quality.

The lake is groundwater-fed, it is not exorheic but is connected to the nearby Salas lake. A connecting ditch was established in the beginning of 20th century or earlier. Water exchange between the two lakes depends on the wind direction. Historically, the lake's water level has been lower; now there is no need to restore it.

There are abundant *Isoëtes lacustris* and *Sparganium gramineum* stands in the lake. *Nuphar pumila* grows along the lake shore. In pine (*Pinus sylvestris*) woodlands, moss *Leucobryum glaucum* (rather rare in eastern Latvia) can be found. Protected bird species such as *Dryocopus martius* and *Ficedula parva* concentrate in the oldest woodlands. Three bat species including *Myotis dasycneme* are observed in the territory.

2. Threats to habitat and species conservation

- Potential increase of recreational and anthropogenic pressure (there is a recreation and tourism centre with capacity of 90 guests located 200 m from the lake but the capacity of infrastructure is suitable for up to 2000 people). Lake is rather intensively used by visitors from the nearest residential areas, as well as by anglers which adversely influence habitats of the nature reserve (excessive vehicle use, trampling, removal of dead wood, waste, etc.)
- Growth of trees and shrubs (*Salix* spp, *Frangula alnus, Padus avium*) directly on the shore of the lake. Their leaf and twig litter promotes the accumulation of organic matter and the intensification of lake eutrophication processes.
- Artificial replenishment of fish stocks with species that feed on benthic aquatic organisms by loosening bottom surface and causing release of bound phosphorus (*Abramis brama, Cyprinus carpio, Carassius carassius, Tinca tinca*) and promoting eutrophication. In lakes of this type, angling with fish feeding is not recommended.
- Removal of biodiversity structures (logs, snags, etc.) from woodlands reduces the possibility of improvement of structural quality and reaching the quality of protected woodland habitat (necessary for the reduction of habitat fragmentation in the country).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Conservation of ecological quality of Kapu lake.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Development and approval of Individual regulations on protection and use, to introduce lake habitat conservation and reduction of recreation pressure.
- For the conservation of lake ecological quality, it is necessary to carry out actions for the prevention of recreational load increase on the shores of the lake. It includes restriction of the number of boats in the lake, prevention of establishment of new footbridges and bathing sites, restriction of movement of cars in the nature reserve, restriction of constructing additional infrastructure elements. Toilets and waste bins must be ensured in the existing picnic site at south-western side of the lake. Activities for the attraction of visitors, including from the adjoining leisure complex are not allowed.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9000	Potential Protected woodland habitats	2.7	15.9	-	Non-intervention.		2.7
7140	Transition mires and quaking bogs	0.2	1.2	Favourable.	Non-intervention.		0.2
3130	*Lobelia-Isoetes* lakes	8.2	48.2	Poor.	Non-intervention. Removal of trees bent over the lake. Prevention of water level elevation by controlling of beavers and beaver dams in a ditch which connects Kapu and Salas lakes. Thinning of littoral reedbeds; removal of reed debris after the implementation of visitor flow reduction.	On necessity.	8.2

Katlešu meži | *Nature Reserve (LV0522100)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Alūksne municipality Liepna rural territory.

AREA: 151 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Katlešu meži Nature Reserve is located in a vast forest massif at Liepna river and it includes wet coniferous forests. The territory is important for the preservation of significant biodiversity in woodlands of *Populus tremula* and mixed forests, wet *Alnus glutinosa* forests, as well as bog woodlands with *Pinus sylvestris* and *Picea abies*. Bog woodlands in the nature reserve are considered to be a benchmark in the north-eastern part of Latvia. There are several micro-reserves in the territory of the nature reserve and in its vicinity that are established for the protection of rare bird species.

Several rare and protected species are found in the territory, such as plants *Cinna latifolia, Carex disperma, Epipogium aphyllum* (the only locality in Latvia). Rare bird species are *Tetrao tetrix* and *Tetrao urogallus*. There are several rare Clausiliidae species such as *Bulgarica cana, Cochlodina orthostoma* and *Clausilia cruciata*.

2. Threats to habitat and species conservation

If the existing protection regime and ecological conditions of the territory are preserved, there are no threats to the nature values of the area.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation and increasing the area and integrity of habitats by ensuring non-intervention in woodlands which have not yet reached the quality of protected habitats but where development towards protected habitats is expected.

5. Necessary management and conservation measures

5.1. General measures

- Update of maps according to the newest approaches.
- Development of Individual regulations on protection and use, in order to ensure the reduction of fragmentation.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	43.7	28.9	Poor.	Non-intervention.		43.7
9080*	Fennoscandian deciduous swamp woods	48.9	32.4	Poor.	Non-intervention.		48.9
9010*	Western Taïga	12.0	7.9	Favourable.	Non-intervention.		12.0
9000	Potential Protected woodland habitat	15.5	10.3	-	Non-intervention.		15.5
7140	Transition mires and quaking bogs	1.0	<1	Favourable.	Non-intervention.		1.0

Kaušņu purvs | *Nature Reserve (LV0505900)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Jēkabpils municipality Kalna rural territory.

AREA: 221 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Kaušņu purvs Nature Reserve is located in an area rich in forests, mires, protected and rare plant, animal, bird species. The territory is particularly valuable as the foraging and living area of large mammals – *Canis lupus* and *Lynx lynx*.

The territory is located at the Ērmīte river. It includes Ērmītes (Aklais) lake with its surroundings, and biodiverse woodlands – both drained and bog woodlands, and old woodlands of *Populus tremula* and *Picea abies*. The nature reserve is important for the conservation of raised bog which is degraded by drainage, as well as dystrophic lake and transition mire. Forests are important habitats for rare species of birds - *Bonasa bonasia, Dendrocopos leucotos, Picus canus*. Rare invertebrate species include *Lestes virens*. Rare moss and lichen species grow in forest, such as *Metzgeria furcata* and *Lejeunea cavifolia*.

2. Threats to habitat and species conservation

The existence of habitats of the territory is adversely affected by hydrological regime changes – previous drainage in nature reserve (ditches in forest blocks 137, 138) and adjoining woodlands.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Hydrological regime research in nature reserve and surrounding territories; development of a rewetting plan.
- Development of a monitoring programme for the evaluation of management success.
- Undisturbed course of natural processes in forest habitats, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps. It is possible that areas of protected woodland habitats are larger, particularly 9010* *Western Taïga*.
- Hydrology research in nature reserve an adjoining territories. Development of a construction project for rewetting. Plan must include mire vegetation monitoring for the evaluation of mire restoration success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	43.8	19.8	Bad.	Rewetting; removal of trees and shrubs from ditch berms; ditch blocking or filling.	43.8	
9010*	Western Taïga	11.5	5.2	Favourable.	Non-intervention.		11.5
7140	Transition mires and quaking bogs	1.1	<1	Favourable.	Rewetting; ditch blocking or filling.	1.1	
7120	Degraded raised bogs	4.1	1.8	Bad.	Rewetting; removal of trees and shrubs from ditch berms; ditch blocking or filling.	4.1	
7110*	Active raised bogs	5.6	2.5	Bad.	Rewetting; ditch blocking or filling.	5.6	
3160	Natural dystrophic lakes and ponds	2.3	1.0	Poor.	Reduction of water discharge from Ermīte lake.		2.3

Kārķu purvs | *Nature Reserve (LV0515300)*

1. Brief description

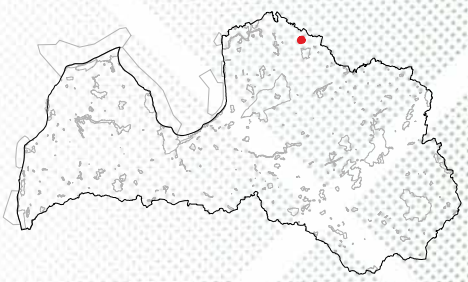
YEAR OF FOUNDATION: 1997.

LOCATION: Valka municipality Kārķi rural territory.

AREA: 309.3 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kārķu Purvs Nature Reserve includes Lake Bezdibeņa and the surrounding mire and woodlands. The territory is important for the protection of active raised bog, bog woodlands, and natural dystrophic lakes. The territory of nature reserve does not cover the entire area of mire. Ditches are established in mire.

Rare and protected plant species found in the mire include *Betula nana* and *Drosera intermedia*. The territory is important for rare bird species such as *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Mergus albellus, Grus grus, Pluvialis apricaria, Numenius arquata, Tringa glareola, Dryocopus martius,* and *Lanius excubitor*. Two micro-reserves are established in the nature reserve and adjoining areas for the protection of *Tetrao tetrix*.

2. Threats to habitat and species conservation

The existence of wet habitats of the territory may be adversely affected by hydrological regime changes. There are ditches in part of the mire.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Rewetting; maintenance of hydrological regime optimal for wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	67.4	21.8	Favourable.	Rewetting, in complex with mires (ditch blocking or filling).	67.4	
7150	Depressions on peat substrates	11.1	3.6	Favourable.	Rewetting (ditch blocking or filling).		11.1
7120	Degraded raised bogs	15.2	4.9	Bad.	Rewetting (ditch blocking or filling).	15.2	
7110*	Active raised bogs	183.1	59.2	Poor.	Rewetting (ditch blocking or filling).	183.1	
3160	Natural dystrophic lakes and ponds	16.6	5.4	Poor.	Non-intervention.		16.6

Kinkausku meži | *Nature Reserve (LV0533800)*

1. Brief description

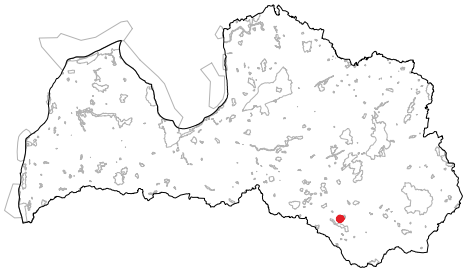
YEAR OF FOUNDATION: 2004.

LOCATION: Ilūkste municipality Dviete rural territory.

AREA: 231 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kinkausku meži Nature Reserve is located in an area rich in woodlands and mires, between Daugava and Dviete rivers, and it includes micro-reserve of the lesser spotted eagle *Aquila pomarina*. The territory is located in terrain depression among undulating elevations. In eastern part it is crossed by Viesīte river which is regulated here. There are also other ditches which discharge water away from the nature reserve. The territory is important for the conservation of bog woodlands and swamp woods. In relatively open areas, there are rare plant communities with *Carex pauciflora, Carex dioica, Carex lepidocarpa, Sphagnum* spp., etc. Ditches are partly overgrown and do not function in some parts. This has a positive effect on habitats.

In the nature reserve there is one of the largest localities of *Betula nana* in Latvia, and other rare and protected plant species, such as *Carex paupercula, Anastrophyllum hellerianum*, orchids, and others.

2. Threats to habitat and species conservation

Changes in hydrological regime may adversely affect the wet habitats of the territory.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Maintenance of hydrological regime optimal for wet habitats. Rewetting, if necessary.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Evaluation of the necessity of rewetting.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Bog woodland	224.4	97.2	Poor.	Non-intervention. Rewetting, if necessary.	According to research results.	224.4
91D0*	Fennoscandian deciduous swamp woods	2.4	1.0	Poor.	Non-intervention.		2.4

Klagatu purvs | *Nature Reserve (LV0533500)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Limbaži municipality Umurga rural territory.

AREA: 152 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Klagatu purvs Nature Reserve includes two mires with small mineral-ground islets, and surrounding forests. The territory is important for the protection of active raised bogs, transition mires and quaking bogs, and bog woodlands. It is located in a part of Ziemeļvidzeme region where relatively large areas of oak (*Quercus robur*) woodlands can be found. In transition mire, there is an abundant population of *Liparis loeselii*; also other orchid species can be found such as *Dactylorhiza incarnata, Dactylorhiza maculata, Hammarbya paludosa*. Rare and protected lichen species grow in woodlands, such as *Arthonia spadicea*. Two micro-reserves are established in the nature reserve for the protection of *Ciconia nigra* and *Pandion haliaetus*. Also *Tetrao urogallus* can be found.

2. Threats to habitat and species conservation

Succession in oak woodlands is leading towards development of other protected woodland habitats.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Hydrological regime research; evaluation of the necessary measures for its maintenance, taking into account the drainage systems in the adjoining area.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	37.6	24.7	Poor.	Non-intervention. Rewetting (ditch blocking or filling).	According to research results.	37.6
9160	Oak forests	11.2	7.4	Poor.	Non-intervention.		11.2
9000	Potential Protected woodland habitat	2.8	1.8	-	Targeted thinning to increase admixture of broadleaf trees.	2.8	
9080*	Fennoscandian deciduous swamp woods	4.7	3.1	Poor.	Non-intervention.		4.7
7140	Transition mires and quaking bogs	34.9	22.9	Favourable.	Non-intervention.		34.9
7110*	Active raised bogs	44.9	29.5	Poor.	Non-intervention. Rewetting (ditch blocking or filling).	According to research results.	44.9

Klaucānu un Priekulānu ezeri | *Nature Reserve (LV0505700)*

1. Brief description

YEAR OF FOUNDATION: 1957.

LOCATION: Jēkabpils municipality Kalns rural territory.

AREA: 200 ha.

NATURE MANAGEMENT PLAN: 2006 (2006–2013).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Klaucānu un Priekulānu ezeri Nature Reserve is located in a relatively wooded area. It includes Lakes Klaucānu and Priekulānu, and surrounding territories, mainly forests, which cover about half of the territory. Forests are characterized by a large variety of growth conditions and intensive use in the past.

The territory is important for the protection of water chestnut *Trapa natans*. It is a relict species of the Atlantic period. In Latvia, *Trapa natans* is found north of the main species distribution range. In Lake Klaucānu, *Trapa natans* grows in floating-leaf vegetation zone almost all around the lake. In Lake Priekulānu, it forms abundant colonies in lake bays and in some places also at the shore. Lake Pokratas is another locality of this species in Latvia.

Lakes Klaucānu and Priekulānu are exorheic, rather shallow, and correspond to criteria of protected habitat. In some places, their hydrological regime is influenced by beavers (*Castor fiber*). Most of the lake shores are muddy. There is 2-6 m thick layer of gyttja in lakes. Lake Priekulānu is mostly affected by nutrient rich waters which are discharged by Podvāze river and which promote eutrophication, reduction of depth, and can lead to complete overgrowth of the lake. Lake Klaucānu is not significantly affected.

The terrestrial part of the nature reserve is diverse, with forests of several site types, therefore also the bird fauna is rich. In total, 24 EU protected bird species have been found in the nature reserve, such as *Bonasa bonasia, Circus aeruginosus, Scolopax rusticola, Picoides leucotos*, and others. Of invertebrates, five indicator species of woodland key habitats and five rare and protected species have been found, for example, *Leucorrhinia caudalis*. In addition to *Trapa natans*, four more rare and protected plant species can be found, for example, *Scolochloa festucacea* and *Agrimonia pilosa*. In the 1960s, the rare moss species *Hamatocaulis lapponicus* was sampled in the nature reserve. However, there is no new information on this locality.

Semi-natural grasslands are almost completely overgrown; small openings have remained mainly between the two lakes. The territory is located at the southwestern edge of South-Eastern Geobotanical District. Here, semi-natural grasslands are small and highly fragmented. Although the grasslands of the territory are not nationally important, their conservation is important for the biodiversity conservation in the region and in the nature reserve. Species composition of the overgrowing grasslands indicates on a good restoration potential, and restored grasslands will be important for the maintenance of landscape-ecological integrity and important for the increase of biodiversity in the territory.

2. Threats to habitat and species conservation

- Uncontrolled use of water vehicles. Even a single use of a motorboat or personal watercraft can cause excessive waves in water which can wash out the root system of *Trapa natans* and mechanically break their stems.
- As the access to the lake is difficult, activities of anglers are concentrated in few places. In result, the influence on *Trapa natans* in these sites is increased – plants are pulled out with fishing rods and nets.
- In both lakes, measurements have been made for gyttja extraction. If gyttja will be extracted, in both lakes plants can be destroyed both mechanically, and by resuspension which can reduce the vitality of plants.
- Lakes are not susceptible to small amounts of biogene input (from the catchment area). However, potential input of large volumes of biogenes can deteriorate the growth conditions of *Trapa natans* – water pH will rise due to algal "blooms", water transparency during the vegetation season will decrease, sediment accumulation will increase, causing overgrowth of lakes in a short period. Currently, there are no such threats.
- Nutrient rich water discharged by Podvāze river causes small and potentially preventable impact on Lake Priekulānu. Taking into account the slow retention time (one month) and the position of Podvāze river mouth, all the inflowing phosphorus during the vegetation season is accumulated in lake.

- Nature values of woodlands and habitats of rare bird and invertebrate species are degraded due to removal of dead wood, withering and withered trees.
- Overgrowth and paludification of grasslands due to management cessation.

3. Existing management of the protected habitats and its assessment

- Over time, the conservation measures were based on various prohibitions such as prohibitions on angling and boating, both in the entire lake and in individual locations. Currently, no management measures are carried out in lakes.
- According to Rural Support Service, in 2014 grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Conservation of the ecosystem structure of the nature reserve by improvement of habitat quality (particularly lakes) and maintenance of suitable conditions for their associated species. Measures for *Trapa natans* population conservation are particularly important.
- Reduction of biogene input into lakes.
- Restoration of grassland habitats in the maximum possible area (up to 32 hectares) and their maintenance in favorable conservation status.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types 9050 *Fennoscandian herb-rich forests with* Picea abies, 91E0* *Alluvial forests with* Alnus glutinosa *and* Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae), and 9010* *Western Taïga* is expected.

5. Necessary management and conservation measures

5.1. General measures

- Habitat inventory and mapping according to the newest methods and approaches.
- Restrictions on angling and use of water vehicles – prohibition of movement of any floating structures through *Trapa natans* colonies, except for measures accepted by the competent nature conservation institutions (research and management).
- Modification of nature reserve borders.
  - In places where borders are located along the bank of the lake, they must be moved 50 m away from the lake, in order to prevent potential impacts from shore to the lake.
  - It is necessary to include alluvial forests which currently are located outside the territory (at southern part of Lake Klaucānu).
  - Maintenance of the existing infrastructure; the lake should not be additionally promoted as a recreation site. Development of grassland restoration and management plan. Plan must include: evaluation of grassland habitat creation in their historical territories (about 32 ha) and evaluation of shallow ditch systems and their possible restoration.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	41.0	20.5	Poor.	Limitation of *Nuphar lutea, Potamogeton sp.*, and *Myriophyllum spicatum* – mowing from boat, preventing the overgrowth of *Trapa natans* colonies.		On necessity.
91E0*	Alluvial forests	7.4	3.7	Poor.	Non-intervention.		7.4
9000	Potential Protected woodland habitat	25.5	12.6	-	Non-intervention.		25.5
6000	Grasslands to be restored	32.0	16.0	-	Restoration. Maintenance.	32.0	 32.0

Klāņu purvs | *Nature Reserve (LV0517000)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Ventspils municipality Pope and Tārgale rural territories.

AREA: 1615 ha.

NATURE MANAGEMENT PLAN: 2006 (2006–2016).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 427 of 12 May 2009, Regulation on Individual Protection and Use of the Klāņu Purvs Nature Reserve.

Klāņu purvs Nature Reserve includes a complex of Klāņu Mire, Pūņu (Stāvu) Mire and Dziru Mire, as well as Lake Klāņezers – a mesotrophic lake of lagoon type. The territory is important for the conservation of mires (which occupies almost third of the territory) as well as for conservation of swamp woods and deciduous swamp woods. Lake shores are covered with woodlands and mires in some places; in other areas they are open, wet and with peaty substrate. The western site of lake borders with an open mire. Northern shore is sandy or with boulders in some places.

In total, there are nine EU protected habitat types and more than 80 rare and protected plant and animal species in the nature reserve. The most important vascular plant species are *Cypripedium calceolus, Rhynchospora fusca, Eleocharis multicaulis, Liparis loeselii*, and *Corallorhiza trifida*. There are also several rare moss species such as *Fossombronia foveolata, Preissia quadrata, Riccardia chamaedryfolia*, and others. There are rare invertebrate species such as *Euphydryas aurinia* and *Orthetrum brunneum*. Four protected snail species have been found in the wet *Alnus glutinosa* forests. Several micro-reserves have been established in the nature reserve and in its immediate vicinity for the protection of bird species. The most important bird species in the territory are *Bonasa bonasia, Haliaeetus albicilla, Tetrao tetrix*, and *Tetrao urogallus*.

The nature reserve is important for the conservation of habitat type 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) at a regional scale. From landscape-ecological point of view, the territory is a stepping stone for the spread of species in the northern part of Kurzeme Geobotanical District.

2. Threats to habitat and species conservation

- One of the biggest problems is the change of hydrological regime which has occurred at different periods of time. In the 1920s and 1930s, Klāņu-Bušnieku Canal was excavated, causing water level drop by 20-30 cm in Lake Klāņu. Later, drainage of surrounding forests was carried out. Drainage ditches were excavated in the southern part of two mires, negatively affecting the mire. Dzīru Mire has been destroyed as an active raised bog.
- Grassland habitats are threatened by management cessation, which promotes habitat fragmentation and reduces the size and quality of species habitats. The management of grasslands is difficult due to their small areas and the lack of access roads, especially if financial support for grassland maintenance is not available.

3. Existing management of the protected habitats and its assessment

- In 2006, in the framework of the LIFE project "Implementation of Mire Habitat Management Plan for Latvia" (LIFE04 NAT/LV/000196) the stabilisation of natural hydrological regime was successfully carried out – peat dams were established on ditches.
- According to Rural Support Service, in 2014 most of the grasslands were not managed in the scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Prevention of further degradation of habitats of mires and wet forests; promotion of stabilization of the hydrological regime and the restoration of natural habitats.
- Conservation and restoration of suitable habitats for particular rare plant species.
- Habitat quality improvement in *Tetrao urogallus* leks.
- Maintenance of the optimal water level in Lake Klāņu.
- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

- Semi-natural grassland habitats must be conserved in their maximum possible area (including historical grasslands) and maintained in favourable conservation status. The territory is located in the northern part of Kurzeme Geobotanical District where semi-natural grasslands are highly fragmented. Therefore, grassland conservation is important for the biodiversity conservation and for the reduction of grassland habitat fragmentation in the region (especially for habitat type 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae)). It is a stepping stone for species distribution, feeding site for invertebrates and mammals, and habitat for protected plant species. The nearest protected areas, which also include habitat type 6410, are Platenes Purvs and Popes Zāļu Purvs Nature Reserves. In order to ensure biodiversity in these areas, it is necessary to ensure the species distribution possibilities among them. In case of restoration of historical grasslands, grassland area within the nature reserve would be sufficient for the maintenance of biodiversity in the territory.

5. Necessary management and conservation measures

5.1. General measures

- Modify the border of the territory, including mire areas east of the nature reserve.
- Dižgrāvis Ditch – it is necessary to clarify the possibility to construct a water flow regulator and its influence on protected habitats in the lake and its surroundings.
- Raise the runoff threshold along the southern tail-end of Riesta Dam, after the research and evaluation.
- Impact assessment of the previous mire restoration work (construction of dams) – continuation of the monitoring the vegetation and water level that was started during the LIFE project.
- Cleaning of the Klāņu-Bušnieku Canal (including its part along the border of the territory) is not permissible in the territory of nature reserve to the extent that water level of the lake may decrease.
- Inventory of the historical grasslands, elaboration of grassland restoration plan, restoration of grasslands in the maximum possible area.

5.2. Specific measures

5.2.1. Species

Management activities of *Tetrao urogallus* leks in area of at least 10 hectares are necessary to ensure species conservation.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	154.7	9.6	Poor.	Non-intervention, except rewetting, in complex with mire.		154.7
9080*	Fennoscandian deciduous swamp woods	254.4	15.8	Poor.	Non-intervention.		254.4
9010*	Western Taïga	26.9	1.7	Favourable.	Non-intervention.		26.9
7140	Transition mires and quaking bogs	16.8	1.0	Favourable.	Non-intervention.		16.8
7120	Degraded raised bogs	19.2	1.2	Bad.	Rewetting by ditch blocking or filling-up.	19.2	
7110*	Active raised bogs	422.4	26.2	Favourable.	Non-intervention.		422.4
6410	*Molinia* meadows	14.4	<1	Bad.	Restoration. Maintenance.	14.4	14.4
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.5	<1	Bad.	Restoration. Maintenance.	1.5	1.5
6210	Semi-natural dry calcareous grasslands	1.4	<1	Bad.	Restoration. Maintenance.	1.4	1.4
6000	Grasslands to be restored (overgrown with shrubs and forest).	10.0	<1	-	Restoration. Maintenance.	10.0	10.0
3260	Natural river reaches and river riffles	0.3	<1	Poor.	Non-intervention (until completion of study on the optimal water level in lake).		0.3
3130	*Lobelia-Isoetes* lakes	59.6	3.7	Poor.	Non-intervention.		59.6

Semi-natural grasslands must be restored in their maximum possible area which is at least 25 hectares, including historical grasslands, where currently there are scrubs and new forests. Restoration measures include felling of trees and shrubs, stump and root milling, restorative mowing and/or grazing. These areas are not clarified yet (must be clarified when developing a grassland restoration plan).

Klešniku purvs | *Nature Reserve (LV0510300)*

1. Brief description

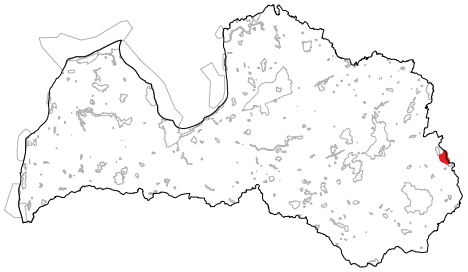
YEAR OF FOUNDATION: 1957.

LOCATION: Cibla municipality, Līdumnieki rural territory.

AREA: 3345 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Klešniku purvs Nature Reserve is located at the border of Latvia and Russia, in the western edge of a wide mire and forest massif. The territory is important for the protection of raised bogs, bog woodlands and natural dystrophic lakes. It includes also part of the Pītelis Lake in Latvia. Both mire and lake continue on the other side of the border.

In mires of the nature reserve, dwarf birch *Betula nana* can be found. *Cypripedium calceolus* grows in bog woodlands. Rare invertebrate species include *Carabus menethriesi*. The wide open mire is a suitable breeding place for waders, which are found here in high density and diversity. Three micro-reserves for the protection of the *Tetrao urogallus* have been established. However, leks overgrow with *Picea abies* due to drainage carried out in the surrounding of the mire. Other important bird species are *Bonasa bonasia, Circus pygargus, Ciconia nigra, Tetrao tetrix*.

2. Threats to habitat and species conservation

- The wet habitats of the territory are adversely affected by changes in the hydrological regime, such as renovation, maintenance and further construction in the area adjacent to the nature reserve.
- The intensive use of mire for picking of berries, resulting in the accumulation of municipal waste.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Providing optimal hydrological regime for mire and forest habitats.
- Undisturbed course of natural processes in natural and mire forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

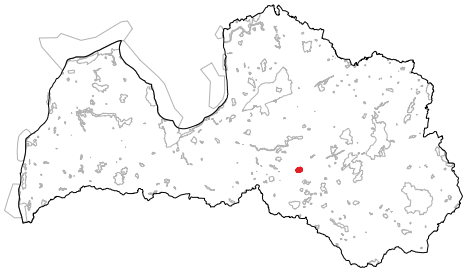
- Clarification of habitat areas and their condition.
- Hydrology research; elaboration of building project for the rewetting of mires and bog woodlands.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	438.8	13.1	Poor.	Non-intervention, except rewetting in bog woodlands and mires.		438.8
9080*	Fennoscandian deciduous swamp woods	94.0	2.8	Poor.	Non-intervention.		94.0
7150	Depressions on peat substrates	66.9	2.0	Favourable.	Non-intervention.		66.9
7120	Degraded raised bogs	20.8	<1	Bad.	Rewetting.	20.8	
7110*	Active raised bogs	1244.9	37.2	Favourable.	Non-intervention.		1244.9
3160	Natural dystrophic lakes and ponds	132.7	4.0	Poor.	Non-intervention.		132.7

Klintaine | *Nature Reserve (LV0529300)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Pļaviņas municipality Klintaine rural territory.

AREA: 83 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE AREAS: part of Klintaines sausgultne un karsta kritenes Geological and Geomorphological Object.

Klintaine Nature Reserve is located at Daugava River, and it includes woodlands, grasslands and dolomite outcrops between Daugava, Plešupīte and Klintaine (also known as Maltupīte or Būda) rivers. In springtime in Klintaine river, water flows through a ravine and disappears in several sinkholes without reaching the river Daugava. Part of the water discharges through cracks in dolomite quarry in a territory near river Daugava.

The nature reserve is important for the protection of calcareous (dolomite) outcrops, lowland hay meadows and dry grasslands on calcareous substrates. 2 to 4 meters high dolomite outcrop creates a border with Daugava River in the entire area of the nature reserve. Part of the grasslands has not been grubbed up, and they are regularly managed. This is one of the five Natura 2000 sites in Latvia where habitat type 6110* *Rupicolous calcareous or basophilic grasslands of the* Alysso-Sedion albi can be found. The territory is on the sector of Daugava where there are only few Natura 2000 sites, and therefore it is also stepping stone facilitating species dispersal among Ābeļi and Daugavas ieleja Nature Reserves. Several rare and protected plant species have been found in the nature reserve, such as *Pulsatilla patens, Ajuga genevensis, Gentiana cruciata, Asperula tinctoria, Laserpitium prutenicum, Anemone sylvestris,* and others. Important invertebrate species are *Meloe violaceus, Parnassius mnemosyne, Lasius fuliginosus*. Breeding of *Alcedo atthis* has been observed in the territory.

2. Threats to habitat and species conservation

- Grasslands are threatened by management cessation, fragmentation, and eutrophication from surrounding agricultural lands which are intensively managed.
- Daugava river cliffs are threatened by collapses, landslides and erosion in the entire area of nature reserve.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 habitat type 6510 *Lowland hay meadows* was managed partly (about 40 % of the total area) in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Restoration of grasslands in their maximum area; their maintenance in favourable conservation status.
- Maintenance of populations of protected species in favourable conservation status.
- Undisturbed course of natural processes in outcrops of calcareous bedrocks and sinkholes.

5. Necessary management and conservation measures

5.1. General measures

- Development of Nature management plan including the assessment of possibilities of grassland habitat restoration and management, particularly regarding the condition and necessary management measures for habitat type 6110* *Rupicolous calcareous or basophilic grasslands of the* Alysso-Sedion albi.
- Evaluation of the possibilities of extension of the nature reserve, including the grassland adjacent to the north-eastern border at Tīrumgalvji farmstead, and grasslands adjacent to the northern border, from "Mucenieki" farmstead to "Mežākas". The purpose of the extension is to increase the area of protected semi-natural grasslands, increase landscape ecological stability thus ensuring the sustainability of their protection.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
8210	Calcareous rocky slopes	0.17	<1	Favourable.	Non-intervention.		0.17
6510	Lowland hay meadows	18.5	22.3	Bad.	Restoration. Maintenance.	7.4	18.5
6210	Semi-natural dry calcareous grasslands	0.7	<1	Bad.	Restoration. Maintenance.	0.7	0.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.1	<1	Poor.	Restoration. Maintenance.	0.1	0.1
6110*	Rupicolous calcareous or basophilic grasslands	0.02	<1	Poor.	Restoration. Maintenance.	0.02	0.02
3190	Lakes of gypsum karst	0.2	<1	Favourable.	Non-intervention.		0.2

Krapas gārša | *Nature Reserve (LV0533900)*

1. Brief description

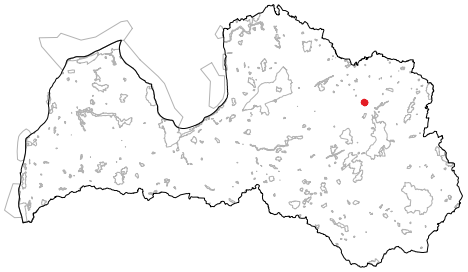
YEAR OF FOUNDATION: 2004.

LOCATION: Gulbene municipality Dauksti rural territory.

AREA: 207 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Krapas gārša Nature Reserve is part of a small forest massif near Gulbene town, near Lake Valme. The territory is crossed by Krustalīce river.

The nature reserve is important for the conservation of western Taïga, wet broadleaved forests, swamp woods, and alluvial forests. Several rare and protected species of vascular plants, mosses, and lichens have been found here, such as *Glyceria lithuanica, Thelotrema lepadinum, Lobaria pulmonaria,* and others.

Several micro-reserves established for the protection of protected woodland habitats are located outside the nature reserve, as well as biologically very important woodlands with rare moss, lichen and mushroom species, which currently are without a legal protection.

2. Threats to habitat and species conservation

- Habitat quality is reduced by forestry activities – selective felling (sanitary, selection and thinning felling), removal of dead wood and withering trees.
- Beaver dams and fallen logs promote slowdown of the water flow, rise of the water temperature, decrease of dissolved oxygen, shore erosion or paludification, pebbles and boulders being covered with sediments, and disappearance of habitat.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types *Fennoscandian herb-rich forests with* Picea abies and *Fennoscandian hemiboreal natural old broad-leaved deciduous* forests (Quercus, Tilia, Acer, Fraxinus or Ulmus) rich in epiphytes is expected.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps according to the latest methods and approaches.
- Development and approval of Individual regulations on protection and use, in order to ensure non-intervention in woodlands.
- Removal of large woody debris in order to ensure water discharge and to reduce bank erosion.
- Extension of the protected nature territory by inclusion of biologically-valuable woodlands adjoining the nature reserve.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	4.2	2.0	Favourable.	Non-intervention.		4.2
9010*	Western Taïga	29.6	14.3	Favourable.	Non-intervention.		29.6
91E0*	Alluvial forests	7.7	3.7	Favourable.	Non-intervention.		7.7
9080*	Fennoscandian deciduous swamp woods	92.3	44.6	Favourable.	Non-intervention.		92.3
9000	Potential Protected woodland habitat	5.3	2.6	-	Non-intervention.		5.3
3260	Natural river reaches and river riffles	0.5	<1	Poor.	Maintenance of water discharge: removal or reduction of large woody debris, demolition of beaver dams in river reaches where pebbles or boulders in the riverbed indicate on high quality river rapids. Once per five years.	0.3	

Kreiču purvs | *Nature Reserve (LV0519100)*

1. Brief description

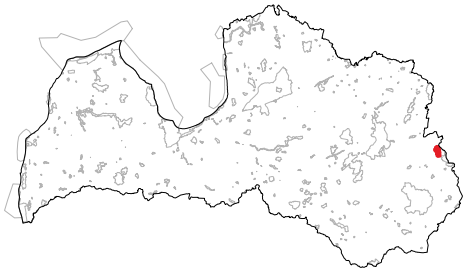
YEAR OF FOUNDATION: 1999.

LOCATION: Kārsava municipality Gološeva rural territory, Cibla municipality Blonti rural territory.

AREA: 2273 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kreiču purvs Nature Reserve is located at the border of Latvia and Russia, in the western edge of a wide mire and forest massif. The territory is important for the protection of raised bogs, bog woodlands and natural dystrophic lakes. It includes Kreiču Mire with mineral ground islets, and Lake Rajevka. The western part of the nature reserve is a suitable habitat for woodpeckers as well as a stopover site for wolves on their way from Russia. Three micro-reserves for the protection of *Tetrao urogallus* have been established in the territory. Due to the drainage carried out in the bog and in the vicinity of micro-reserves, the hydrological regime has been adversely affected, and leks overgrow with *Picea abies*. Other important species in the nature reserve are *Bonasa bonasia*, *Tetrao tetrix, Caprimulgus europaeus*. Examples of rare and protected plant species are dwarf birch *Betula nana* and moss *Cephaloziella elachista*.

2. Threats to habitat and species conservation

- The wet habitats of the territory are adversely affected by changes in the hydrological regime, such as renovation, maintenance and further construction in the area adjacent to the nature reserve.
- The hydrological regime of the territory can be affected negatively by extraction of dolomite and peat that is planned in Mērdzene rural territory.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to protect or manage habitats.
- Groundwater monitoring system is established to study the potential impact of drainage of adjacent areas associated with the planned dolomite and peat extraction in Mērdzene rural territory.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural mire and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Rewetting and maintenance of optimal hydrological regime for habitats of mires and wet forests.

5. Necessary management and conservation measures

5.1. General measures

- Development of Nature management plan, update of habitat maps, especially for woodland habitats.
- Research into the hydrological regime and development of mire and bog woodland rewetting project.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	348.5	15.3	Poor.	Rewetting in complex with mire habitats. Non-intervention.	~150 (according to research results)	198
9160	Oak forests	1.9	<1	Favourable.	Non-intervention.		1.9
9080*	Fennoscandian deciduous swamp woods	6.5	<1	Favourable.	Non-intervention.		6.5
9010*	Western Taïga	4.9	<1	Poor.	Non-intervention.		4.9
7120	Degraded raised bogs	88.3	3.9	Bad.	Rewetting by ditch blocking or filling-up.	88.3	
7110*	Active raised bogs	1509.2	66.4	Poor.	Rewetting by ditch blocking or filling-up.	1509.2	
3160	Natural dystrophic lakes and ponds	42.9	1.9	Poor.	Non-intervention.		42.9

Krojas meži | *Nature Reserve (LV0534000)*

1. Brief description

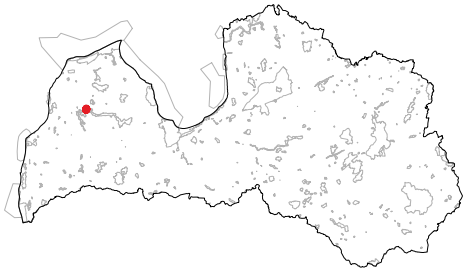
YEAR OF FOUNDATION: 2004.

LOCATION: Ventspils municipality Ugāle rural territory.

AREA: 19 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Krojas meži Nature Reserve includes lower reach of Kroja river and adjoining woodlands on steep slopes of the both river banks. The territory is extended in the north-south direction. In south, it borders with Abavas senleja Nature Park. Pluču tīrelis Nature Reserve is located half a kilometer away in the eastern direction.

The site is important for the protection of old boreal spruce (*Picea abies*) forest (Western Taïga). A significant value is also the natural, unmodified Kroja river. There is a rich ground vegetation with *Allium ursinum*, rare moss and lichen species characteristic to natural forests, as well as large volumes of dead wood and biologically-old trees. Spring discharges and seepages can be found in woodlands.

2. Threats to habitat and species conservation

Forest habitat fragmentation caused by logging.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by non-intervention in woodlands which have not yet reached the quality of protected habitats. Development towards habitat types *Fennoscandian herb-rich forests with* Picea abies and *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* is expected.

5. Necessary management and conservation measures

5.1. General measures

Establishment of a single protected area together with Abavas senleja Nature Reserve and the adjoining nature reserves.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	14.1	74.2	Poor.	Non-intervention.		14.1
7160	Fennoscandian mineral-rich springs and springfens	0.08	<1	Favourable.	Non-intervention.		0.013
3260	Natural river reaches and river riffles	0.7	<1	Poor.	Removal of woody debris.		0.7
91E0*	Alluvial forests	1.3	6.8	Favourable.	Non-intervention.		1.3

Kupravas liepu audze | *Nature Reserve (LV0501500)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Alūksne municipality Liepna rural territory.

AREA: 33 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Kupravas liepu audze Nature Reserve is located in a wide forest area. It is established for the protection of old broad-leaved forests. Woodlands are dominated by linden (Tilia cordata) of various ages, with admixture of *Fraxinus excelsior, Quercus robur, Acer platanoides, Ulmus glabra*, and *Picea abies*. There are many rare plant species in the nature reserve, including *Cinna latifolia, Festuca altissima, Dentaria bulbifera*, protected moss species *Lejeunea cavifolia*, and rare lichen species, such as *Usnea florida*.

2. Threats to habitat and species conservation

Forest management (thinning).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Increase of proportion of broadleaf trees in spruce plantations.

5. Necessary management and conservation measures

5.1. General measures

Update of habitat maps.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	8.8	26.7	Poor.	Non-intervention.		8.8
9000	Potential Protected woodland habitat	2.9	8.7	-	Increase of proportion of broadleaved trees in *Picea abies* plantations.	2.9	

Ķirbas purvs | *Nature Reserve (LV0521800)*

1. Brief description

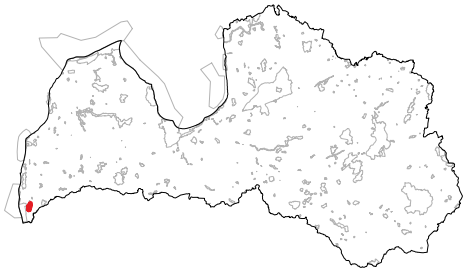
YEAR OF FOUNDATION: 1999.

LOCATION: Rucava municipality Rucava rural territory.

AREA: 1095 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ķirbas purvs Nature Reserve is located in an area rich in woodlands and mires, close to several other protected nature territories. The territory is important for the conservation of alkaline fens, active raised bogs, bog woodlands, and swamp woods. The territory is rich in protected plant species – *Carex buxbaumii, Carex davalliana, Cladium mariscus, Hedera helix, Schoenus ferrugineus, Trichophorum caespitosum, Hydrocotyle vulgaris, Dactylorhiza baltica, Listera cordata, Dactylorhiza ochroleuca*, and others. There are also rare invertebrate species, such as *Vertigo geyeri, Vertigo genesii,* and others. The territory is an important staying and breeding site for *Bonasa bonasia, Circus pygargus*, and *Tetrao tetrix*.

In eastern part, the territory borders with peat extraction fields. In part of the nature reserve, drainage influence can be observed.

2. Threats to habitat and species conservation

Wet habitats (mires, forests) are adversely affected by peat extraction and associated drainage in the adjoining territory.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Restoration and maintenance of hydrological regime optimal for mire and woodland habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Hydrological regime research (including complex hydrology research of the nearby located protected nature territories – Ķirbas purvs, Ječu purvs, and Rucavas īvju audze Nature Reserves). Planning and implementation of rewetting.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	158.0	14.4	Poor.	Reduction of dam influence on the border with peat extraction fields. Non-intervention.	According to hydrological research.	
9080*	Fennoscandian deciduous swamp woods	30.6	2.8	Poor.	Non-intervention.		30.6
7230	Alkaline fens	149.8	13.7	Bad to Favourable.	Rewetting (dam blocking or filling). Felling of trees and shrubs (in complex with rewetting) – in north part of nature reserve. Felling of regrowth of shrubs and deciduous trees (at least once per 5 years).	12.0 12.0	 12.0
7210*	*Cladium mariscus* fens	0.2	<1	Favourable	Non-intervention.	0.2	
7120	Degraded raised bogs	20.3	1.9	Poor.	Reduction of dam influence on the border with peat extraction fields.	According to hydrological research.	
7110*	Active raised bogs	172.2	15.7	Favourable	Reduction of dam influence on the border with peat extraction fields.	According to hydrological research.	

Lapiņu ezers | *Nature Reserve (LV0531500)*

1. Brief description

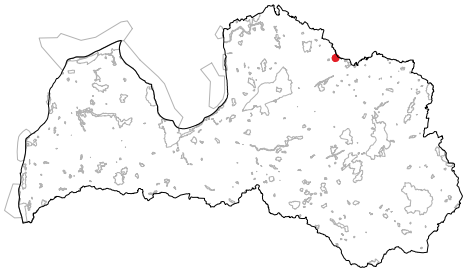
YEAR OF FOUNDATION: 2004.

LOCATION: Valka municipality Zvārtava rural territory.

AREA: 1 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Lapiņu ezers Nature Reserve lays in a terrain depression in the complex of wooded inland dunes near the Gauja River. It includes the small Lapinu lake, surrounding transition mires and quaking bogs, and a small belt of forest. The lake is overgrowing and practically inaccessible to visitors. The water level in lake was once significantly lowered. Two ditches are inflowing in the lake, and there is one outflow which had been regulated in the past but now it has become natural. The area is important for the protection of rare moss species – *Hamatocaulis lapponicus* and *Hamatocaulis vernicosus*. Also other rare plant species can be found here, for example, *Carex loliacea* and *Dactylorhiza maculata*.

2. Threats to habitat and species conservation

Bog woodlands can be adversely affected by previous drainage and by hydrological regime changes.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	0.6	60.0	Favourable.	Non-intervention.		0.6
7140	Transition mires and quaking bogs	0.4	40.0	Favourable.	Non-intervention.		0.4
3160	Natural dystrophic lakes and ponds	0.13	13.0	Favourable.	Non-intervention.		0.13

Laugas purvs | *Nature Reserve (LV0518700)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Krimulda municipality Lēdurga rural territory; Limbaži municipality Vidriži rural territory.

AREA: 755 ha.

NATURE MANAGEMENT PLAN: developed in 2017 (2017–2029).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Laugas purvs Nature Reserve includes the central part of the Lauga Mire, as well as surrounding wet forests. In the north, the mire neighbors with the Vidriži Mire. In the western side of the mire, drainage ditches were created in 1960s, to drain the bog and to extract the peat. As a result, water level in one of the bog lakes, Lake Višezers, was lowered by 1,5 meters. Peat extraction is continues also nowadays. A small river, Viršupe, flows out of the bog. In its lower reaches, it is called Ķīšupe.

There are six EU protected habitat types, and raised bog covers most of the area. In total, all mire habitats occupy 85% of the area.

There are 34 protected species: 20 protected bird species, three vascular plant, seven mammal, four invertebrate species and one species of fish. This territory is important for the conservation of several rare bird species. *Pluvialis apricaria*, *Tetrao tetrix, Tringa glareola* are breeding here. Geese, ducks and cranes stay here during the migration. Several protected plant species can be found in the nature reserve. For example, *Trichophorum cespitosum* which is found only in the western and northern parts of the country.

2. Threats to habitat and species conservation

Network of drainage ditches surrounding the nature reserve; and negative influences from neighbouring peat milling fields – they cause drainage of the bog, mire habitat degradation, overgrowth with pines. Lake Višezers is degraded due to operation of drainage system causing lake water level lowering.

3. Existing management of the protected habitats and its assessment

Between 2000 and 2004, five peat and wood dams of different sizes were constructed outside the nature reserve, at its border. These dams hold water and raise water level in Višezers. Dams have been built for the maintenance of necessary moisture in the large cranberry fields managed by the research farm "Gundegas". As a result, the water level in Lake Višezers is restored, and the hydrological regime of the bog in the surroundings of lake is partially restored, and the influence of dams can be assessed as positive. However, the technical condition and durability of the dams should be considered as insufficient.

4. Priorities of management and conservation

Construction of dams for hydrology maintenance and restoration, in nature reserve and adjacent territory.

5. Necessary management and conservation measures

5.1. General measures

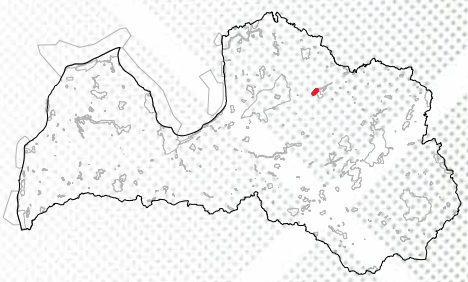
- It is necessary to revise and modify the borders of the territory, to include protected habitats near the border of nature reserve and belong to the ecosystem of the Lauga Mire.
- Long-term agreement or contract on the establishment of additional dams and their further maintenance, alongside the existing dams of the research farm "Gundegas", to promote the maintenance of the moisture regime in Natura 2000 site and outside of it.
- Blocking of 114 dams in the bog to stabilize the hydrological regime and to restore degraded habitats.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010	Western Taïga	6.2	<1	Poor.	Non-intervention.		6.2
91D0*	Bog woodland	79.9	10.6	Poor.	Non-intervention. Improvement of hydrological regime in woodlands in eastern part of the Lauga Mire.	 9.9	70.0
7140	Transition mires and quaking bogs	0.79	<1	Favourable.	Non-intervention. Rewetting, in complex with raised bog rewetting (construction of dams).	 0.58	0.21
7120	Degraded raised bogs	61.5	8.1	Bad.	Rewetting (construction of dams). Removal of trees.	22.79 3.45	
7110*	Active raised bogs	551.45	73.0	Favourable.	Non-intervention. Rewetting (construction of dams).	 73.84	477.6
7150	Depressions on peat substrates	13.6	1.8	Favourable.	Non-intervention.		13.6
3160	Natural dystrophic lakes and ponds	10.01	1.3	Poor.	Stabilization of hydrological regime in Lake Višezers (optimal level is 58,3 to 58,5 m) – replacement of temporary dams with persistent dams on drainage ditches, according to Nature management plan. Non-intervention (Lodes Lake).	10.01	 4.7
3260	Natural river reaches and river riffles	2.86	<1	Poor.	Non-intervention.		2.23

Launkalne | *Nature Reserve (LV0528200)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Smiltene municipality Launkalne rural territory.

AREA: 172 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: 2007 (2007–2013).

Launkalne Nature Reserve includes the upstream reach of Rauza river and adjoining areas on both sides of the river. The territory is extended in the northeast-southwest direction.

The most important nature values of the territory are the natural river riffles and their invertebrate species – freshwater pearl mussel *Margaritifera margaritifera* and thick shelled river mussel *Unio crassus*. There are also other rare invertebrate species, for example, *Catocala fraxini* and *Pedicia rivosa*. Ichthyocenosis is dominated by small-size cold-water fish species – *Phoxinus phoxinus, Noemacheilus barbatulus, Salmo trutta, Gobio gobio,* and *Cottus gobio*. Rauza river is an important habitat for *Lutra lutra* and *Lampetra planeri*.

From landscape-ecological point of view, the territory could become important for the conservation of semi-natural grasslands in North Vidzeme Geobotanical District. The currently known area of EU protected grassland habitats in the territory is small. However, if the grasslands will be restored in the area of existing low-value perennial grasslands, together with Šepka and Rauza Nature Reserves the territory will form a biodiversity conservation and species distribution corridor. Orchids such as *Dactylorhiza maculata* can be found in grasslands.

Very rare lichen *Dermatocarpon luridum* is found on stones in the river.

There is a pig farm outside the nature reserve but in direct vicinity to river. It significantly influences the ecosystems of nature reserve. Also a small hydro power plant (HPP) – Jeiska Mill – is located just at the border of the reserve.

2. Threats to habitat and species conservation

- Beaver dams and fallen logs in river promote slowdown of the water flow, pebbles and boulders being covered with sediments, and the disappearance of habitats suitable for *Margaritifera margaritifera*. The vitality of *Margaritifera margaritifera* is reduced due to warmed up water in beaver inundations and the decrease of dissolved oxygen. Beaver dams and large woody debris in the river act as barriers to migration of fish, including *Salmo trutta* which are hosts for glochidias and ensure the dispersal of *M. margaritifera*.
- The existence of *Margaritifera margaritifera* and *Unio crassus* is threatened due to biogene pollution from the pig farm "Kalna Ēķītes".
- Operation of Jeiska HPP causes water level changes. During the summer low-water periods, water temperature in Jeiska reservoir increases, dissolved oxygen decreases, causing the decrease in pearl mussel vitality.
- The amount of *Salmo trutta* in the river is insufficient for the development of sustainable population of *M. margaritifera*.
- Fish movement is hindered due to improperly designed piles of stones in the river.
- Overgrowth of semi-natural grasslands with shrubs; fragmentation.

3. Existing management of the protected habitats and its assessment

- In the years 2005 and 2006, a project supported by Latvian Environmental Protection Fund "Protection of Pearl Mussel Habitats" was carried out in the nature reserve. It included reduction of the amount of beavers (hunting; demolition of beaver dams), and release of Salmo trutta. The reduction of beavers was efficient only during the project implementation, and the population recovered after it.
- Management of river riffle areas has been episodic and based on individual projects; habitat quality and condition of rare species populations is deteriorating again after the end of project.
- According to Rural Support Service, in 2014 97 % of the known area of habitat types 6210, 6450 and 6510 was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Implementation of management and protection measures in complex with measures in Rauza and Šepka Nature Reserves.
- Maintenance of river riffles suitable for *Margaritifera margaritifera* and *Unio crassus*, and their juveniles.
- Maintenance of water discharge; prevention of clogging of river reaches suitable for pearl mussels and prevention of pearl mussels being buried with sediments.
- Provision of the guaranteed water discharge in summer low-water period downstream of Jeiska HPP.
- Reduction and prevention of water pollution.
- Creation and maintenance of sustainable *Margaritifera margaritifera* population in river.
- Restoration and maintenance in favourable conservation status of semi-natural grasslands in an area of at least 50 hectares. Restoration of semi-natural grasslands in the area of current perennial grasslands is necessary. Grassland restoration is a priority if it is planned and organised in the drainage basin of Rauza river and their tributaries (Šepka and Rauza Nature Reserves). Otherwise, the restoration efficiency will be low.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of merging three Nature Reserves – Rauza, Šepka and Launkalne – in one Natura 2000 territory because Rauza river valley (where two nature reserves are located) and Ludze (tributary of Rauza) river valley form a single physical and geographical territory.
- Development of a new nature management plan.
- Development and approval of Individual regulations on protection and use.
- Inventory of grasslands; development of grassland restoration and management plan. The currently known area of semi-natural grasslands is only 5.5 hectares but the total area of grasslands is over 50 hectares. According to the cartographic material, these areas can be restored to semi-natural grasslands. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered.
- Evaluation of drainage systems which are located in catchment area of rivers of nature reserve, and pollution created by them. Development of action plan for its reduction or prevention.
- Regular monitoring of the river and removal of beaver dams. Cooperation with experts of State Forest Service and hunter collectives for the reduction of the amount of beavers. The hunting of beavers and the elimination of their population is permissible.
- Monitoring of the population of *Margaritifera margaritifera* in order to assess the condition of population and the efficiency of restoration measures.
- Maintenance of Jeiska HPP in accordance to operation rules, ensuring the guaranteed water discharge in river also during the summer low-water period, and as far as possible decreasing water level and discharge fluctuations downstream of HPP.
- Inventory of the impact of pig farm "Kalna Ēķītes" on the water course. In cooperation with owners of the farm – development and implementation of pollution reduction measures and further prevention measures.
- Repair or elimination of water flow regulator in centre of Rauziņa village, in accordance to expert conclusions.

5.2. Specific measures

5.2.1. Species

- Population condition of *Margaritifera margaritifera* in nature reserve is assessed as bad.
- Artificial infestation of *Salmo trutta* with glochidia once per two years; evaluation of artificial breeding of pearl mussel juveniles.
- Prevention of beaver activities in river reaches where pearl mussels can be found or where suitable conditions can be created.
- Restoration of multi-aged population of *Salmo trutta* in the river by regular (annual) release of juvenile fish.
- Monitoring and result control of all the activities.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	3.0	1.7	Poor.	Non-intervention.		3.0
9160	Oak forests	0.6	<1	Poor.	Non-intervention.		0.6
91E0*	Alluvial forests	1.4	<1	Poor.	Non-intervention.		1.4
6510	Lowland hay meadows	0.3	<1	Poor.	Restoration. Maintenance.	0	0.3
6450	Northern boreal alluvial meadows	4.4	2.6	Poor.	Restoration. Maintenance.	0	4.4
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.8	<1	Poor.	Restoration. Maintenance.	0	0.8
6000	Grasslands to be restored	At least 50	29.1	-	Restoration. Maintenance.	50	50
3260	Natural river reaches and river riffles	7.0	4.1	Bad.	Removal of beaver dams and clogs. Creation of river rapids – downstream of Jeiska Mills; downstream of Zadiņi farmstead; in ditch inflowing in Rauza river, opposite to Lejas Ēķītes.	0.1	Annually in the whole river reach included in nature reserve (7 km).

According to the currently available information, protected grassland habitats are properly managed. However, data are outdated, and the repeated evaluation of condition of grasslands is necessary. The information on grassland restoration has not been not specified in nature management plan of 2007, however, it has been emphasized that grasslands must be maintained in their maximum area for breeding of birds (*Crex crex*) and as a foraging site for birds of prey. To increase grassland biodiversity, it is necessary not only to maintain their open condition but also to restore their plant species and vegetation diversity. Therefore, the inventory of all grasslands of the nature reserve is necessary in order to assess their restoration potential to semi-natural grasslands. It is expected that grassland restoration will be necessary in an area of at least 50 hectares.
Annual grassland management measures are necessary in the entire area of EU protected grassland habitats (5.5 ha), as well as in restored grassland areas. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Lāču purvs | *Nature Reserve (LV0505200)*

1. Brief description

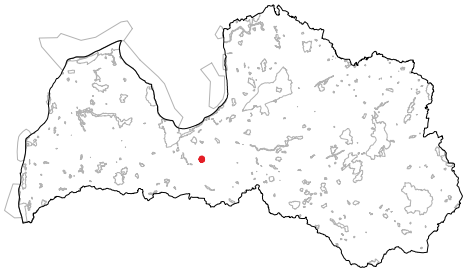
YEAR OF FOUNDATION: 1977.

LOCATION: Ozolnieki municipality Sidrabene rural territory.

AREA: 206 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Lāču purvs Nature Reserve is located in an area rich in woods, between Jelgava and Baldone towns. The territory was established for the protection of bog woodlands and transitional mires and quaking bogs. There are drained forests and regulated water courses in the surroundings. The partly open area of the mire is small, overgrown with pines (*Pinus sylvestris*). Transitional mire has overgrown with reeds (*Phragmites australis*). The territory is important for the rare and protected bird species, such as *Bonasa bonasia, Tetrao tetrix, Grus grus*, and others.

2. Threats to habitat and species conservation

- Habitats of wet forests wetland have been negatively affected by past drainage and hydrological regime changes.
- Renovation of drainage systems in forests adjoining the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of hydrological regime optimal for habitats of wet forests.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	145.6	70.7	Poor.	Non-intervention.		145.6
9080*	Fennoscandian deciduous swamp woods	19.9	9.7	Favourable.	Non-intervention.		19.9
9010*	Western Taïga	6.2	3.0	Bad.	Non-intervention.		6.2
7140	Transition mires and quaking bogs	1.3	<1	Bad.	Non-intervention.		1.3
7110*	Active raised bogs	29.0	14.1	Poor.	Non-intervention.		29.0

Lepuru purvs | *Nature Reserve (LV0501100)*

1. Brief description

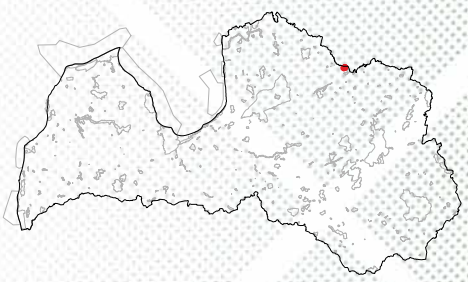
YEAR OF FOUNDATION: 1977.

LOCATION: Ape municipality, Gaujiena rural territory.

AREA: 325 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Lepuru purvs Nature Reserve is located in the forests and bog rich area at the border with Estonia, near River Gauja. Mire has developed in the depression between hills. Previously the wet woodlands and bog woodlands in the north of the mire has been drained.

The territory is important for the protection of the eastern type of raised bog, transition mires, bog woodlands and old pine forests in bog islets on mineral substrate. It is an important habitat for several bird species, including *Pernis apivorus*. The rare *Salix myrtilloides* is found in the bog.

2. Threats to habitat and species conservation

Hydrology changes in the surrounding of mire (renovation of drainage system, establishment of new ditches).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed natural environment.

5. Necessary management and conservation measures

5.1. General measures

The development of a construction project for the rewetting, assessing the status of the hydrological regime and planning the necessary habitat restoration measures, if the restoration of bogs and bog woodlands is assessed as useful and technically feasible.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	50.4	15.5	Favourable to poor.	Non-intervention. Rewetting, jointly in woodlands and mires.	9	41.4
9010*	Western Taïga	2.8	<1	Favourable.	Non-intervention. Rewetting, jointly in woodlands and mires.	According to research results.	2.8
7140	Transition mires and quaking bogs	3.7	1.1	Favourable.	Non-intervention.		3.7
7110*	Active raised bogs	150.2	46.2	Favourable.	Non-intervention.		150.2

Lielais Mārku purvs | *Nature Reserve (LV0518600)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Gulbene municipality Dauksti rural territory.

AREA: 929 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Lielais Mārku purvs Nature Reserve includes a raised bog with hollows, as well as bog woodlands and drained woodlands along the mire edges. Lake Ušurs is located in the western part of the territory. In the southwest, the mire borders with peat extraction fields. Two regulated rivers flow out of the bog (Nidrupīte and Grūžupīte rivers). Northern and western parts of the mire, as well as adjoining areas are drained. In the northern part, mire has been burned, and now overgrows with pines (*Pinus sylvestris*).

The territory is particularly suitable for breeding of various waterbirds and waders. Species which are staging during the migration or breeding are *Anser fabalis, Milvus migrans, Tetrao tetrix, Pluvialis apricaria, Anas querquedula, Numenius arquata*, and others. Protected invertebrates *Nehalennia speciosa* and *Leucorrhinia pectoralis* have been observed at bog lakes.

This is one of the few localities of *Trichophorum cespitosum* (species characteristic for western Latvia) in the eastern part of Latvia. Several rare orchid species can be found in the territory, for example, *Orchis mascula*. The nature reserve is also important for large mammals.

2. Threats to habitat and species conservation

The existence of habitats of the territory is affected negatively by hydrological regime changes, including the maintenance of ditches in the edge zone, peat extraction and the associated drainage in adjoining areas (outside the nature reserve).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage forest and mire habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Rewetting; maintenance of hydrological conditions which are optimal for wet habitats (mires and forests).

5. Necessary management and conservation measures

5.1. General measures

- Hydrological research of the entire complex of mire. Evaluation of the possibilities and necessity of rewetting. Development of a construction project for rewetting and for the water level stabilization in bog woodlands and parts of mire which are affected by drainage.
- Adjustment of the borders of the nature reserve by including parts of mire which are located outside the nature reserve.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	127.4	13.7	Poor.	Rewetting (blocking or filling of ditches).	According to research results.	
9010*	Western Taïga	2.6	<1	Favourable.	Non-intervention.		2.6
7150	Depressions on peat substrates	16.3	1.7	Favourable.	Non-intervention.		16.3
7120	Degraded raised bogs	8.7	<1	Bad.	Rewetting (blocking or filling of ditches)	According to research results.	
7110*	Active raised bogs	593.7	64.0	Favourable.	Rewetting (blocking or filling of ditches)	According to research results.	
3160	Natural dystrophic lakes and ponds	1.2	<1	Favourable.	Non-intervention.		1.2

Lielais Pelečāres purvs | *Nature Reserve (LV0512200)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Krustpils municipality Atašiene rural territory; Līvāni municipality Rudzāti rural territory; Riebiņi municipality Sīļukalns rural territory, and Varakļāni municipality Varakļāni rural territory.

AREA: 5684 ha.

NATURE MANAGEMENT PLAN: 2016 (2017–2027).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Lielais Pelečāres purvs Nature Reserve is located in an extensive massif of mires, most of which is occupied by Teiči Mire. Together with the Teiči Mire, the Great Pelečāres Mire is included in a list of internationally important wetlands. The most part of the territory is occupied by Lielais Mire, as well as by several smaller mires. In south-western part Daguma (Deguma or Pelečāres) lake is located, as well as several small lakes. Nature reserve is drained by several watercourses and drainage ditches. Mineral-ground islets in the mire are biologically valuable and peculiar.

The nature reserve is very important for the conservation of active raised bogs, transitional mires and quaking bogs, and bog woodlands. Ten protected habitats of EU importance have been found in the nature reserve, covering 88.14% of the total area of the territory. There are 55 rare and protected species – seven species of vascular plants, six lichen, one moss, one mushroom, two mammal, nine invertebrate, one amphibian and 28 bird species. Protected vascular plants include *Hypericum hirsutum* and *Diphasium complanatum*. Very rare lichen species Cladonia parasitica has been found here. In the southern part of the territory, two species that are new in Latvia have been found – lichen *Peltigera extenuata* and mushroom *Pronectria robergei*. The open landscape is a very important breeding site for waders. Surrounding woodlands are suitable for woodpeckers and owls. The nature reserve is one of the few places in Latvia, where a regular breeding of *Aquila chrysaetos* is observed. The most important bird species of the area are *Bonasa bonasia, Strix uralensis, Aegolius funereus, Tetrao urogallus, Aquila pomarina,* and others. Important mammal species in the territory are *Sicista betulina, Canis lupus*, and *Ursus arctos*.

2. Threats to habitat and species conservation

- The existence of the habitats of the territory is adversely affected by drainage that was carried out years ago, as well as by possible hydrological regime changes including maintenance of ditches in the borderline area of the nature reserve and adjoining areas.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats of forests and mires.

4. Priorities of management and conservation

- Rewetting. Maintenance of hydrological regime optimal to wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- A hydrological study of the entire complex of mires is necessary, and the possibilities of rewetting must be evaluated. A construction project must be developed for the complex rewetting of wet habitats and for

the water level stabilization in bog woodlands and in parts of mire which are influenced by drainage. A negative influence on nature values of the nature reserve must be prevented when planning the maintenance or renovation of drainage systems in the forests adjacent to the nature reserve, and separate management plan must be developed in accordance with the recommendations of species and habitat expert.

- A programme and methods for the restoration success monitoring must be developed.
- In micro-reserves included in the nature reserve, management in accordance to recommendations of ornithologist is necessary as there are not only *Tetrao urogallus* (7 – 21 males) but also other bird species, and establishment of a micro-reserve is necessary for their conservation. For example, *Glaucidium passerinum*.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	1042.6	18.3	Poor.	Rewetting, in complex with mire habitats.		
9080*	Fennoscandian deciduous swamp woods	0.9	<1	Poor.	Non-intervention.		0.9
9020*	Broad-leaved deciduous forests	14.4	<1	Poor.	Non-intervention.		14.4
9160	Oak forests	24.6	<1	Poor.	Non-intervention.		24.6
9010*	Western Taïga	23.4	<1	Poor.	Non-intervention.		23.4
7160	Fennoscandian mineral-rich springs and springfens	7.8	<1	Poor.	Non-intervention.		7.8
7140	Transition mires and quaking bogs	10.8	<1	Favourable.	Rewetting, in complex with 7120 – ditch blocking or filling, felling of trees.	10.8	
7120	Degraded raised bogs	25.6	<1	Bad.	Rewetting – ditch blocking or filling, felling of trees.	25.6	
7110*	Active raised bogs	3810.2	67.0	Favourable.	Rewetting – ditch blocking or filling, felling of trees.	3810.2	
3160	Natural dystrophic lakes and ponds	54.9	<1	Favourable.	Non-intervention.		54.9

Lielais purvs | *Nature Reserve (LV0504800)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Gulbene municipality Ranka rural territory; Smiltene municipality Variņi rural territory.

AREA: 150 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Lielais purvs Nature Reserve is located in a large massif of forests. Outflow of Vizla river is located in the mire. Mire is influenced by regulation of natural watercourses and drainage of woodlands which have contributed to the overgrowth of mire which has previously been larger in size. The territory is important for the conservation of bog woodlands, as well as for the protection for capercaillie (*Tetrao urogallus*) leks. Protected plant species include *Hammarbya paludosa* and *Salix myrtilloides*.

2. Threats to habitat and species conservation

- Habitats of the territory may be adversely affected by hydrological regime changes, including maintenance of ditches in adjoining territories.
- *Tetrao urogallus* lek sites are adversely affected by overgrowth of bog woodlands with spruces (*Picea abies*) and the development of dense layer of dwarf shrubs.

3. Existing management of the protected habitats and its assessment

Maintenance and improvement (decrease of proportion of spruces) of *Tetrao urogallus* leks was carried out in 2007.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Rewetting; maintenance of hydrological conditions which are optimal for wet habitats.
- Restoration and maintenance of *Tetrao urogallus* leks.

5. Necessary management and conservation measures

5.1. General measures

Complex hydrological research of the entire complex of mires; evaluation of possibilities and necessity of rewetting. Development of a construction project for rewetting and stabilisation of water level in bog woodlands and in parts of mires which are influenced by drainage.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	91.3	60.8	Poor.	Rewetting (ditch blocking or filling); evaluation of influence of rewetting on transition mire habitats.	According to research results.	
					Restoration and maintenance of *Tetrao urogallus* leks.	On necessity.	
9010*	Western Taïga	6.6	4.4	Poor.	Non-intervention.		6.6
7140	Transition mires and quaking bogs	5.4	3.6	Poor.	Felling of trees.		5.4

Lielais un Pemmes purvs | *Nature Reserve (LV0518500)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Limbaži municipality Limbaži rural territory; Krimulda municipality Lēdurga rural territory.

AREA: 2625 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Lielais un Pemmes purvs Nature Reserve includes raised bog whose northern part is called Lielais Mire, but southern part – Pemmes Mire. In some places in the mire, also vegetation of transition mire (western part of Lielais Mire and Linezers Lake) can be found, as well as pools, mineral-ground islets, forest roads and ditches. In the 19th century and the early part of the 20th century, there were farmsteads and arable lands on mire islets. Groups of islets were connected by roads, with ditches on both sides. Nowadays, all islets are overgrown with forest.

The territory is important for the protection of raised bog. Open mire area, as well as mire islets and peninsulas covered with forests are suitable for breeding of rare birds of prey – this is one of the few breeding sites of short-toed snake-eagle *Circaetus gallicus* in Latvia. Open areas (lakes and pools) as well as wet areas and swamps are suitable for waders and waterbirds. Significant bird species found in the nature reserve are *Bonasa bonasia, Ciconia nigra, Tetrao tetrix*. Rare plant species – *Trichophorum cespitosum*.

It is likely that the northern part of the mire has been drained in the 19th century. There are ditches that extend far into the bog. Probably, to some extent, they promoted the overgrowth of mire with pines. The level of the Linezers Lake has been lowered, and because of this the areas of transition mires and quaking bogs have increased. The rivers in the vicinity are straightened and deepened, also influencing the present hydrological regime of the nature reserve.

2. Threats to habitat and species conservation

Habitats of mire and wet forests are influenced negatively by drainage ditches. In future, hydrological regime of the territory may be affected negatively by ditch maintenance (restoration) in the vicinity of nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats of mires and forests.

4. Priorities of management and conservation

- Rewetting; maintenance of hydrological conditions optimal for wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological research in the entire mire; evaluation of possibilities of rewetting. Development of construction project for the complex rewetting and stabilization of water level in bog woodlands and in mire parts which are affected by drainage.
- Development of a monitoring programme and methods for the evaluation of rewetting success.
- Update of habitat maps and areas.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	506.4	19.3	Poor.	Rewetting (ditch blocking or filling up), in complex with raised bog.	506.4	
9160	Oak forests	0.03	<1	Poor.	Non-intervention.		0.03
9020*	Broad-leaved deciduous forests	3.2	<1	Poor.	Non-intervention.		3.2
9010*	Western Taïga	97.2	3.7	Favourable.	Non-intervention.		97.2
7150	Depressions on peat substrates	0.4	<1	Favourable.	Rewetting (ditch blocking or filling up), in complex with raised bog.	0.4	
7140	Transition mires and quaking bogs	45.7	1.7	Favourable.	Rewetting (ditch blocking or filling up), in complex with raised bog.	45.7	
7120	Degraded raised bogs	36.2	1.4	Bad.	Rewetting (ditch blocking or filling up). Felling, especially in eastern part of mire.	According to hydrological research results.	
7110*	Active raised bogs	2207.9	84.1	Poor.	Rewetting (ditch blocking or filling up).	According to hydrological research results.	
3160	Natural dystrophic lakes and ponds	30.3	1.1	Favourable.	Water level restoration in Linezers Lake – complex rewetting in the entire mire. Non-intervention.	9.0	21.3

Lielā Baltezera salas | *Nature Reserve (LV0513000)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Ādaži and Garkalne municipalities.

AREA: 20 ha.

NATURE MANAGEMENT PLAN: 2003 (2004–2014).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Islands of the Lielais Baltezers Lake have a status of a nature monument since 1924. Nowadays, Lielā Baltezera salas Nature Reserve includes five islands which are important for the protection of forest habitats. There is a particular ecosystem of islands developed in an oligotrophic lake (currently a lake is eutrophic), with specific plant and bird species. The biological value of the islands is increased also because of the belt-like arrangement of habitats which is determined by terrain. Pine (*Pinus sylvestris*) woodlands are located in highest places but *Alnus glutinosa* grow at the coast. Shrub layer includes species which are not typical for forest, for example, *Malus domestica* and *Ribes uva-crispa*. Nature values of the territory are adversely affected by the spread of invasive shrubs *Amelanchier spicata, Sambucus racemosa, Acer negundo,* and *Rosa rugosa*. Coasts of the lake and islands are sandy. Islands are attractive to people from surrounding areas, and there are recreation spots created. The largest load is noticed in Ropažu, Liepu and Priežu islands.

Several rare and protected plant species have been found in the territory, for example, *Vincetoxicum hirundinaria, Angelica archangelica*. Important invertebrate species are *Liocola marmorata* and *Leucorrhinia caudalis*. Earlier, hare was also an abundant locality of *Osmoderma barnabita*. *Lutra lutra* lives here. Birds of various species can be observed in the nature reserve – birds living in woodlands of islands, and also birds breeding on coasts of islands.

In 2003, management rules were developed for Baltezers Lake, including restrictions on angling from March 15 to June 30 in order to ensure bird breeding in the 20 m wide belt around the islands.

2. Threats to habitat and species conservation

- Anthropogenic load (waste, trampling, campfire sites, etc.).
- Removal of dead wood for use in campfires.
- The spread of invasive species which suppress the natural vegetation.
- Bird fauna is adversely affected by holidaymakers and anglers who regularly visit the islands, disturbing birds during their breeding period.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Restriction of the distribution of invasive species.

5. Necessary management and conservation measures

5.1. General measures

- It would be useful to include the new island (2.6 hectares) in the area of nature reserve because it has developed completely naturally and is almost uninfluenced by people.
- Reduction of overgrowth with aquatic macrophytes between Ropažu and Liepu islands, in order to improve the oxygen regime and living conditions for fish and other species.
- Removal or burning (in winter) of mass of decayed reeds which have accumulated on the border between mineral ground of islands and aquatic environment, in order to improve water discharge from islands. Prevention of the paludification of driest places of islands and promotion of the conservation of their habitats.
- Clarifying of areas of protected habitats, as well as distribution of invasive species and areas where they must be felled.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	7.45	37.2	Poor.	Non-intervention. Felling of invasive shrubs.		7.45
9020*	Broad-leaved deciduous forests	8.97	44.8	Poor.	Non-intervention. Felling of invasive shrubs.		8.97
9000	Potential Protected woodland habitat	5.5	27.5	-	Felling of invasive shrubs.		5.5

Lielie Kangari | *Nature Reserve (LV0513400)*

1. Brief description

YEAR OF FOUNDATION: 1957.

LOCATION: Ogre municipality Suntaži rural territory; Ropaži municipality Ropaži rural territory.

AREA: 1972 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Lielie Kangari Nature Reserve includes the largest ridge of eskers in Latvia (Lielie Kangari), as well as Kangari lake, Lielkangari Mire and wet forests around the mire. The maximum height of the esker ridge is 78 m above the sea level, relative height – 27 m, slope inclination up to 30°. The nature reserve consists of two relatively different parts, which are ecologically closely interconnected, forming a single complex. Esker ridge is covered by forest which has developed from coniferous forest to broadleaf-spruce forest as a result of natural eutrophication. Lielkangari Mire is relatively unaffected.

There are nine EU protected habitat types and a large number of protected species: 20 species of plants, three moss, two mushroom, six lichen, 15 invertebrate, 19 bird, two mammal species. Among them are plants *Cypripedium calceolus, Betula nana, Salix myrtilloides, Carex paupercula, Trichophorum cespitosum,* mushroom *Hericium coralloides*, lichen *Ramalina thrausta*, birds *Bonasa bonasia, Pernis apivorus, Tetrao tetrix, Tetrao urogallus, Tringa glareola*, invertebrates *Osmoderma eremita, Necydalis major, Bombus schrencki, Ena montana*, and others.

In the 20th century, several ditches were excavated in Lielkangari Mire and its surroundings, therefore water level in Kangari lake was lowered, and some parts of the mire were drained. Currently, ditches gradually overgrow, and they function only partly. There are several quarries near the nature reserve, used for dolomite and gravel extraction.

2. Threats to habitat and species conservation

- Mire habitats are influenced negatively by drainage.
- Recreation at Lielais Kangaru lake, next to the motorway, is a potential threat.
- Due to eutrophication of dry pine forests, the proportion of spruces (*Picea abies*) and deciduous trees in the woodland is increasing; vegetation characteristic to habitat type 9060 *Coniferous forests on, or connected to, glaciofluvial eskers* is disappearing.
- Birds are adversely affected by the three dolomite quarries in the direct vicinity (noise). Also the influence of excavation in quarries on the water level in mire is not evaluated.

3. Existing management of the protected habitats and its assessment

Liberation (improvement of insolation by felling of shrubs near the trunk) of several old oaks (*Quercus robur*) has been carried out on the esker along the motorway, in order to improve habitat for *Osmoderma barnabita*. The vitality of liberated trees has improved.

4. Priorities of management and conservation

- Rewetting; maintenance of hydrological regime optimal for wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of forests on eskers and dry pine forest (*Cladinosa-Callunosa*) on dunes at Kangariši.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps according to the latest methods.
- Protection of locality of *Cypripedium calceolus* in condition which is optimal for species (control; restriction of activities by people in the vicinity of location).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	496.6	25.20	Poor.	Improvement of hydrological regime in at least part of the woodland area.	160	
9180*	Slope forests	1.6	<1	Poor.	Non-intervention.		1.6
9080*	Fennoscandian deciduous swamp woods	8.6	<1	Favourable.	Non-intervention.		8.6
9060	Coniferous esker forests	44.5	2.3	Bad.	Felling of shrubs and spruce (*Picea abies*) advance growth. Non-intervention.	1.0	 43.5
9010*	Western Taïga	100.7	5.1	Poor.	Non-intervention.		100.7
7140	Transition mires and quaking bogs	18.6	<1	Favourable.	Non-intervention.		18.6
7110*	Active raised bogs	605.8	30.7	Poor.	Rewetting (blocking or filling of ditches; NW and DW part of the territory).	40	565.8
3160	Natural dystrophic lakes and ponds	2.0	<1	Poor.	Non-intervention.		2.0
3150	Natural eutrophic lakes	3.5	<1	Poor.	Non-intervention.		3.5

Lielpurvs | *Nature Reserve (LV0509700)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Aloja municipality Staicele town with rural territory; Salacgrīva municipality Salacgrīva town with rural territory.

AREA: 1024.4 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Lielpurvs Nature Reserve is located in a wooded area near Salaca River. It includes Lielpurvs (Zābaku Mire) with surrounding woodlands. Puršēnupe river is flowing through the territory. The surrounding forests are drained. Ditches are also found in woodlands of nature reserve and in the periphery of the mire. There are two large complexes of bog pools in the mire.

The territory is important for the protection of raised bogs. Rare plant community with *Trichophorum cespitosum* can be found here, as well as several rare and protected invertebrate species, such as *Leucorrhinia pectoralis* and *Euphydryas maturna*. The most important bird species present in the area are *Bonasa bonasia, Tetrao tetrix*. *Dendrocopos medius* is found in old *Populus tremula* woodlands. Four micro-reserves are established in nature reserve and its adjacent territories for the protection of *Tetrao urogallus* and *Picoides tridactylus*. The area is used by brown bear *Ursus arctos*.

2. Threats to habitat and species conservation

Wet habitats of the territory are adversely affected by previous drainage and by possible hydrological regime changes such as maintenance of ditches on the edge of nature reserve and in adjacent forests.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Rewetting; maintenance of hydrological regime optimal for wet forests.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Complex research of hydrological regime. Evaluation of possibilities of rewetting. Development of construction project for the restoration of optimal hydrological regime in mire areas influenced by drainage and in bog woodlands.

5.2. Specific measures

5.2.1. Species

For the conservation of *Tetrao urogallus* lek sites: assessment of necessary management measures at the level of forest block compartment.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	131.6	12.8	Bad.	Rewetting (ditch damming of filling up).	131.6	
9080*	Fennoscandian deciduous swamp woods	11.83	1.1	Poor.	Non-intervention.		11.83
9020*	Broad-leaved deciduous forests	10.77	1.1	Favourable.	Non-intervention.		10.77
9010*	Western Taïga	44.29	4.3	Favourable.	Non-intervention.		44.29
7150	Depressions on peat substrates	99.16	9.6	Poor.	Rewetting (ditch damming of filling up).		99.16
7120	Degraded raised bogs	251.31	24.5	Bad.	Rewetting (ditch damming of filling up).	251.31	
7110*	Active raised bogs	360.27	35.2	Poor.	Rewetting (ditch damming of filling up).	360.27	
3160	Natural dystrophic lakes and ponds	10.0	<1	Favourable.	Non-intervention.		10.0
3260	Natural river reaches and river riffles	1.0	<1	Poor.	Non-intervention.		1.0

Lielsalas purvs | *Nature Reserve (LV0511600)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Madona municipality Barkava rural territory.

AREA: 204 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Lielsalas purvs Nature Reserve is located on the north-eastern edge of a large massif of mires which includes also Teiči Mire (the largest mire in this massif). The territory is important for the conservation of active raised bogs with protected plant species *Chamaedaphne calyculata*, and for the conservation of bog woodlands. *Tetrao tetrix* and *Tetrao urogallus* are the most important bird species in the nature reserve. The territory is suitable for staying and migration of wolves (*Canis lupus*) which are migrating between Lubāns Wetlands and Teiči Mire. Protected moss species *Anastrophyllum hellerianum* can be found on fallen logs in forests.

Mire is affected by drainage and overgrown with small-dimension pines (*Pinus sylvestris*). Dispersed, old, slow-growing pines can be found. Mire adjoining woodlands are drained. Wet habitats are adversely affected by the rather many drainage ditches which are located also in the territory of nature reserve. The western part of mire has been previously burned.

2. Threats to habitat and species conservation

- Wet habitats of the territory are adversely affected by previous drainage, as well as by possible further hydrological regime changes caused by maintenance of ditches in territories adjoining the nature reserve.
- Spread of invasive species *Heracleum sosnowskyi* at the southern part of nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Rewetting; maintenance of hydrological regime which is optimal for wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological research of the territory; evaluation of the possibilities of rewetting. Development of a construction project for complex rewetting in wet habitats influenced by drainage (mires and bog woodlands).
- Abatement of invasive plant species *Heracleum sosnowskyi* (prevention of blossoming).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	32.4	15.9	Bad.	Rewetting (ditch blocking or filling).	32.4	
9010*	Western Taïga	10.5	5.2	Favourable.	Non-intervention.	10.5	
7110*	Active raised bogs	163.1	79.9		Rewetting (ditch blocking or filling).	According to research results.	

Lielupes grīvas pļavas | *Nature Reserve (LV0530800)*

1. Brief description

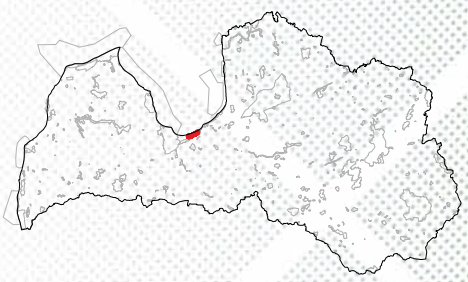
YEAR OF FOUNDATION: 2004.

LOCATION: Jūrmala City

AREA: 277 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2009).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Lielupes grīvas pļavas Nature Reserve consists of six territories on both banks of the Lielupe River, close to the river mouth. In the course of urban development, grasslands at Lielupe River are built up or used for allotment gardens, therefore semi-natural grasslands are located in isolated areas. The most significant values of the nature reserve are associated with floodplain grasslands of Lielupe River floodplain. The most rare habitat in the area is 1630* *Boreal baltic coastal meadows* which has developed on brackish soils. This is one of the seven Natura 2000 sites in Latvia where this habitat type can be found. In Latvia, it is important also for conservation of grassland habitats 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae), 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*, and 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) (it is one of the 15-20 Natura 2000 sites in Latvia with the highest proportion of total habitat area in Natura 2000 network).

The territory is important for the reduction of grassland habitat fragmentation. It is one of the most significant sectors in the Lielupe valley as the species migration corridor between Zemgale and Coastal Geobotanical Districts. Because of the unique natural conditions, the nature reserve is important not only for conservation of biodiversity in Jūrmala city but also at a national level, especially as objects of cultural and natural history because these grasslands are relicts of the large Lielupe floodplain grasslands which are now built up and otherwise destroyed. There are also small areas of wet forests whose conservation value will increase with time, with stabilisation of their structures. Aquatorium of Lielupe River and its distributaries are integral part of the floodplain complex.

There are 16 specially protected plant species in grasslands. The locality of very rare species *Angelica palustris* is the most abundant here compared to the whole territory of Latvia. Other important plant species are *Gladiolus imbricatus, Dactylorhiza baltica, Dactylorhiza maculata, Dactylorhiza incarnata, Centaurium littorale, Herminium monorchis, Trifolium fragiferum*, and others. The most unusual is the species complex of brackish soils, such as *Triglochin maritimum, Glaux maritima, Juncus gerardii*.

Seven protected bird species are found in the nature reserve, such as *Crex crex*, *Sterna albifrons*, and *Porzana parva*.

2. Threats to habitat and species conservation

- Lack of grassland management; overgrowth; inadequate management (grass shredding and leaving in grassland; annual burning of dry grass; eutrophication of river shores due to lack of management).
- Degradation and overgrowth of network of shallow ditches, causing hydrological regime changes and reedbed expansion.
- Eutrophication of the river, municipal waste, and the influence of allotment gardens have contributed to expansion of nitrophilous species, especially in the distribution zone of habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*; making its conservation status worse.
- Littoral parts of Lielupe River and its distributaries are overgrown with emergent macrophytes. This way, they become inaccessible for ducks and waders, and unsuitable for their breeding.
- Fish (*Esox lucius, Abramis brama*) spawning becomes difficult or even impossible due to overgrowth of distributaries and small water bodies with dense emergent vegetation.
- Interruption of the water flow in oxbows, water bodies in the reedbeds and distributaries because of clogging by accumulated plant residues, especially reeds.
- Decrease of the former biodiversity of flooded areas and floodplains due to their overgrowth with monotonous reedbeds or their transformation to a constantly flooded state.
- Construction debris is accumulated in some places of the area of former wastewater treatment plant.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to protect or manage protected grassland, aquatic and forest habitats.
- According to Rural Support Service, in 2014 grasslands were not managed in the scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Grasslands owned by Jūrmala City Council are managed by mowing and shredding.

4. Priorities of management and conservation

- Conservation of grassland habitat diversity; restoration of semi-natural grasslands up to their maximum possible area; their maintenance in a favourable conservation status.
- Restoration and maintenance of hydrological regime that provides a favourable conservation status for grassland habitats.
- Maintenance of populations of species of brackish habitats (especially *Angelica palustris*) in a favourable conservation status.
- Provision of water flow rate in oxbows, water bodies located in reedbeds, and distributaries, by preventing the development of clogs or their transformation to a constantly flooded state. Establishment of connection between Lielupe River and small water bodies in reedbeds.
- The management of coastal areas and small water bodies to ensure their suitability for waterbirds and to restore fish spawning grounds.
- Undisturbed course of natural processes in natural grassland and forest habitats.

5. Necessary management and conservation measures

5.1. General measures

- Update of the Nature management plan by assessing the condition of the current grassland habitats and protected species populations. In the framework of the plan, development of a plan for grassland restoration and management, also evaluating alternative solutions for the use of grassland biomass (a project devoted to this issue is desirable), and rewetting (establishment and repair of culverts; cleaning of ditches).
- As a periodically flooded area, the nature reserve is included in the Flood Risk Management Plan for the Lielupe river basin district in 2016-2021. In order to reduce the risk of flood in the territory included in the nature reserve, the cleaning of Lielupe riverbed from the mouth to the railway bridge (territory 5 and 6 in the Nature management plan) is recommended as the priority.
- Establishment of open water corridors for ducks and waders (territories 1, 2, 3 and 6 in the Nature management plan).

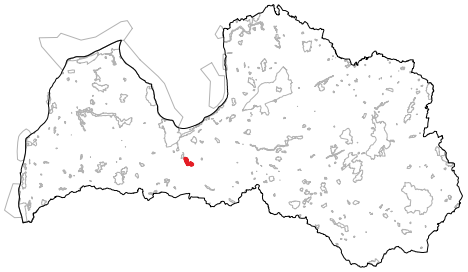
5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	3.2	1.2	Poor.	Non-intervention.		3.2
91E0*	Alluvial forests	3.7	1.3	Poor.	Non-intervention.		3.7
6410	Molinia meadows	6.7	2.4	Poor.	Restoration. Maintenance.	6.7	6.7
6210	Semi-natural dry calcareous grasslands	10.5	3.8	Bad.	Restoration. Maintenance.	10.5	10.5
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.4	<1	Poor.	Restoration. Maintenance.	1.4	1.4
6430	Hydrophilous tall herb fringe communities	14.9	5.4	Favourable to poor.	Restoration. Maintenance.	Up to 14.9	Up to 14.9
3260	Natural river reaches and river riffles	29.0	10.5	Bad.	Thinning of dense belts of emergent macrophytes on the banks of Lielupe and its distributaries. Once per 3 years.	3.0	
3150	Natural eutrophic lakes	10	3.6	Poor.	Thinning of dense belts of emergent macrophytes; creating open areas and access to open water suitable for ducks and waders. Such areas will increase the fish spawning grounds. Once per 5 years.	1.0	
1630*	Coastal meadows	1.4	<1	Poor.	Restoration. Maintenance.	1.4	1.4

One-time restoration measures are necessary both in semi-natural grasslands and in areas of former allotment gardens where semi-natural grasslands should be restored or created, in some places by removal of additional soil. Considering that many grassland areas were managed by grass shredding for several years, restoration measures might be necessary also in the areas managed so far. The whole area which is currently mapped as habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels* must be inventoried, as the interpretation of this habitat has changed since the first mapping of semi-natural grasslands (the beginning of 2000s). Part of this area is likely to belong to the habitat type 6450 *Northern boreal alluvial meadows*, but it is in poor protection status. It is mentioned in the nature conservation plan of 2000 that analysis of possibilities and necessity of drainage system should be carried out. It is still not done.

Lielupes palienes pļavas | *Nature Reserve (LV0523100)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Jelgava municipality Jaunsvirlauka rural territory; Ozolnieku municipality Cenas rural territory; Jelgava City.

AREA: 352 ha.

NATURE MANAGEMENT PLAN: 2006 (2007–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 326 of 12 May 2008, Regulation on Individual Protection and Use of the Lielupes Palienes Pļavas Nature Reserve.

Lielupes palienes pļavas Nature Reserve was established for the conservation of semi-natural floodplain grasslands on the banks of Lielupe River; four EU protected grassland habitat types have been found here. The territory of the nature reserve consists of four separate territories (territories I, II, III and IV according to Nature management plan) which are the "green islands" in the areas intensively used for agriculture and building construction. These areas increase the environmental quality of Jelgava city and its surroundings. The area is homogeneous – more than 95% of the area is occupied by semi-natural grasslands. Regular floods of various volumes ensure the necessary ecological conditions for floodplain grasslands in the long term. The area of the nature reserve is partly drained using ditches, but the system operates periodically due to low stream gradient.

Regularly flooded semi-natural grasslands are important as one of the last unregulated parts of the Lielupe floodplain. The territory is significant for the reduction of grassland fragmentation. This is one of the most important sectors in Lielupe river floodplain which is a species dispersal corridor between Coastal and Zemgale Geobotanical Districts.

In total, 27 rare and protected plant and animal species have been found in the nature reserve. Floodplain grasslands, when properly managed, are suitable for grassland-breeding waders and for other ecological groups of grassland birds. The nature reserve is important for breeding of *Charadriiformes* birds and as a stopover site for migrating waterbirds. The most important bird species are *Crex crex, Limosa limosa, Tringa totanus, Ciconia nigra, Philomachus pugnax, Porzana parva, Gallinago media*.

Protected plant species are *Dactylorhiza maculata, Dactylorhiza baltica, Colchicum autumnale, Tulipa sylvestris, Fritillaria meleagris, Allium scorodoprasum*.

2. Threats to habitat and species conservation

- Negative influence can be caused by the new Jelgava bypass crossing the nature reserve; this is scheduled to be built in the future as part of the Jelgava city territorial plan.
- Lack of grassland management; overgrowth; inadequate management (grass shredding and leaving on site; high mowing, leaving unmown high sward; free-range grazing when some places are overgrazed and others insufficiently grazed; eutrophication of the river banks due to lack of management).
- Degradation and overgrowth of shallow drainage ditches; it changes the hydrological regime and promotes reedbed expansion.
- Possibility of wastewaters entering into the grasslands during the spring floods at Sieramuiža residential area, promoting rapid eutrophication of grasslands and reedbed expansion.
- River eutrophication, municipal waste and influence from former allotment gardens have contributed to the expansion of nitrophilous plants, especially on the banks of river, in the distribution belt of habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*, making the protection status of this habitat type worse.
- Disturbance to breeding birds caused by visitors.

3. Existing management of the protected habitats and its assessment

- In 2006, in the framework of the EC LIFE program "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04 NAT/LV/000198), semi-natural grasslands were restored in the area of approximately 200 ha. In Pilssala (Lielupe river

island located in Jelgava city), pastures for semi-feral horses were established. Grazing is still continued. The current approach to allowing grassland animals to move freely in the entire grassland area has caused overgrazing in some places but insufficient grazing in others.

- According to Rural Support Service, in 2014 approximately 108 hectares of grasslands were managed in the scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".
- In 2015, experts of the Latvian Fund for Nature inventoried territories I and II. The results are summarized in the report. It was concluded that grassland management has not been optimal. It caused the biodiversity decrease both for flora and vegetation, and the decrease in the diversity of grassland bird species, therefore it is necessary to adapt management measures to the requirements of maintenance of biodiversity.

4. Priorities of management and conservation

- The diversity of the grassland habitats and the number of species is very high, therefore the preservation of habitat types and habitats of plant and animal types in favourable conservation status is the priority.
- Management and restoration of grassland habitats to the maximum possible area; maintaining them in a favourable conservation status, also providing suitable conditions for grassland birds.
- Restoration of currently overgrazed and insufficiently grazed grasslands, as well as allotment gardens and long-term abandoned grasslands (currently non-compliant to EU grassland criteria) to grasslands of EU significance; their maintenance in a favourable conservation status.
- Maintenance and restoration of a hydrological regime that ensures a favourable conservation status for grassland habitats (Sieramuiža Residential area is a priority).

5. Necessary management and conservation measures

5.1. General measures

- Management measures recommended by Latvian Fund for Nature in 2015 must be implemented in territories I and II.
- In territories III and IV, grassland inventory should be carried out. It should include also management assessment and recommendations.
- Development and implementation of rewetting plan (priority for the area II and northern part of territory I), including also assessment for preservation and maintenance for wetlands recently developed in territory II which are important for protected bird species *Circus aeruginosus* and *Botaurus stellaris*.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6120	Xeric sand calcareous grasslands	0.9	<1	Favourable.	Restoration. Maintenance.	0.9	0.9
6210	Semi-natural dry calcareous grasslands	1.2	<1	Favourable.	Restoration. Maintenance.	1.2	1.2
6510	Lowland hay meadows	40.4	11.5	Bad.	Restoration. Maintenance.	40.4	40.4
6450	Northern boreal alluvial meadows	170.0	48.3	Bad.	Restoration. Maintenance.	170.0	170.0
6430	Hydrophilous tall herb fringe communities	8.2	2.3	Poor.	Restoration. Maintenance.	0.0	8.2
6530*	Fennoscandian wooded meadows	5.1	1.4	Bad.	Restoration. Maintenance.	0.0	5.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	8.4	2.4	Poor.	Restoration. Maintenance.	8.4	8.4

Restoration and maintenance measures for territories I and II are described in detail in report on inventory carried out by Latvian Fund for Nature in year 2015. A similar inventory is necessary for territories III and IV. In the table, grassland area is specified using the newest information on the territories I and II.

Liepājas ezers | *Nature Reserve (LV0507800)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Liepāja City; Nīca municipality Nīca and Otaņķi rural territories; Grobiņa municipality Grobiņa rural territory.

AREA: 4544 ha.

NATURE MANAGEMENT PLAN: 2008 (2008–2023).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 5 of 03 January 2013, Regulation on Individual Protection and Use of Liepājas Ezers Nature Reserve.

Liepājas ezers Nature Reserve includes one of the largest and most important lagoon-type lakes in Latvia, with species which are characteristic for brackish habitats.

The lake and its surroundings have historically been important for the economic activity of people - the lake is used for sailing from the Bārta river to the sea and for fishing, while coastal meadows were used for pasturing and haymaking. Lake is important for the accumulation of sediments carried by rivers, and it is rapidly filling up with sediments. Already in the 1930s, solutions were proposed for maintaining open areas of the lake (regulation of overgrowth, sediment accumulation control).

The nature reserve provides protection for more than 100 breeding, migratory and wintering bird species and is included in the list of Important Bird and Biodiversity Areas. There are at least 46 bird species which are protected in Latvia, such as *Chlidonias niger, Circus pygargus, Haliaeetus albicilla, Philomachus pugnax, Porzana parva*. The territory is rich in protected invertebrate species, such as *Unio crassus, Vertigo angustior, Vertigo geyeri, Vertigo genesii, Leucorrhinia pectoralis, Euphydryas aurinia, Maculinea teleius, Lycaena dispar,* and others. Also 41 species of protected plants have been found.

The diversity of fish species is related to the open system of migration: Bārta River – Lake Liepāja, Otaņķe River – Lake Liepāja, and the channels - Liepaja Port Aquatorium - Baltic Sea. *Anguilla anguilla* and *Salmo trutta* are migrating through Lake Liepāja.

There are 11 protected habitats of EU importance in the nature reserve. In the open part of the lake, large areas are occupied by *Najas marina* and charophytes. Very valuable semi-natural grassland habitats are located in the eastern shore of the lake. At a national level, the territory is of apriority significance for the protection of habitat type 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) (the most important territory in Latvia regarding the proportion of this habitat type of the total area in Natura 2000 territories), and 1630* *Boreal baltic coastal meadows* (fourth most important).

Grasslands in the nature reserve are important for several rare and protected species. At a national level, this is a priority territory for the restoration of *Calidris alpina schinzii* population in Latvia, and for the protection of grassland-breeding waders. This is one of the few territories in Latvia which is suitable for breeding of a globally protected bird species *Acrocephalus paludicola*. Important plant species are *Schoenus ferrugineus, Euphorbia palustris, Serratula tinctoria, Trifolium fragiferum, Carex buxbaumii, Sanguisorba officinalis*. Coast of Lake Liepāja is the only permanent locality of *Aster tripolium* in Latvia.

From the landscape-ecological point of view, this is a priority territory for the sustainable conservation of compact, continuous grasslands in Coastal Geobotanical District.

According to the flood management plan of the Venta River basin, the downstream areas of Bārta, Otaņķe, Ālande rivers are included in the list of Flood Risk Areas of National Significance. Here, the protection of human safety and infrastructure is a priority if compared to other activities.

2. Threats to habitat and species conservation

- The shallow littoral part of Lake Liepāja overgrows with aquatic macrophytes. The reason is the input of phosphorus and nitrogen compounds into the lake from the catchment area (agricultural lands, various production sites, forestry activities (Otaņķe river) and households).
- There is a dense overgrowth with aquatic macrophytes in the mouth of Bārta River and the southern part of the lake. In the low-water period, it hinders the water exchange, and contributes to increased eutrophication in this part of the lake.

- Cessation of grassland management – leads to fragmentation, overgrowth with trees, shrubs and reeds.
- High-intensity grazing in Vītiņu Grasslands is unsuitable for grassland invertebrates (especially *Clausiliidae* and grass dwelling insects) as the sward is maintained low during all the grazing season.
- Impact of recreation on the lake – boats, heavy-duty boats.
- Although the populations of waterbirds are relatively stable, they are adversely affected by predators (American mink *Neovison vison*) and changes in nesting habitats.

3. Existing management of the protected habitats and its assessment

- Since 2002, grassland management measures have been implemented with the support of the fund "ARK Nature" in Netherlands – pastures for semi-feral cattle and horses were established in Vītiņi Grasslands. The grazing is not regulated, therefore animals are mostly grazing in the driest part of the grassland, where overgrazing occurs. In fen, animals graze less regularly, there are hummocks and it overgrows with reeds. The reduction of rare invertebrate species populations due to overgrazing is observed.
- In April 2004, the association "Liepājas Ezeri" was established for the purpose of management of Liepāja and Tosmare lakes.
- According to Rural Support Service, in 2014 less than 5 % of habitat type 1630* *Boreal baltic coastal meadows* was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Habitat types 6270* and 6410 were managed in larger areas (up to 70 % of their total area).
- In framework of EC LIFE programme project "Securing Sustainable Farming to Ensure Conservation of Globally Threatened Bird Species in an Agrarian Landscape" (LIFE09 NAT/LT/000234), felling of shrubs and restorative mowing was carried out in an area of 120 ha.

4. Priorities of management and conservation

- The diversity of semi-natural habitats and the amount of species is very high, therefore both the conservation of habitats and species' habitats in favourable conservation status is the priority.
- Restoration of grassland habitats in maximum possible area, and their maintenance in favourable conservation status.
- Restoration of the *Calidris alpina schinzii* population; maintenance of grassland-breeding waders' populations in favorable conservation status.
- Preservation of habitats suitable for *Acrocephalus paludicola* breeding; management which is suitable for this species.
- Maintenance of populations of invertebrates *Maculinea teleius, Lycaena dispar, Euphydryas aurinia, Vertigo* spp. in favourable conservation status.
- Maintenance of populations of plant species *Aster tripolium, Euphorbia palustris, Serratula tinctoria, Trifolium fragiferum, Carex buxbaumii, Schoenus ferrugineus, Sanguisorba officinalis* in favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

- Development of a new nature management plan.
- Inventory of grasslands. Nature management plan of 2008 is based on outdated data, and there are major discrepancies in statistics on habitat areas in different sources of information. The inventory must include evaluation of conservation status of flora, vegetation, grassland birds and invertebrates, as well as the assessment of their restoration and management measures.
- Evaluation of hydrological regime in grasslands for the planning of grassland management. This is especially important in Vītiņi Grasslands where shallow ditch systems used to be located but now paludification of grasslands occurs in the area.
- Evaluation of possible extension of nature reserve by inclusion of adjoining grasslands, in order to increase landscape-ecological connectivity and the total area of grassland habitats, and to ensure their better conservation in the long term. There are EU-protected grassland habitats in an area up to 100 hectares which are adjoining nature reserve in north and north-east, as well as grasslands of polders (important for protection of birds) adjoining nature reserve in south and west.
- Maintenance of lake functionality:
  - Mowing of the main boat route along the lake central axis, from the northern part to the Bārta river mouth.
  - Mowing of aquatic macrophytes in lower reaches and mouth of river Bārta.
  - Cleaning of boat routes – from boat cooperatives to the open part of the lake.
  - Creation of a network of channels in the southern part of lake, in order to improve water exchange.

- Mowing of continuous reedbeds.
- Removal of sunken logs and other objects in mouth of Bārta river. Mowing in boat routes, bottom channels and in Bārta river mouth, at least 4 times a year.
- Sediment removal in beds of Ālande, Otaņķe and Bārta rivers; removal of excessive aquatic macrophytes in order to decrease flood risk, to maintain water discharge and to ensure the requirements mentioned above.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7230	Alkaline fens	4.9	<1	Poor.	Mowing or grazing (both methods can be combined).		4.9
7210*	*Cladium mariscus* fens	0.03	<1	Favourable.	Non-intervention.		0.03
6450	Northern boreal alluvial meadows	159.8	3.5	Bad.	Restoration. Maintenance.	Up to 159.8	159.8
6430	Hydrophilous tall herb fringe communities	0.8	<1	Favourable.	Restoration. Maintenance.	0.0	0.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	34.7	<1	Poor.	Restoration. Maintenance.	Up to 34.7	34.7
6210	Semi-natural dry calcareous grasslands	199.8	4.4	Bad.	Restoration. Maintenance.	Up to 199.8	199.8
6410	*Molinia* meadows	265.9	5.8	Poor.	Restoration. Maintenance.	Up to 265.9	265.9
3260	Natural river reaches and river riffles	5.0	<1	Poor.	Sediment removal from river mouths – Bārta, Otaņķe, Ālande rivers.	On necessity	30.0
3150	Natural eutrophic lakes	3715.0	81.7	Poor.	Mowing of aquatic plants in littoral zone and river mouths, in main boat routes, three times per season (first time in May or June).		
1630*	Coastal meadows	19.0	<1	Bad.	Restoration. Maintenance.	Up to 19.0	19.0
1310	Annuals colonising mud and sand	1.1	<1	Poor.	Non-intervention.		1.1

Liepnas niedrāji | *Nature Reserve (LV0534100)*

1. Brief description

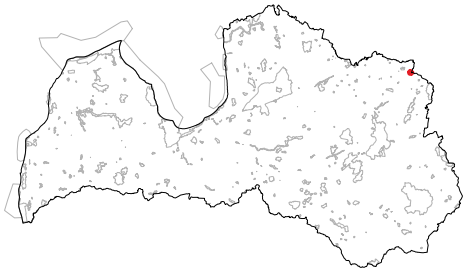
YEAR OF FOUNDATION: 2004.

LOCATION: Alūksne municipality, Liepna rural territory.

AREA: 159 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Liepnas niedrāji Nature Reserve includes wet forests and it is important for conservation of old bog woodland and drooping woodreed *Cinna latifolia*. Several rare and protected plant species have been found here - *Carex paupercula, Dactylorhiza incarnata, Galium triflorum,* as well as butterfly *Coenonympha hero*. The territory is important for *Tetrao urogallus* protection.

2. Threats to habitat and species conservation

Overgrowth of woodlands with understory and with *Picea abies* in the subcanopy.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance and/or restoration of optimal hydrological regime.

5. Necessary management and conservation measures

5.1. General measures

Research of the hydrological regime; rewetting if a decision is made that it is necessary. Measure includes also the development of a monitoring programme and methods for the assessment of restoration efficiency.

5.2. Specific measures

5.2.1. Species

Management of Tetrao urogallus lek sites: felling of *Picea abies* and *Betula* spp. advance growth and subcanopy in area of 114 hectares; removal of woody species along the ditches.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	134.7	84.7	Poor	Non-intervention. Rewetting in accordance to expert judgement.		134.7

Linezers | *Nature Reserve (LV0525200)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Krimulda municipality Lēdurga rural territory.

AREA: 130 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Linezers Nature Reserve is located in an area rich in forests, mires and lakes. It includes Lake Linezers and part of the adjoining Sāra Mire. The territory is important for the protection of natural eutrophic lake, active raised bog and bog woodlands. Micro-reserve which is established for the protection of western osprey *Pandion haliaetus* is adjoining the nature reserve. Sāra Mire is surrounded by terrain elevations. There are also several mineral-ground islets in the mire. Agricultural lands adjoining the mire are drained. Several ditches are located also in *Pandion haliaetus* micro-reserve and its buffer zone. Possibly, also the wet habitats in nature reserve are influenced by this drainage.

Sāra Mire in the nature reserve is one of the few mires in Latvia where both *Trichophorum cespitosum* which is characteristic for coastal areas can be found together with *Betula nana* which grows in raised bogs of eastern and northern parts of Latvia. Protected species include orchids *Liparis loeselii, Hammarbya paludosa, Dactylorhiza incarnata*, moss *Schistostega pennata*.

The size of Lake Linezers is 7.4 hectares. Its level was lowered by excavation of ditch at its northern part. The European medicinal leech *Hirundo medicinalis* can be found in the lake. There is also one of the few localities of moss *Ricciocarpos natans* known in Latvia.

2. Threats for habitat and species conservation

Lake overgrowth and establishment of a belt of transition mire has been promoted by lowering of lake water level. The possible elevation of lake water level should be assessed very carefully because the blocking of lake outflowing ditch will cause a prolonged flooding of transition mire and the simplification of its vegetation.

3. Existing management of the protected habitats and its assessment

So far, the management of protected habitats has not been carried out.

4. Priorities of management and conservation

- Maintenance of hydrological regime which is optimal for wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of habitat suitable for *Hirudo medicinalis* in the lake, by implementation of measures which would ensure the presence of large mammals as necessary hosts in open littoral areas and water.

5. Necessary management and protection measures

5.1. General measures

Optimization (extension) of the territory of nature reserve by including the entire ecologically uniform area of the mire up to Lake Aģe (south) and motorway V82 (east).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	34.3	26.4	Poor.	Non-intervention.		34.3
7140	Transition mires and quaking bogs	6.7	5.2	Favourable.	Non-intervention.		6.7
7120	Degraded raised bogs	5.7	4.4	Poor.	Non-intervention. Assessment of the influence of drainage in areas adjoining the nature reserve; measures in these territories (including ditch blocking or filling).	According to evaluation.	5.7
7110*	Active raised bogs	59.5	45.8	Favourable.	Non-intervention.		59.5
3150	Natural eutrophic lakes	7.4	5.7	Bad.	Non-intervention. Extension of access to lake in ~ 15 m wide zone in NE part of the lake, in order to attract large mammals as necessary hosts for *Hirudo medicinalis* (in accordance to species conservation plan). Once per 3-5 years.	0.1	7.4

Līvbērzes liekņa | *Nature Reserve (LV0523000)*

1. Brief description

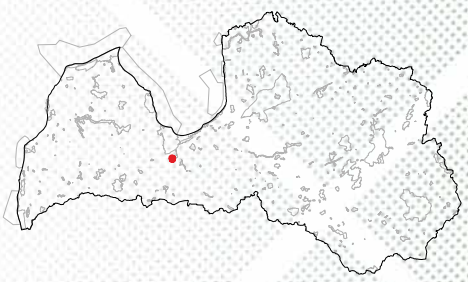
YEAR OF FOUNDATION: 1999.

LOCATION: Dobele municipality Jaunbērze rural territory, Jelgava municipality Līvbērze rural territory.

AREA: 144 ha.

NATURE MANAGEMENT PLAN: 2010 (2010–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Līvbērzes liekņa Nature Reserve is located in Tīreļi Plain. It borders with vast agricultural land in the south, with drained woodlands in the north and in the west, and with Vecbērze river floodplain overgrown with *Alnus incana* in the east. The territory is important for the conservation of wet forests of deciduous trees. Woodlands are dominated by *Fraxinus excelsior*, with admixture of *Alnus glutinosa* and *Quercus robur*.

The hydrological regime has been changed in the vicinity of the nature reserve and also in the nature reserve itself. Large areas of forests were drained in the 1960s when Vecbērze Polder and polder ditches were established. Spring flood does not occur in Vecbērze river anymore, and the flooding regime characteristic for natural floodplain is lost. Also the channel of Vecslampe river is modified. These actions have promoted the growth of shrubs in the wet forests, adversely affecting the structural quality of habitats and the plant species composition. However, in spite of large-scale drainage, sufficiently wet growing conditions have remained in the territory, and in some places in summer water can be detected above the ground.

This is considered to be the most significant and biodiverse area of wet *Fraxinus excelsior* forests in Latvia. It is the relatively least affected area in the largest massif of deciduous wet forests which are now logged in monotonous clearcuts. There is a large proportion of old woodlands and large volumes of dead wood. There are 27 rare and protected species: three species of vascular plants, one moss, two lichen, five mammal, 10 bird species, five rare and one protected invertebrate species. Protected bat species *Plecotus auritus* has been found here. There is the farthest westward located locality of *Agrimonia pilosa*. Many rare and protected bird species can be found in the nature reserve. Out of these, the most important ones are *Dendrocopos medius, Picoides tridactylus* and *Dendrocopos leucotos*, as well as *Dryocopus martius* and *Picus canus*. At the end of the 1990s, rare plant species *Hypericum hirsutum* and rare moss species *Dicranum viride* were found.

2. Threats to habitat and species conservation

- Changes in the hydrological regime, which may result in dryer conditions.
- Removal of dead and old trees from forest.
- Spread of invasive species *Solidago canadensis* from adjacent territories via forest block roads. Localities of *Agrimonia pilosa* are located on forest block roads.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Hydrological conditions optimal for habitats.

5. Necessary management and conservation measures

5.1. General measures

- Non-maintenance and non-restoration of ditches in the territory of the nature reserve.
- Investigation on optimal hydrological regime and possibilities of its maintenance or establishment. Evaluation of measures of renovation and maintenance of drainage systems in the adjacent territories, their impact on hydrological regime and habitats of the nature reserve.

- Extension of the nature reserve by including wet forests located at its NW edge. There are protected woodland habitats and several localities of protected plant species.
- Limitation of the distribution of *Solidago canadensis* at the boundary of nature reserve – on the road between 85th and 100th forest blocks.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	8.9	6.2	Poor.	Non-intervention, including non-maintenance of drainage system.		8.9
91E0*	Alluvial forests	132.6	92.1	Poor.	Non-intervention, including non-maintenance of drainage system.		132.6

Lubāna mitrājs | *Nature Reserve (LV0536600)*

1. Brief description

YEAR OF FOUNDATION: 2009.

LOCATION: Rēzekne municipality Nagļi and Gaigalava rural territories; Balvi municipality Bērzpils and Krišjāņi rural territories; Madona municipality Barkava and Ošupe rural territories; Rugāji municipality Lazdukalns and Rugāji rural territories; Viļāni municipality Dekšāre rural territory; Varakļāni municipality Varakļāni rural territory; Lubāns municipality Indrāni rural territory; Gulbene municipality Dauksti and Stradi rural territories.

AREA: 51 351 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 135 of 10 February 2009, Regulation on Individual Protection and Use of Lubāna Mitrājs Nature Reserve.

Lubāna mitrājs Nature Reserve includes Lake Lubāns, which is the largest lake in Latvia, its adjoining mires, and surroundings of lower reaches of Pededze river. The territory is important for the protection of the largest inland wetland in Latvia which is very important for the conservation of protected species populations and protected habitats. The territory includes a large variety of protected habitats – riparian alluvial grasslands, raised bogs, bog woodlands, boreal forests, *Alnus glutinosa* swamp woods, wooded meadows and pastures, etc. Lubāna mitrājs Nature Reserve was established by merging 12 Nature Reserves – Bērzpils purvs, Īdiņu purvs, Īdeņas un Kvapānu dīķi, Lagažas – Šnitku purvs, Lubānas ieplakas, Lubānas un Sūļagala purvs, Pārabaine, Pededzes lejtece, Salas purvs, Tīrumnieku purvs, Seldžu ozolu audze un Audīles mežs, and it additionally includes Lake Lubāns and biologically valuable territories adjoining the lake.

Lake Lubāns and the nearby fish ponds are one of the most important stopover and foraging sites for migratory birds in Latvia. It is also one of the best breeding sites for globally threatened bird species such as *Aquila pomarina, Haliaetus albicilla, Cygnus columbianus, Gallinago media*, and others. In total, 224 bird species have been observed, 185 of which are also breeding here.

In lake adjoining territories, there are five polders – drainage systems which are established in order to protect residential areas from floods. One of the most drainage-affected areas in the Lubāna wetland complex is the Sala Mire.

The entire territory of nature reserve is located in the National Flood Risk Territory of National Significance. There is a high probability that more than 500 people can be influenced by spring flooding. According to flood risk index (10% exceedance probability, or a 10 year recurrence interval), more than 3600 ha of the nature reserve are flooded during the flood. It determines the necessity to coordinate nature protection priorities with safety issues of people and infrastructure. Lake Lubāns is a public lake.

The territory is one of the most important Natura 2000 sites in Latvia for the conservation of grasslands according to their total area. There area about 3 000 hectares of grassland habitats of EU importance, which is the largest area of all Natura 2000 sites in Latvia. It is the most important Natura 2000 territory for the protection of habitat type 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)*, the second most important for 6530* *Fennoscandian wooded meadows*, the fourth most important for 6120* *Xeric sand calcareous grasslands* and 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* (respectively 43,8 %, 23,6 %, 11,9 %, 5,9 % and 6,5% of the total area of habitat type in Natura 2000 territories in Latvia).

The most important plant species are *Gladiolus imbricatus, Cnidium dubium, Carex aquatilis, Viola stagnina*. The great diversity of woodland habitats supports a variety and large numbers of rare moss, lichen and invertebrate species.

2. Threats to habitat and species conservation

- Habitats of wet forests and mires are negatively influenced by changes in natural hydrological regime caused by drainage.
- Protected woodland habitats at Pededze river (alluvial forests; riparian mixed forests of *Quercus robur,*

Ulmus glabra, Fraxinus excelsior along the river), and alluvial grasslands are threatened due to flooding regime modifications due to river straightening and drainage of floodplains.

- Fragmentation of protected forest habitats. Protected woodland habitats are small and distant, and sensitive to disturbances. In case of accidental disappearance of species, there is a high probability that species in this area may not return.
- Protected woodland habitats are adversely affected by forestry activities – partial removal of mature trees and dead wood.
- The existence of grassland habitats is threatened by management cessation which is caused both by socio-economic factors and highly complex hydrological conditions. Access roads are in poor condition, and grasslands are inaccessible.
- Spread of invasive plant species *Heracleum sosnowskyi*. There are large and expanding colonies along watercourses, on dams around Lake Lubāns.
- Eutrophication of Lake Lubāns. Some parts of the lake are rapidly overgrowing. The proportion of open water areas is decreasing.

3. Existing management of the protected habitats and its assessment

- On the coast of the lake near Īdeņa and Kvāpans villages, reeds are harvested every year, in an area of 3-6 hectares, and prescribed burning of reedbeds is carried out in bird breeding sites. 106 artificial islets and four migration corridors have been established. Measures need to be carried out in larger areas, and the overgrowth of islets must be prevented. Moreover, the modification of artificial islets is necessary as currently birds are breeding just on few of them. The current islets are suitable for predator mammals (American mink *Neovison vison*) which destroy clutches of birds. In 2015 and 2016, reeds and shrubs were mown on these islets. In 2017, prescribed burning of reeds was carried out also in Zvejsala ponds.
- Restoration of semi-natural grassland habitats was carried out within the framework of the EC LIFE programme project "Management of Lubāns Wetland Complex, Latvia" (LIFE03NAT/LV/000083; 2003–2007). Shrubs were felled in an area of 341 ha, mowing of grasslands was started, ditches were filled (61 dams) in order to increase humidity. In the first years after restoration (2005–2007), monitoring indicated only slight changes in the composition of the species; vegetation became more varied, but the influence of increased moisture was not observed. Monitoring was continued in 2015 (unpublished data of Vija Kreile) and the results of wetting were observed – the proportion of wet grassland species, particularly sedges, was increased, and paludification was not observed. In grasslands which were managed by grass shredding for a lengthy period of time, or grass was left on site, the cover of expansive species (*Filipendula ulmaria* and *Urtica dioica*) was increased.
- Rewetting in four mires was carried out within the framework of the same project. In total, 58 wooden dams were constructed. Similar activities must be continued, and also trees must be felled in heavily drained and overgrown parts of the mire.
- According to Rural Support Service, in 2014 most of the moist grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Support was received for the management of 70–90 % of habitat types 6450 *Northern boreal alluvial meadows*, 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis), 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*. Only 22–48 % of habitat types 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia), 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe),* and 6120* *Xeric sand calcareous grasslands* were managed.
- Restoration of wooded meadows in an area of 17 hectares was carried out within LIFE programme project "Management of Fennoscandian wooded meadows (6530*) and two priority beetle species: planning, public participation, innovation" (LIFE09/NAT/LV/000240).
- From 2016 to 2021, part of the Klāni Grasslands will be managed in scope of LIFE programme project "Conservation arrangements for Lesser Spotted Eagle in Latvia" (LIFE13 NAT/LV/001078).

4. Priorities of management and conservation

- Balancing the requirements for the protection of species and habitats and the prevention of flood risk.
- Rewetting in bog woodlands and mires, restoring ~ 2000 ha.
- Restoration of grassland habitats in their maximum possible area; maintenance in favourable conservation status. The number of habitats and species in semi-natural grasslands is very high, therefore the priority in the territory is both the conservation of habitats and species' habitats in favourable conservation status.
- Coordination of the binding rules and biodiversity conservation measures regarding permissible forestry activities.

- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitats. Promotion of the development of future habitats by selective felling in potentially valuable territories, for example, in order to promote proportion of broadleaved trees.
- Undisturbed course of natural processes in habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Elimination of invasive species *Heracleum sosnowskyi*.

5. Necessary management and conservation measures

5.1. General measures

- Development of nature management plan; modification of Functional zoning and Individual regulations on protection and use in accordance to research results included in the nature management plan.
- Clarification of areas of EU protected habitat types in the entire area of the nature reserve; habitat mapping according to latest methods and approaches.
- Hydrological regime research in the nature reserve. Assessment of potential rewetting impact on the surroundings. Coordination of interests of nature conservation and flood prevention and flood impact mitigation. Rewetting must be carried out in accordance to the procedures specified in regulatory enactments, if it is concluded that rewetting is possible and necessary. The measure also includes the preparation of a monitoring programme and methods for the assessment of restoration efficiency.
- Research of the rewetting possibilities for the conservation of alluvial forests and alluvial grasslands.
- Maintenance of water discharge in watercourses by prevention of excessive overgrowth and clogs (promoting the flood risk); prevention of the development of continuous reedbeds in flooded areas and floodplains.
- In-depth evaluation of grassland habitats; development of grassland restoration and management plan. Plan must include:
  - prioritization of conservation of grassland nature values in Lubāns wetland, at regional and national level;
  - modeling of grassland management possibilities in different hydrological regime scenarios, depending on the priorities set;
  - analysis of the use of grassland biomass;
  - assessment of the necessities of construction/ repair of access roads.
- Development of grassland management recommendations in accordance to socio-economical and nature resource use possibilities in the territory. Recommendations must include: necessary management measures (including rewetting) at the level of detail of minimal unit of habitat maps (*polygons*) for every EU protected grassland habitat or birds habitat; time period for their implementation; recommended, acceptable and inappropriate types of management. Management recommendations should be based on hydrological regime assessment, and also appropriate management technique must be recommended. If rewetting is necessary, recommendations should also be given for management until the start of rewetting.
- Restriction of invasive species *Heracleum sosnowskyi* spread; intense elimination of its colonies.
- Strengthening of the Northern Dam.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91F0	Riparian mixed forests	15.6	<1	Poor.	Non-intervention. Evaluation of possible restoration of flood regime in some sites.	According to research results.	15.6
91E0*	Alluvial forests	94.7	<1	Poor.	Non-intervention. Evaluation of possible restoration of flood regime in some sites.	According to research results.	94.7
91D0*	Bog woodland	2636.0	5.1	Poor.	Non-intervention, except rewetting, in complex with mires.	According to research results.	
9160	Oak forests	82.6	<1	Poor to favourable.	Non-intervention. Felling of spruces in advance growth and subcanopy; removal of felling residues.	2	80.6
9080*	*Tilio-Acerion* forests of slopes, screes and ravines	722.3	1.4	Poor.	Non-intervention. Rewetting, in complex with mires.	According to research results.	722.3
9020*	Broad-leaved deciduous forests	12.3	<1	Poor to favourable.	Non-intervention.		12.3
9010*	Western Taïga	436.2	<1	Bad to favourable.	Improvement of structural quality in low-quality woodlands – creation of canopy gaps, increase of dead wood volumes.	According to research results.	436.2
9000	Potential Protected woodland habitat	1250.0	2.4	-	Non-intervention. Selective felling in order to increase the proportion of broadleaved trees.	45.5	1204.5
7150	Depressions on peat substrates	5.1	<1	Poor.	Non-intervention.		5.1
7140	Transition mires and quaking bogs	1083.3	2.1	Poor.	Rewetting, in complex with raised bogs and wet forests (ditch blocking or filling).	According to research results.	

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7120	Degraded raised bogs	416.7	<1	Bad.	Rewetting, in complex with wet forests (ditch blocking or filling).	According to research results.	
7110*	Active raised bogs	5823.1	11.3	Poor.	Rewetting, in complex with raised bogs and wet forests (ditch blocking or filling).	According to research results.	
6530*	Fennoscandian wooded meadows	56.7	<1	Bad.	Restoration. Maintenance.	56.7	56.7
6510	Lowland hay meadows	90.3	<1	Favourable.	Restoration. Maintenance.	10.0	90.3
6450	Northern boreal alluvial meadows	2368.5	4.6	Favourable.	Restoration. Maintenance.	307	2368.5
6430	Hydrophilous tall herb fringe communities	Jāprecizē.		Poor.	Restoration. Maintenance.	Unknown.	Unknown.
6410	*Molinia* meadows	4.7	<1	Bad.	Restoration. Maintenance.	3.4	4.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	257.0	<1	Favourable.	Restoration. Maintenance.	68.0	257.0
6230*	Species-rich *Nardus* grasslands	66.4	<1	Bad.	Restoration. Maintenance.	34.6	66.4
6210	Semi-natural dry calcareous grasslands	0.8	<1	Bad.	Restoration. Maintenance.	0.34	0.8
6120*	Xeric sand calcareous grasslands	23.3	<1	Bad.	Restoration. Maintenance.	18.0	23.3
5130	*Juniperus communis* formations on heaths or calcareous grasslands	3.7	<1	Bad.	Restoration. Maintenance.	3.7	3.7
6000	Grasslands to be restored	1700.0	3.0	-	Restoration. Maintenance.	1700.0	1700.0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3260	Natural river reaches and river riffles	40.0		Poor.	Minimize excessive macrophyte overgrowth and sediment accumulation in order to secure water discharge in channels and channelized rivers, and diminish development of flood events/situations.	20.0	
3160	Natural dystrophic lakes and ponds	10.8	<1	Favourable.	Non-intervention.		10.8
3150	Natural eutrophic lakes	8166.0	15.90	Poor.	Prevention of erosion encouraged by flood protection infrastructure. Removal of decayed plant mass that is washed ashore (in order to decrease the eutrophication). On islets: reed gathering and burning (in order to prevent the overgrowth). Once per 1-3 years.	5.0	40.0

Ļubasts | *Nature Reserve (LV0534300)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Daugavpils municipality Līksna rural territory.

AREA: 110 ha.

NATURE MANAGEMENT PLAN: 2016. (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Ļubasts Nature Reserve is located on the edge of a forest massif, near the Daugava River, near Daugavpils City. It includes Lake Ļubasts with the adjoining belt of forest. On the west side, the nature reserve borders with an area of allotment gardens (Ļūbaste 1). The lake is shallow; its average depth is 0.3 m. Šaltupe river flows into the lake. In the area of allotment gardens, drainage was carried out in 1960s. The natural outflow was filled up, and water of lake was redirected via drainage ditch to Līksna river. As a result, water level in the lake was lowered by 1 m. There are swamps on the lake coasts, the lake is hard to reach, it is almost completely overgrown; only a few open water areas are left, overgrown with submerged vegetation, mainly *Stratiotes aloides*. In springtime, water of Daugava River via Līksna river flows into lake, flooding shores of the lake and residential areas at the lower level. When the water level drops, the flood water flows out of the lake, but lake cleaning does not occur. The rapid overgrowth of the lake continues. It is promoted by the transformation of the natural hydrographical network, by drainage of the territories next to the lake, as well as by the anthropogenic pollution and insufficient water discharge during the low water periods.

The nature reserve is established for the protection of breeding site of the black tern *Chlidonias niger*. In total, 27 rare and protected bird species have been observed in the nature reserve, such as *Circus aeruginosus, Circus pygargus, Botaurus stellaris, Chroicocephalus ridibundus, Porzana porzana* and others. Protected plant species can be found in the wet forests of the territory, such as *Galium trifidum* and *Iris sibirica*. The nature reserve is important also for rare and protected invertebrate species (17 in total), such as *Dytiscus latissimus* and *Leucorrhinia pectoralis*.

2. Threats to habitat and species conservation

- The water level of the lake is lowered by 60-70 cm due to previous filling up of the natural outflow of the lake, and redirection of the water via a drainage ditch. As a result, the open surface area and depth of the lake are significantly reduced, and the process of overgrowing is rapidly increasing.
- During the spring floods, water level in Daugava and Līksna rivers in rising, and the lowest parts of Ļubaste village are flooded. There is no central wastewater collection system, therefore organic pollution flows into the lake.
- During the floods, water outflow is slower than inflow. As a result, sediments are deposited in lake bottom, causing biogene pollution.
- If the overgrowth of lake will continue, areas suitable for rare species *Chlidonias niger* breeding will decrease.
- Bird species characteristic to lake shore grasslands disappear due to lake eutrophication and overgrowth with reeds.
- The intensification of lake overgrowth (mainly with *Stratiotes aloides*) is a clear signal that the lake's ecosystem has entered the final degradation phase, and urgent lake restoration and rehabilitation measures are necessary.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Improvement of lake hydrological regime by taking measures for restoration and rehabilitation of the lake's ecosystem.
- Improvement of the quality of habitats necessary for breeding birds.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of hydrological regime optimal for wet forests.

5. Necessary management and conservation measures

5.1.General measures

- Development of a detailed plan for lake restoration and rehabilitation.
- Regular maintenance of the lake outflow.
- For the maintenance of the main ditch, removal of illegal constructions (firewood sheds, fences, etc.) is necessary.
- Maintenance of drainage systems in summer cottage area Ļubasti 1.
- Establishment of two separate access spots (corridors) to the lake near the Lubaste cottage area, with the aim of creating summer cottage residents' interest in access to the lake. This will also raise the number of ducks and waders in the territory.
- Reduction of overgrowth of the lake coast with expansive species by regular mowing.
- Enlargement of the nature reserve by incorporating 9.12 ha of protected habitats of grasslands (6450 *Northern boreal alluvial meadows*) and woodlands (9080* *Fennoscandian deciduous swamp woods*).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	16.9	15.4	Poor.	Non-intervention.		16.9
3150	Natural eutrophic lakes	42.6	38.7	Bad.	Establishment of open littoral areas by removal of coastal vegetation in maximum possible area (*Phragmites australis, Typha latifolia, Stratiotes aloides*) in summer, at summer cottage area and at outflow M1.		1.0
					Prescribed burning of emergent vegetation (*Phragmites australis, Typha latifolia, Stratiotes aloides*) in winter, under frozen conditions (summer cottage area).		1.0
					Mowing of Ļubasts outflowing ditch, once per year.		1.0
					Implementation of lake restoration and rehabilitation plan included in the Nature management plan.	42.00	

Maizezers | *Nature Reserve (LV0510000)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Limbaži municipality Umurga rural territory.

AREA: 45.6 ha

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Maizezers Nature Reserve is located near Limbaži town. It includes terrain depression with small-sized Lake Maizezers, and adjoining wet territories, forming a united complex of lake and mires. Rātes Mire is located in the north. The territory is important for the protection of oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*, active raised bogs, transition mires and quaking bogs, and bog woodland. Lake shores are hard to reach because of quaking bogs. A clogged and dysfunctional ditch is located at the south-eastern corner of the lake. Previously, it used to discharge water into Brasla river.

Lake Maizezers is one of the ten localities of *Isoëtes echinospora* in Latvia. There is also rare plant community with *Lobelia dortmanna, Sparganium gramineum*, and *Sparganium angustifolium*.

The territory is also an important habitat for dragonfly *Leucorrhinia pectoralis*.

2. Threats to habitat and species conservation

- Potentially, protected habitats of the territory may be adversely affected by hydrological regime changes.
- In north-western coast of the lake, there is an unmanaged bathing site with minimal amount of facilities. In this area, lake bottom is sandy, with sparse reeds. Here, *Lobelia-Isoëtes* plants can be found, as well as *Sparganium angustifolium* in the open part of lake. Several forest roads lead to the bathing site.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage mire and woodland habitats.
- Emergent vegetation is eliminated in the area of the bathing site, in a 15-20 meters wide belt, by trampling and, possibly, by mowing. This can be evaluated as positive, as this is the only part of lake where sandy mineral bottom is exposed outside the reedbeds up to the open part of lake. Reedbed near the bathing site is sparse, and individual *Lobelias* and *Isoëtes* can be found here.

4. Priorities of management and conservation

- Conservation of *Isoëtes echinospora*; extension of its habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Specifying the nature reserve borders. There are wet habitats adjoining the nature reserve that forms a single ecosystem of forests, mires and lake. Their inclusion in the nature reserve will ensure their efficient conservation.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	12.7	27.9	Poor.	Non-intervention.		12.7
7140	Transition mires and quaking bogs	10.7	23.5	Favourable.	Non-intervention.		10.7
7110*	Active raised bogs	11.2	24.6	Favourable.	Non-intervention.		11.2
3130	*Lobelia-Isoetes* lakes	5.7	12.5	Bad.	Thinning of coastal reedbeds and removal of reed litter, in order to avoid burial of *Lobelia-Isoëtes* plants (especially *Isoëtes echinospora*). Reedbed thinning is recommended in areas away from the existing bathing site. Separate clusters of reeds must be left, in order to avoid the increased use of this area for recreation. Mown biomass must be removed from water. Reedbed thinning in NE coast must be arranged in a way that waves wash the lake bed and the decayed plants are washed ashore.		0.2

Maņģenes meži | *Nature Reserve (LV0525000)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Kuldīga municipality Rumba rural territory.

AREA: 1657 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 23 of 20 January 2003, Regulation on Individual Protection and Use of the Maņģenes Meži Nature Reserve.

Maņģenes meži Nature Reserve includes a forest area between the valleys of the Abava and the Venta rivers, with valleys and ravines of several small rivers (Bebrupīte, Kazu Valks and others) with beaver-inundated areas, as well as terrain depressions with small raised bogs. A wavy terrain is characteristic. In its southern part, nature reserve is bordering with Abavas Senleja Nature Park, but in the west with Ventas Ieleja Nature Reserve. The territory includes eight micro-reserves established for the protection of plant and bird species. Together with other nearby protected nature territories, the region is significant as a united and continuous complex of nature values.

The nature reserve is important for the protection of various forest habitats – forests of slopes, screes and ravines, deciduous swamp woods, western Taïga, bog woodland. Coniferous forests that are only slightly affected by drainage are home to several rare species. In total, 16 EU protected habitat types have been found. Rare and protected species include seven species of invertebrates, two mammal, four lichen, four moss, one mushroom, three amphibian species, and nine species of vascular plants.

Also 21 species of protected birds can be found such as *Bonasa bonasia, Aegolius funereus, Columba oenas*, and *Haliaeetus albicilla*. The density of *Tetrao urogallus* leks is rather high. Rare amphibians: *Triturus cristatus*. Insects: *Graphoderus bilineatus, Nothorhina punctata*, and *Leucorrhinia pectoralis*. Mosses: *Anastrophyllum hellerianum* and *Bazzania trilobata*.

2. Threats to habitat and species conservation

- The quality of forest habitats in the nature reserve has significantly decreased due to logging.
- The overgrowth of *Tetrao urogallus* leks is promoted by previous drainage and changes of the hydrological regime.
- The biodiversity of the territory is potentially decreasing due to overgrowth of grasslands, gaps and fallow-lands.
- Beaver dams and fallen logs in rivers promote the slowdown of the stream, water temperature rise, decrease of dissolved oxygen, river shore erosion or paludification (depending on the longitudinal profile of the river), riverbeds with pebbles and gravel become buried by sediments; disappearance of habitats suitable for oxygen-sensitive aquatic invertebrates, as well as for as *Lampetra planeri* and for salmonid fish.
- Potentially, forests are threatened by increase of beaver activities which can cause the withering of biologically valuable woodlands on riverside banks.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 grasslands of the territory were not managed in the scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Parts of the grasslands were surveyed in 2014, and were assessed as non-compliant to the criteria of EU protected grassland habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Decrease in forest fragmentation; increase of area and integrity of protected habitats by ensuring non-intervention in woodlands that have not yet reached the quality of protected habitats.
- Maintenance of *Tetrao urogallus* leks and habitats in a favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

- Considering the merging of Maņģenes meži Nature Reserve with Abavas senleja Nature Park.
- Evaluation of the necessity of restoration of semi-natural grasslands instead of agricultural lands and especially instead of fallow-lands. In the Nature management plan in 2016, the importance of agricultural lands (approx. 177 ha) for the preservation of biodiversity of the nature reserve was not evaluated. Usually, grasslands in forest landscapes are important for the increasing of diversity of species and as foraging sites for forest invertebrates, birds, and mammals.
- Schemes to reduce habitat fragmentation and for habitat aggregation measures must be developed after the habitat mapping.
- Development and approval of Regulations on Individual Protection and Use including logging restrictions in order to reduce future fragmentation of forest habitats.
- Research of hydrological regime in all the territory of the nature reserve, concentrating on woodland habitats where rewetting is planned, as well as on mire habitats, in order to reduce the influence of drainage in mires.
- Development and implementation of rewetting project for mires and forests; filling-up or blocking of sectors of ditches, in order to improve the quality of habitats.
- Maintenance of river riffles by demolishing beaver dams and preventing inundations caused by the dams in river reaches with riverbed with gravel, pebbles and boulders. It should be carried out in order to maintain migration and to avoid habitat deterioration for *Lampetra planeri* and salmonids which are present here, and for *Unio crassus* which potentially can live here.
- Maintenance of *Tetrao urogallus* leks according to the ecological requirements of the species.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	1.6	<1	Poor.	Non-intervention.		1.6
91D0*	Bog woodland	257.6	15.5	Poor.	Non-intervention. Rewetting. Management of *Tetrao urogallus* leks.	 45.1 According to recommen-dations of the expert.	212.5
9080*	Fennoscandian deciduous swamp woods	58.5	3.5	Poor.	Non-intervention. Rewetting.	 1.96	56.6
9050	Herb rich spruce forests	6.5	<1	Poor.	Non-intervention. Rewetting.	 0.4	6.2
9010*	Western Taïga	416.1	25.1	Favourable.	Non-intervention. Felling and burning of *Picea abies*. Increase of volumes of dead wood; prescribed burning. Prescribed burning. Rewetting. Management of *Tetrao urogallus* leks.	 20.4 2.2 10.9 3.0 According to recommen-dations of the expert.	379.6

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9000	Potential Protected woodland habitat	75	4.5	-	Non-intervention. Improvement of structure.	20	65
8220	Siliceous rocky slopes	0.2	<1	Favourable.	Non-intervention.		0.2
6000	Grasslands to be restored	Up to 177.0	10.7		Restoration. Maintenance.	Up to 177.0	Up to 177.0
7220*	Petrifying springs	0.03	<1	Favourable.	Non-intervention.		0.03
7160	Fennoscandian mineral-rich springs and springfens	4.0	<1	Favourable.	Non-intervention.		4.0
7140	Transition mires and quaking bogs	1.5	<1	Favourable.	Non-intervention.		1.5
7120	Degraded raised bogs	7.3	<1	Bad.	Non-intervention. Rewetting.	4.1	3.3
7110*	Active raised bogs	6.3	<1	Bad.	Non-intervention.		6.3
3260	Natural river reaches and river riffles	1.9	<1	Poor.	Limitation of beaver activities (decreasing their amount, demolishing dams on a regular basis), removal of large woody debris.	1.9	
2180	Wooded dunes	54.0	3.3	Poor.	Non-intervention. Felling of *Picea abies*; prescribed burning. Increase of volumes of dead wood; prescribed burning.	0.9 25.1	28.0

Matkules meži | *Nature Reserve (LV0534400)*

1. Brief description

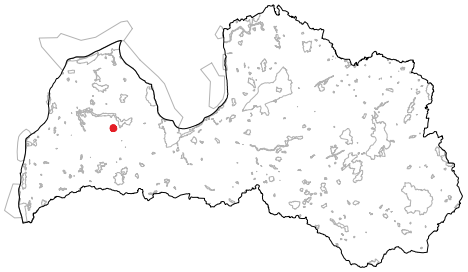
YEAR OF FOUNDATION: 2004.

LOCATION: Kandava municipality Matkule rural territory.

AREA: 80 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Matkules meži Nature Reserve is located in a small forest area. It includes both wet and drained woodlands and dry forests on terrain elevation. The territory is established for the protection of woodland habitats. Although the area of the nature reserve is small, there are three types of EU protected habitat types. The territory is important as black stork *Ciconia nigra* breeding site; it includes micro-reserve which is established for the conservation of the breeding site for this species.

2. Threats to habitat and species conservation

- The existence of wet habitats of the territory can be adversely affected by hydrological regime changes.
- Structural quality of woodland habitats and the condition of their depending species can be deteriorated by removal of dead wood, standing dead trees and biologically-old trees.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Maintenance of hydrological regime optimal for wet habitats.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Development and approval of Individual regulations on protection and use in order to provide non-intervention (selective felling ("sanitary felling") should be excluded).
- Update of habitat maps.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	27.5	34.4	Poor.	Non-intervention.		27.5
9080*	Fennoscandian deciduous swamp woods	27.2	34.1	Poor	Non-intervention.		27.2
9010*	Western Taïga	16.4	20.6	Poor.	Non-intervention.		16.4

Mazie Kangari | *Nature Reserve (LV0520500)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Sigulda municipality Allaži rural territory.

AREA: 348 ha.

NATURE MANAGEMENT PLAN: 2003 (2004—2009), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Mazie Kangari Nature Reserve includes a ridge of Mazie Kangari esker and Buļļu Mire with adjoining areas. There is a mosaic of mixed forests on terrain elevations and bog woodlands in terrain depressions. There are 16 plant species in the nature reserve with their localities close to the borders of their distribution range. Examples of rare and protected species are plants *Dracocephalum ruyschiana*, *Onobrychis arenaria*, lichen *Lobaria pulmonaria*, butterflies *Papilio machaon, Apatura iris* and *Limenitis camilla*. In total, 14 protected bird species have been found in the nature reserve. *Tetrao tetrix* are displaying in the Buļļu Mire.

Important localities of protected plant species *Pulsatilla patens* and *Onobrychis arenaria* are found also outside the nature reserve, in the immediate vicinity.

Buļļu Mire is located north of the esker ridge. It is drained, and its runoff flows into Krievupe River. Small peat extraction sites (from 1950s) are located in its western part. Drainage influence can be observed in their vicinity. The central part of the mire has remained almost unchanged.

Due to succession, coniferous trees in woodlands are replaced by deciduous trees, rich ground vegetation of herbaceous plants has developed. Woodlands corresponding to habitat type 9060 *Coniferous forests on, or connected to, glaciofluvial eskers* are almost lacking because species characteristic to broadleaved forests dominate in ground vegetation and understory.

2. Threats to habitat and species conservation

- Mire and wet forests are adversely influenced by drainage.
- Quality of woodland habitats is reduced due to removal of dead wood and biologically-old trees.
- Recreation. Excessive vehicle use in the mire.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage mire and forest habitats.
- Improvement of insolation for some of the old trees (along the old motorway) had been carried out by felling younger trees at the southern side of old trees.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Restoration and maintenance of hydrological regime.
- Semi-natural grasslands in the nature reserve are fragmented and isolated in forests. Their maintenance in nature reserve is recommended but it is not a priority.

5. Necessary management and conservation measures

5.1. General measures

- Inventory of forest habitats according to the latest methods.
- A complex hydrological research of the territory. Evaluation of possibilities of rewetting.
- Development of a construction project for a complex rewetting in wet habitats and for the stabilization of water level in parts of mire which are affected by drainage.
- Inventory of areas of habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*; evaluation of their possible compliance to habitat type 6450 *Northern boreal alluvial meadows*. Planning of the necessary restoration measures.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	51.8	14.9	Poor.	Rewetting, in complex with mire.	According to research results.	
9060	Coniferous esker forests	39.3	11.3	Bad.	Non-intervention.		
91E0*	Alluvial forests	4.05	1.2	Poor.	Non-intervention.		4.05
7120	Degraded raised bogs	8.7	2.5	Bad.	Rewetting (blocking or filling of ditches); felling of trees in overgrown sites influenced by drainage (NW and W parts of Buļļu Mire). Necessary tasks must be specified during the hydrological research.	8.7	
7110*	Active raised bogs	105.7	30.3	Poor.	Rewetting (blocking or filling of ditches); felling of trees in the overgrown sites influenced by drainage (NW part).	30	
6430	Hydrophilous tall herb fringe communities	3.3	<1	Favourable. Poor.	Restoration (and evaluation of the compliance to habitat type 6450). Maintenance.	3.3	3.3
6210	Semi-natural dry calcareous grasslands	0.2	<1	Poor.	Restoration. Maintenance.	0.2	0.2
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	3.9	1.1	Poor.	Restoration. Maintenance.	3.9	3.9

Mazzalvītes purvs | *Nature Reserve (LV0500800)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Nereta municipality Zalve rural territory.

AREA: 267 ha.

NATURE MANAGEMENT PLAN: 2010 (2011–2021).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Mazzalvītes purvs Nature Reserve is located in a wide forest massif, in a shallow depression between Viesīte and Zalvīte rivers. It includes part of the Sūnāklis Mire. The territory is important for the complex of mire and woodlands which provide habitats for rare and protected species of birds, invertebrates and plants. The micro-reserve for the protection of capercaillie *Tetrao urogallus* leks and *Ciconia nigra* has been established in the territory. Small areas of micro-reserves and their buffer-zones are located outside the nature reserve.

Six protected habitat types of EU importance have been found in the nature reserve as well as 22 protected and rare species, such as birds *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Caprimulgus europaeus, Pandion haliaetus*, moss *Jungermannia leiantha*, very rare beetle Thymalus limbatus, and others.

The habitats of bog woodlands and mires are relatively affected. The hydrological regime of the mire is influenced by drainage that has been carried out in the surrounding area and partly also in the nature reserve. Almost 30% of the woodlands grow on drained peaty substrate. Peat has been extracted in a small part of the nature reserve.

2. Threats to habitat and species conservation

Habitats of mire and woodlands are affected negatively by drainage system which is established in the nature reserve and in its surrounding area. It has promoted the hydrological regime changes and subsequent overgrowth with trees in the mire, and further vegetation changes.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage mire and woodland habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Rewetting would not only improve the condition in protected habitats but also promote the development of bog woodlands in the degraded part of mire which currently do not correspond to criteria of any protected habitat.
- Structure improvement in raised bog.

5. Necessary management and conservation measures

5.1. General measures

Investigation of hydrological regime; development of a construction project of rewetting, assessing its possible impact on habitats of protected bird species (*Tetrao urogallus* and *Ciconia nigra*). Evaluation of the adverse influence of ditches of the adjoining areas and the possibilities to eliminate them. The measure also includes the development of monitoring program and methods for the assessment of restoration efficiency.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	163.8	61.4	Bad.	Non-intervention, except rewetting measures.	According to hydrological research results.	163.8
9010*	Western Taïga	12.9	4.8	Favourable.	Non-intervention.		12.9
9000	Potential Protected woodland habitat	35.5		-	Rewetting.	According to hydrological research results.	35.5
7140	Transition mires and quaking bogs	0.7	<1	Favourable.	Non-intervention.	According to hydrological research results.	0.7
7120	Degraded raised bogs	21.2	7.9	Bad.	Non-intervention, except rewetting measures. Reduction of runoff to the west and north in ditches from forest blocks 110, by partially filling of ditches and by avoiding ditch cleaning. Reduction of overgrowth at the periphery of the open part of raised bog by partial felling of pines in a 50-100 m wide belt around the opening in forest block 111 and 112.	According to hydrological research results.	21.2
7110*	Active raised bogs	65.6	24.6	Bad.	Non-intervention, except rewetting measures. Assessment of the runoff from 111 block and the possibilities of its reduction by using existing ditch berm in the eastern edge of block 110.	According to hydrological research results.	65.6

Medze | *Nature Reserve (LV0507600)*

1. Brief description

YEAR OF FOUNDATION: 1962.

LOCATION: Grobiņa municipality, Medze rural territory.

AREA: 95 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Medze Nature Reserve was originally established for the preservation of Baltic Ice Lake coastal formations. The territory is extended in the north-south direction, it is 12 km long, and located along the P111 motorway. Nature reserve includes slopes and side ravines of the coastal formation, covered with dry grasslands on calcareous substrates, lowland species-rich dry to mesic grasslands, lowland hay meadows, fragments of woodlands, and agricultural lands. The slope height reaches 30 m, and the highest point is the Spicais Hill.

There are four EU protected habitat types. Although the total area of grassland habitats is not large, they are very important for the reduction of fragmentation in the southern part of Coastal Geobotanical District, on the border with Kurzeme Geobotanical District. Grasslands are important as a heritage of cultural history, as they are ancient semi-natural grasslands that have survived until the present without improvement or grubbing up. They are important for the preservation of the characteristic landscape and allow a better view of the geomorphological object. Nature reserve is rich in rare and protected plant and invertebrate species. The most important ones are plant species *Orchis mascula, Gentianella uliginosa, Euphrasia micrantha, Linaria loeselii, Radiola linoides, Juncus capitatus, Ranunculus bulbosus*.

2. Threats to habitat and species conservation

Grassland fragmentation and disappearance of open landscape is promoted by lack of grassland management and overgrowth with shrubs.

3. Existing management of the protected habitats and its assessment

- So far no significant measures have been taken to manage grassland habitats.
- According to Rural Support Service, in 2014 none of the grasslands were managed in scope of Rural Development Programme measure “Maintaining biodiversity in grasslands”.

4. Priorities of management and conservation

Management of semi-natural grasslands; their restoration up to their maximum possible area; maintenance in favourable conservation status, providing suitable conditions for protected plant species.

5. Necessary management and conservation measures

5.1. General measures

Development of grassland restoration and management plan. In order to increase the landscape ecological connectivity of grassland habitats and the long-term conservation of species diversity in grasslands, evaluation of establishment of grassland habitats in their historical areas must be considered. Semi-natural grasslands must be restored and created in territories of improved perennial grasslands and fallow-lands.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	5.7	6.0	Favourable.	Non-intervention.		5.7
6510	Lowland hay meadows	3.5	3.7	Bad.	Restoration. Maintenance.	3.5	3.5
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	5.6	5.9	Bad.	Restoration. Maintenance.	5.6	5.6
6210	Semi-natural dry calcareous grasslands	4.5	4.7	Bad.	Restoration. Maintenance.	4.5	4.5

Melnais purvs | *Nature Reserve (LV0506600)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Sala municipality Sala rural territory.

AREA: 151 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Melnais purvs Nature Reserve is located in an area rich in forests and mires. It includes part of the Melnais Mire with several mineral-ground islets and old woodlands surrounding the mire. The territory is important for the protection of eastern-type raised bog with *Chamaedaphne calyculata*, and bog woodland. Dry coniferous forests and fragments of transitional mire can be found on bog edges. In the most part of the area, mire has overgrown with relatively new pines. There are some old, almost overgrown ditches.

The most important protected bird species are the *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Dryocopus martius*. In forest, protected invertebrate species can be found, such as Boros schneideri, Hericium coralloides. Several Clausiliidae species can be found in Populus tremula woodlands with admixture of broadleaved trees, such as Clausilia dubia and Bulgarica cana.

2. Threats to habitat and species conservation

Changes in hydrological regime in the nature reserve and in adjacent territories.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage mire and woodland habitats.

4. Priorities of management and conservation

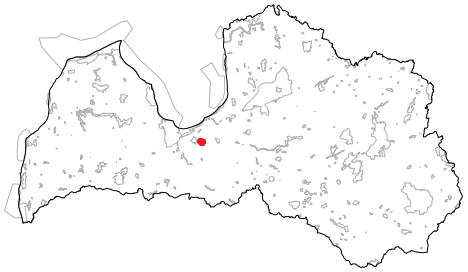
Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	41.4	27.4	Poor.	Non-intervention.		41.4
9010*	Western Taïga	9.4	6.2	Favourable.	Non-intervention.		9.4
7140	Transition mires and quaking bogs	2.7	1.8	Favourable.	Non-intervention.		2.7
7120	Degraded raised bogs	10.8	7.1	Poor.	Non-intervention.		10.8
7110*	Active raised bogs	77.1	51.1	Poor.	Non-intervention.		77.1

Melnā ezera purvs | *Nature Reserve (LV0528700)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Olaine municipality, Olaine rural territory.

AREA: 317 ha.

NATURE MANAGEMENT PLAN: 2011 (2011–2021).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Melnā ezera purvs Nature Reserve occupies part of the Cena Mire which was the largest mire in Latvia in the first half of 20th century. Currently, a large part of the mire is used for peat extraction, creation of agricultural lands, but the less affected parts are included in two nature reserves. In the central part of the bog there is Melnā Ezera Lake, as well as many small irregularly shaped bog pools. The territory complements the biological value of the nearby Cenas Tīrelis Nature Reserve, and it is a part of the biological corridor connecting to Ķemeri National Park located to the west. Six EU protected habitat types have been found in the nature reserve, and mire habitats are the most important of them.

There are more than 25 protected species. The territory is important because of the high diversity and abundance of rare bird species such as *Tringa glareola, Philomachus pugnax, Porzana porzana, Porzana parva, Tetrao tetrix, Botaurus stellaris*, and others. This is one of the few breeding sites of Cygnus cygnus in the central part of the country. During the breeding season, *Mergellus albellus* has been observed here; mire is also a stopover site of *Anser fabalis* and *Anser albifrons* during their autumn migration. The territory is surrounded by peat extraction fields and drainage ditches from nearly all sides. Flooded peat extraction fields are suitable for waders and waterbirds, and it is an important stopover site during the migration.

2. Threats to habitat and species conservation

- Hydrological regime is seriously altered due to anthropogenic activities. The main negative impact is caused by large drainage ditches that surround the nature reserve, discharging water not only from the surrounding peat extraction fields but also from the nature reserve area. The network of local ditches is located around Melnā Ezera Lake, and it drains the central part of the nature reserve.
- Several bog lakes are drained by ditches at the western part of the territory. This has caused peat settling and severe lowering of the water level. Open water area has disappeared, bog lakes overgrow with sedges and *Sphagnum* mosses. Only small islets in the overgrown area indicate on the previous bog lakes. Water continuously flows from these habitats to the main ditch.
- The decrease of the water level of the Melnais Ezers Lake has caused the mineralization of upper peat layer.
- Establishment of new peat extraction territories in the adjoining natural mire areas will negatively influence the hydrological regime and mire habitats in the nature reserve.
- Bog vegetation is negatively influenced by use of quadricycles.

3. Existing management of the protected habitats and its assessment

In 2011, in the framework of the EC LIFE program "Raised Bogs" (LIFE08 NAT/LV/000449), the research of ditch network and rewetting were carried out, and peat dams on ditches were established. Although the impact of drainage can not be completely eliminated due to the surrounding peat extraction fields and large drainage ditches, rewetting has slightly improved the condition of the bog.

4. Priorities of management and conservation

Monitoring and maintenance of peat dams built in 2012.

5. Necessary management and conservation measures

5.1. General measures

- Continuation of the monitoring of rewetting which was started in 2010 (monitoring of vegetation and water level). Evaluation of the influence of management measures on bog woodlands.
- If peat extraction is started in raised bogs bordering the nature reserve, monitoring of its influence on species and habitats of the nature reserve is necessary.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	31.2	9.8	Poor.	Non-intervention.		31.2
9010*	Western Taïga	5.1	1.6	Favourable.	Non-intervention.		5.1
7140	Transition mires and quaking bogs	3.7	1.2	Bad.	Non-intervention.		3.7
7120	Degraded raised bogs	82.5	26.0	Bad.	Monitoring and maintenance of dams established on ditches.		On necessity.
7110*	Active raised bogs	125.6	39.6	Poor.	Non-intervention.		125.6
3160	Natural dystrophic lakes and ponds	18.4	5.8	Poor.	Non-intervention.		18.4

Melnsalas purvs | *Nature Reserve (LV0527000)*

1. Brief description

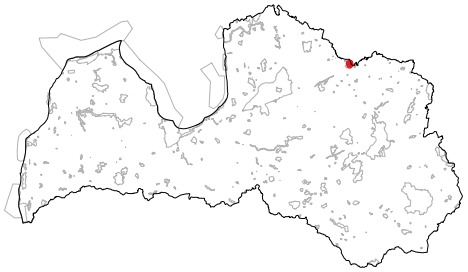
YEAR OF FOUNDATION: 1999.

LOCATION: Ape municipality, Gaujiena rural territory.

AREA: 618 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Melnsalas purvs Nature Reserve is located in forest-rich territory located between the Gauja river and Latvian-Estonian border. Part of the mire is located outside the nature reserve in Estonia. Several other mires are located nearby.

The nature reserve is important for the protection of eastern-type bogs with *Chamaedaphne calyculata* and bog woodlands. Transition mires are located on bog edges. In bog, there are mineral-ground islets, covered with old broadleaf forests *(Tilia cordata, Fraxinus excelsior*). Several rare and protected species can be found in the nature reserve, such as *Carex montana, Galium triflorum, Betula nana, Salix myrtilloides, Glyceria striata* (the only locality in Latvia). The most important rare bird species are *Tetrao tetrix* and *Tetrao urogallus*.

2. Threats to habitat and species conservation

Mire and forest habitats are influenced by hydrological regime changes promoted by drainage system established in the nature reserve and its surroundings. Drainage impact on mire is small and can be observed in bog edges as an increased overgrowth with pines.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage mire and woodland habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest and mire habitats, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Complex research of mire hydrological regime, in order to evaluate possibilities of mitigating drainage impact.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	63.5	10.2	Favourable.	Non-intervention. Research of hydrological regime and possibilities of blocking of certain ditches if this can be used for mitigating drainage impact according to research.	According to research results.	63.5
9020*	Broad-leaved deciduous forests	25.1	4.1	Favourable.	Non-intervention.		25.1
7140	Transition mires and quaking bogs	0.5	<1	Favourable.	Non-intervention.		0.5
7150	Depressions on peat substrates	19.7	3.2	Favourable.	Non-intervention.		19.7
7110*	Active raised bogs	489.1	79.1	Favourable.	Non-intervention. Research of hydrological regime and possibilities of blocking of certain ditches if this can be used for drainage impact mitigating according to research. .	50	439.1
3160	Natural dystrophic lakes and ponds	0.6	<1	Favourable.	Non-intervention.		0.6

Melnupes meži | *Nature Reserve (LV0534500)*

1. Brief description

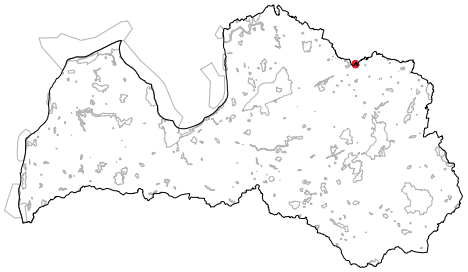
YEAR OF FOUNDATION: 2004.

LOCATION: Ape municipality Trapene rural territory.

AREA: 66 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Melnupes meži Nature Reserve is located at the Latvian-Estonian border, close to Melnupe river. The territory is important for the protection of western Taïga (coniferous and mixed woodlands) and bog woodlands. There are *Pinus sylvestris* and *P. sylvestris – Betula* spp. bog woodlands, and dry and moist woodlands with *Picea abies, Populus tremula* and *P. sylvestris* in the territory. A micro-reserve for the protection of *Ciconia nigra* is established here. Examples of rare and protected plant species are *Glyceria striata, Agrimonia pilosa*, and *Carex montana*. *Lobaria pulmonaria* can be found in old *P. tremula* woodlands. Lopinga achine can be found in the nature reserve and also adjacent to the shores of Melnupe river.

2. Threats to habitat and species conservation

Nature values of the territory are not threatened under the existing protection regime.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	19.8	30.0	Favourable.	Non-intervention.		19.8
9010*	Western Taïga	43.7	66.2	Favourable.	Non-intervention.		43.7

Melturu sils | *Nature Reserve (LV0527800)*

1. Brief description

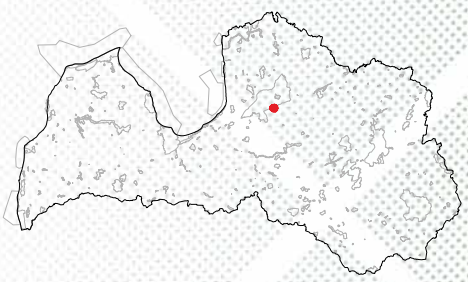
YEAR OF FOUNDATION: 2004.

LOCATION: Amata municipality Drabeši rural territory.

AREA: 288 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Melturu sils Nature Reserve includes an area rich in pine (*Pinus sylvestris*) and spruce (*Picea abies*) woodlands around the tortuous reach of Pērļupe river, at the left bank of Amata river. It includes habitats such as watercourses with river riffles, western Taïga, bog woodland, as well as species-rich dry to mesic grasslands.

The territory is important for the protection of freshwater pearl mussel *Margaritifera margaritifera*. The area is also a habitat for *Lampetra fluviatilis, Lampetra planeri, Salmo trutta fario* and *Salmo trutta m. trutta*. Birds *Bonasa bonasia, Falco subbuteo* and *Gallinago gallinago* should be noted. Several protected and rare plants have been found, for example, orchids *Dactylorhiza baltica* and *Orchis mascula*. Protected invertebrates – *Cochlodina orthostoma* and *Ruthenica filograna*.

2. Threats to habitat and species conservation

- Low water quality due to anthropogenic pollution (wastewater from Spāre residential area, agricultural runoff, railroad runoff). *Margaritifera margaritifera* and particularly their juveniles are sensitive to low water quality such as elevated concentrations of nitrogen etc.
- Activities of beavers (*Castor fiber*) in Pērļupe river and its tributaries. Beaver dams, channels, winter food cache reduce the habitat quality for pearl mussels, salmonids, lampreys, and invertebrates associated with running water. Beavers contribute to stream slowdown and consequently decreased amount of dissolved oxygen, and increased sedimentation. Additional soil and plant debris taken into river cover the pebble-beds and boulder-beds which are habitats of the species mentioned above.
- Overgrowth of alluvial and other grasslands (both EU protected habitats and perennial sown grasslands) contributes to their fragmentation, and reduces the biodiversity of grassland plant and invertebrate species. With reducing quality and diversity, their importance for the conservation of rare plant and animal species also decreases. The shading of watercourses decreases the amount of invertebrates and their associated fish (hosts of juvenile *Margaritifera margaritifera*).

3. Existing management of the protected habitats and its assessment

- Removal of individual beaver dams was started in 2002, in scope of freshwater pearl mussel projects supported by Latvian Fund for Nature. Later, pearl mussel population conservation projects were managed by Nature Conservation Agency. Since 2014, demolition of beaver dams is organized by JSC "Latvijas Valsts Meži". 8 beaver dams were identified in Pērļupe river section between A2 motorway and railroad. Initially, dams were removed 1-2 times per season. Since 2016, this river reach in continuously maintained without dams. Irregularly, in 1-2 sites, beavers tried to restore the dams. Upstream of the railroad, in Pērļupe and its tributaries, 40-50 beaver dams were identified in 2015/2016. They are demolished irregularly.
- Since 2014, the removal of fallen logs and their sediments in Pērļupe river (between motorway A2 and railroad) is organised 1-2 times per year.
- In 2015, grassland restoration along the Pērļupe river (from A2 motorway to railroad) was started. Shrubs, *Alnus incana* and individual *Picea abies* were felled. Grasslands are being mown. The total managed area is 3 hectares. Grassland monitoring has not been carried out, but the density of dry grass layer and the amount of hummocks have decreased. (The initial aim of the grassland management was to reduce the suitability of habitats to beavers and to increase beaver control possibilities.)

4. Priorities of management and conservation

- Improvement of ecological quality of Pērļupe river water: improvement of habitat structure (riverbed composition, flow velocity, shade) necessary for *Margaritifera margaritifera* and salmonids.

- Slowdown and/or stopping of *Margaritifera margaritifera* population decline; population recovery.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation and increase of the area and integrity of protected habitats by ensuring non-intervention in woodlands which have not reached the quality of protected habitats. The development towards habitat types Fennoscandian herb-rich forests with Picea abies, *Western Taïga*, and *Fennoscandian deciduous swamp woods* is expected.
- Grassland management is desirable both for the conservation of *Margaritifera margaritifera* and salmonids (shade, ensured by the development of wooded grassland landscape) and also because the territory is adjoining Gauja National Park which is an important territory on a national-scale for the conservation of semi-natural grasslands. Therefore, restored grasslands will serve not only for the biodiversity increase in Melturu sils Nature Reserve but also for the reduction of grassland fragmentation in the wider region.

5. Necessary management and conservation measures

5.1. General measures

- Identification of existing or potential pollution sources in territories adjoining nature reserve; determination of pollution reduction measures.
- Development of a complex management plan for Pērļupe river, its tributaries, and their shore grasslands upstream of the railroad. Plan must include watercourse management measures, areas and management measures of grasslands (for example, trees which must be preserved for the maintenance of watercourse shade), as well as infrastructure necessary for grassland management and maintenance (roads, watercourse crossings).
- Inventory of nature values in nature reserve and adjoining territories; habitat types and organism groups. Level of detail: forest compartments or species localities.
- Optimisation of borders of the territory based on the area of water withdrawal, natural borders and identified nature values.

5.2. Specific measures

5.2.1. Species

- Population condition of *Margaritifera margaritifera* in nature reserve is assessed as bad.
- For the conservation of species, beaver dams and inundations must be demolished annually, large woody debris must be removed. Juvenile *Salmo trutta fario* and *Salmo trutta m. trutta* must be released regularly, in order to provide hosts for *Margaritifera margaritifera* glochidia, to increase and/or stabilise their population. On necessity, artificial riffles and boulder bars must be established.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	12.9	4.5	Favourable.	Non-intervention.		12.3
91D0*	Bog woodland	6.4	2.2	Poor.	Non-intervention.		13.6
6430	Hydrophilous tall herb fringe communities	2.0	<1	Bad.	Non-intervention.	0.0	2.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	6.5	2.2	Bad.	Restoration. Maintenance.	6.5	6.5
6000	Grasslands to be restored	7.5	2.6	-	Restoration. Maintenance.	7.5	7.5
3260	Natural river reaches and river riffles	2.0	<1	Bad.	Removal of beaver dams and large woody debris. Removal of accumulated sediments. Creation of river riffles and stone stacks in five places in forest block 111, with total length of 100 metres.	0.1	Regularly, on necessity

One-time restoration measures are necessary both in the currently known EU protected grassland habitats, as well as in overgrowing grasslands which do not correspond to criteria of protected habitats (at least 14 ha). Grassland restoration measures include felling of trees and shrubs, root shredding, restorative mowing or grazing, as well as creation of wooded grassland structure along the river (in order to provide shade adequate for Margaritifera margaritifera.

Mežmuižas avoti | *Nature Reserve (LV0512800)*

1. Brief description

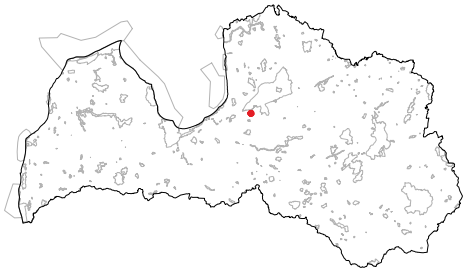
YEAR OF FOUNDATION: 1977.

LOCATION: Sigulda municipality Allaži rural territory.

AREA: 27 ha.

NATURE MANAGEMENT PLAN: developed in 2003 (2004 –2009).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 297 of 21 April 2008, Regulation on Individual Protection and Use of the Mežmuižas Avoti Nature Reserve.



Mežmuižas avoti Nature Reserve is located in Allaži rural territory, 5 km northwest of the village center. Nature Reserve is important for the conservation of one of the largest complexes of springs in Latvia. The territory is crossed by Kaļķugrava Ravine, in which there are seven spring discharges with ravines. Springs flow into a millpond with very clear water and bottom made of a blue clay. Further, water flows through the Egļupe River. Due to the flow of water, small landslides develop on the steep slopes of the ravine. Previously, springs were used for lime extraction; extracted lime was ground in watermills.

Five EU protected habitat types are found in the territory: *Tilio-Acerion* forests of slopes, screes and ravines, western Taïga, Fennoscandian mineral-rich springs and springfens, Fennoscandian lowland species-rich dry to mesic grasslands, semi-natural dry grasslands and scrubland facies on calcareous substrates. There are several rare and protected species: seven bird species, one mammal species, seven snail species, and four invertebrate species. The most important animal species found here are *Osmoderma barnabita* and *Lampetra planeri*. Several rare snail species are found in forests on the slopes, such as *Bulgarica cana, Vitrea contracta, Ena obscura* and others.

In total, around 300 vascular plant species can be found in the territory, including rare species whose distribution range in Latvia is very close to its border. Out of these, nearly 30 vascular plant species are rare and protected, such as *Bromopsis benekenii* and *Dentaria bulbifera*.

Territory is a popular tourist destination, the local tourism infrastructure helps to regulate the flow of visitors, protecting the most sensitive habitats of slopes and springs.

2. Threats to habitat and species conservation

- Anthropogenic pressure caused by visitors.
- Overgrowing of semi-natural grassland habitats, causing reduction of biodiversity of flora and fauna in the territory.
- Insufficient area for sustainable conservation of semi-natural grassland habitats if their area is not increased or if grasslands are transformed.
- Due to the pollution, green algae and submerged plants grow excessively in the pond. Although the pond is not a protected habitat, the decaying of plant residues can lower the landscape value of the pond and also make the quality of water in the pond worse.
- The spread of *Heracleum sosnowskyi* and *Impatiens glandulifera* in the territory.

3. Existing management of the protected habitats and its assessment

- The infrastructure has been built and renovated – wooden boardwalks and stairs around the springs – concentrating the flow of visitors and redirecting them from the most sensitive territories.
- According to statistics of Rural Support Service, semi-natural grasslands in nature reserve in year 2014 were not managed in scope of measure "Maintenance of biodiversity in grasslands".

4. Priorities of management and conservation

- Undisturbed course of natural processes in habitats, as well as in habitats of species that need undisturbed, natural environment (forests, springs).
- Restoration and maintenance of semi-natural grasslands within the area of their historical distribution, as well as by naturalisation of improved grasslands and fallow-lands.
- Restriction of the distribution of invasive species (*Impatiens glandulifera* and *Heracleum sosnowskyi*) in all the areas where they are found.

5. Necessary management and conservation measures

5.1. General measures

- Clarify the reasons of the overgrowth of the millpond Dzirnavdiķis with algae and macrophytes; take measures to decrease the overgrowth.
- Elimination of invasive species *Impatiens glandulifera* by weeding and mowing on the pond shores and surrounding gardens before it starts blooming.
- Elimination of invasive species *Heracleum sosnowskyi* by precluding its blooming.
- Partial removal of aquatic macrophytes from spring discharge sites and from millpond during the summer, to clear some of the more powerful water streams and bedrocks over which the water flows.
- Increase the area of semi-natural grasslands to ensure their biodiversity and sustainability. The results of semi-natural grassland mapping of 2005 are outdated and do not correspond to the current situation. Nature Conservation Plan developed in 2005 does not provide a reasoned assessment of grassland area which is necessary for their protection in the long term. Due to high rate of habitat fragmentation, current area can not ensure favourable conservation status of grasslands in the long term. In order to increase the landscape ecological connectivity of grassland habitats, the establishment of grasslands in their historical territories, should be considered. The restoration of the preserved grasslands is the priority.

5.2. Specific measures

5.2.1. Species

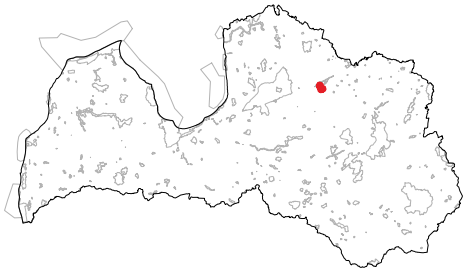
Osmoderma barnabita. Felling of shrubs and advance growth in Mežmuiža Park, between Mežciems farmsteads and the road. Arranging the linden row along the road. In grasslands of the right shore of millpond creek, in territories of "Anniņas", "Avotiņi" and "Rotas", old oaks must be preserved and advance growth must be felled.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	3.2	11.8	Poor.	Non-intervention.		3.2
9010*	Western Taïga	3.0	11.1	Bad.	Non-intervention.		3.0
7160	Fennoscandian mineral-rich springs and springfens	0.05	<1	Favourable.	Elimination of invasive plant species *Impatiens glandulifera* by weeding it on the pond shores and surrounding gardens before the blooming.		0.05
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.2	<1	Bad.	Restoration. Maintenance.	0.2	0.2
6210	Semi-natural dry calcareous grasslands	0.2	<1	Bad.	Restoration. Maintenance.	0.2	0.2
6000	Grasslands to be restored	Up to 6.0	22.2	-	Restoration. Maintenance.	Up to 6.0	Up to 6.0

Mežole | *Nature Reserve (LV0524100)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Smiltene municipality, Launkalne rural territory.

AREA: 2832 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 45 of 21 January 2003, Regulation on Individual Protection and Use of the Mežole Nature Reserve.

Mežole Nature Reserve includes a vast area of forests and mires around the Ludza and Lipsa rivers. Territory is important for the protection of mires, bog woodlands, and old natural boreal forests. Conifer forests in both dry and wet soils are prevailing here; in some places with admixture of broadleaved trees. There are several mires - Apiņu, Baltais and Krievu Mires; both habitats of raised bogs and transition mires can be found, as well as springs and springfens.

Many rare and protected species can be found in nature reserve, such as plants *Cinna latifolia, Carex disperma, Saxifraga hirculus*, invertebrates *Lycaena dispar, Graphoderus bilineatus, Unio crassus*, several rare *Clausiliidae* species. Old forests are rich with rare moss and lichen species such as *Lejeunea cavifolia, Mycoblastus sanguinarius. Hamatocaulis lapponicus* and *Paludella squarrosa*, *Bonasa bonasia, Ciconia nigra, Pernis apivorus, Tetrao urogallus* are the most important bird species in the area.

2. Threats to habitat and species conservation

- Drainage ditches, created in early 20th century and later, are present in all the mires, as well as in the wet forests.
- Some of the ditches are straightened spring discharge streams (Baltais Mire) or streams that flow out of the bog (Apiņu Mire). In the Krievu Mire, water level of the dystrophic lake was lowered by straightening the lake outflow. Peat was extracted in this bog in quarries; there are some preserved peat-drying sheds left.
- Baltais Mire is overgrown with trees and dwarf shrubs because of drainage.
- Semi-natural grasslands in Lipsa floodplain have not been managed for a long time, they are degraded and overgrown with shrubs.
- Beaver dams and large woody debris in the rivers contribute to a slowdown in the flow, an increase in water temperature, a decrease of dissolved oxygen, shore erosion or paludification (depending on the type of the river reach), as well as sedimentation in riverbeds with pebbles and boulders causing the disappearance of potential habitats of *Uno crassus* and *Margaritifera margaritifera*.

3. Existing management of the protected habitats and its assessment

Experimental removal of shade trees along the shore was carried out in 2013 and 2014.

4. Priorities of management and conservation

- Maintenance of hydrological regime optimal for wet forests.
- Undisturbed course of natural processes in forest and mire habitats, as well as in habitats of species that need undisturbed, natural environment.
- Prevention of the formation of beaver dams in river reaches with gravel, pebbles and boulders, to ensure favourable conditions for the existing population of *Lampetra planeri*, as well as for *Unio crassus*, and *Margaritifera margaritifera* which potentially can live here.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of merging the Mežole, Šepka, Rauza, and Launkalne Nature Reserves into one protected nature territory in order to ensure a coordinated protection of *Margaritifera margaritifera* in the Palsa river basin.
- Development of nature conservation plan and draft project of new individual regulations on protection and use, reviewing the existing zoning and its suitability for the protection of nature values.
- Research of the hydrology of the nature reserve. Development of construction project for rewetting

as well as hydrotechnical project, including the development of monitoring program for the assessment of rewetting efficiency.
- Restoration of a small bridge across the River Lipsa to provide access to the equipment for restoration and management of grasslands.
- Removal of large woody debris and beaver dams in river reaches with gravel, pebbles and boulders.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	389.0	13.7	Favourable.	Non-intervention except rewetting.	According to research results.	389.0
91E0*	Alluvial forests	44.9	1.6	Poor.	Non-intervention.		44.9
9180*	Slope forests	0.6	<1	Favourable.	Non-intervention.		0.6
9080*	Fennoscandian deciduous swamp woods	49.6	1.8	Favourable.	Non-intervention.		49.6
9020*	Broad-leaved deciduous forests	17.1	<1	Favourable.	Non-intervention.		17.1
9010*	Western Taïga	499.5	17.6	Favourable.	Non-intervention.		499.5
9000	Potential Protected woodland habitat	85.0	3.0	-	Non-intervention.		85.0
7220*	Petrifying springs	<0.1		Poor.	Non-intervention.		<0.1
7160	Fennoscandian mineral-rich springs and springfens	82.1	2.9	Favourable.	Non-intervention.		82.1
7140	Transition mires and quaking bogs	5.1	<1	Favourable.	Reed cutting and removal. Non-intervention.	1	 4.1
7110*	Active raised bogs	75.2	2.7	Poor.	Non-intervention. Rewetting (hydrology research is necessary).	According to research results.	50

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7120	Degraded raised bogs	12.2	<1	Bad.	Rewetting (hydrology research is necessary).	12.2	
6450	Northern boreal alluvial meadows	2.1	<1	Bad.	Restoration. Maintenance.	2.1	2.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.9	<1	Bad.	Restoration. Maintenance.	0.9	0.9
3160	Natural dystrophic lakes and ponds	0.3	<1	Favourable.	Non-intervention.		0.3
3260	Natural river reaches and river riffles	9.5	<1	Poor.	Removal or reduction of large woody debris; demolition of beaver dams.	3.0	

Mērnieku dumbrāji | *Nature Reserve (LV0522000)*

1. Brief description

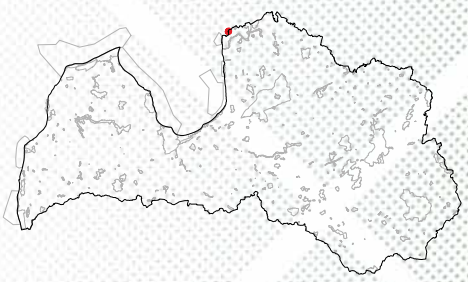
YEAR OF FOUNDATION: 1999.

LOCATION: Salacgrīva municipality, Ainaži rural territory.

AREA: 61 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Mērnieku dumbrāji Nature Reserve is located in a wooded area, at the Latvian-Estonian border, and it includes wet forests. The territory is important for the conservation of wet deciduous forests and western Taïga which are almost unaffected by human. Nearby there is a micro-reserve, established for the protection of *Aquila pomarina*. Other forests are drained and actively managed.

The territory is an important habitat for rare invertebrate species and breeding site for birds, there are rare moss and lichen species. Rare bird species include *Bonasa bonasia, Ciconia nigra, Dendrocopos leucotos*. Vascular plants – *Cinna latifolia* and *Glyceria lithuanica*. Invertebrate – *Apatura ilia*.

2. Threats to habitat and species conservation

In the territory, the restoration of forest block tracks (*stigas*) is carried out, with the excavation and deepening of the ditches. This can lead to changes in the hydrological regime in the future.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitats. Development towards habitat types *Fennoscandian herb-rich forests with* Picea abies, *Fennoscandian deciduous swamp woods*, and *Western Taïga* is expected.

5. Necessary management and conservation measures

5.1. General measures

Update of habitat maps according to the newest methods.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	24.0	39.3	Favourable.	Non-intervention.		24.0
9080*	*Tilio-Acerion* forests of slopes. screes and ravines	22.3	36.5	Poor.	Non-intervention.		22.3
9000	Potential Protected woodland habitat	9.7	15.9	-	Non-intervention.		9.7

Mētru mežs | *Nature Reserve (LV0534600)*

1. Brief description

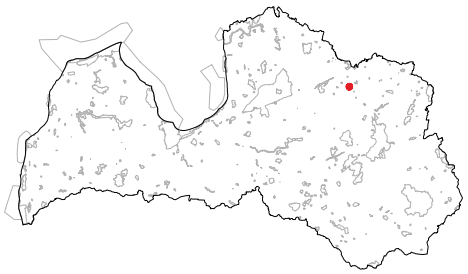
YEAR OF FOUNDATION: 2004.

LOCATION: Gulbene municipality Lejasciems rural territory.

AREA: 74 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Mētru mežs Nature Reserve is located in a wooded area which is rich in small rivers, near the Gauja River. It includes part of the Klajais Mire and Lake Klinča. The territory is important for the protection of western Taïga and bog woodlands. There is an important *Tetrao urogallus* lek. Micro-reserve (for the protection of *Tetrao urogallus*) with wide buffer zone covers the entire nature reserve.

Wet forests of the territory are dominated by *Pinus sylvestris, Picea abies*, and *Betula* spp. Rare species *Carex disperma* can be found in the groundcover. Also protected moss and lichen species can be found here. Bog woodlands with *Betula* spp. are particularly noteworthy as they are rare in Latvia. A large wind-throw covers part of the territory.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Update of habitat maps according to the newest methods.
Assessment of hydrological regime and possibilities of its optimal conservation if necessary.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	16.1	21.8	Favourable.	Non-intervention.		16.1
91D0*	Bog woodland	56.8	76.8	Poor.	Non-intervention.		56.8

Motrines ezers | *Nature Reserve (LV0530600)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Baltinava municipality Baltinava rural territory.

AREA: 46 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Motrines ezers Nature Reserve includes the Lake Motrine and the surrounding transition mires and quaking bogs, as well as wet woodlands. In the south-east it borders with wide agricultural lands. Lake shores are swampy, difficult to access; a ditch is flowing out of the lake, and inflowing into the Kūkova river. In the north, the nature reserve borders with a micro-reserve for the protection of capercaillie *Tetrao urogallus* lek.

The territory is important for the protection of habitat type which is very rare in Latvia - calcareous fens with *Cladium mariscus*. In the small area, there are five EU protected habitat types. The most important species are moss *Hamatocaulis vernicosus,* plants *Pulsatilla patens, Saxifraga hirculus, Liparis loeselii*, snail *Vertigo angustior.*

There are also other rare and protected moss species - *Geocalyx graveolens, Trichocolea tomentella*, and *Meesia triquetra*. In lake, *Hydrilla verticillata* can be found. Several orchid species can be found in transition mires, such as *Hammarbya paludosa* and *Corallorhiza trifida*.

2. Threats to habitat and species conservation

- Around the lake there is a belt of woodlands, several tens to hundred meters wide. It eliminates the possibility of biogene input caused by forestry or agriculture. Drained agriculture lands are located about 70 meters south-east from the lake, outside of protective belt of forest. Wet habitats may be adversely affected in case of cleaning of drainage ditches, including also cleaning and deepening of parts of ditch which is located in the nature reserve.
- The intensive activities of beavers may promote the flooding of new forest areas, and paludification outside the existing wet areas.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Maintenance of hydrological regime which is optimal for wet habitats.
- Undisturbed course of natural processes in aquatic, forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Restriction of activities of beavers in cases if they cause the flooding of new forest areas and paludification outside the existing wet areas.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	7.4	16.1	Poor.	Non-intervention.		7.4
9080*	Fennoscandian deciduous swamp woods	5.5	11.7	Poor.	Non-intervention.		5.5
7210*	*Cladium mariscus* fens	0.03	<1	Favourable.	Non-intervention.		0.03
7140	Transition mires and quaking bogs	1.3	2.8	Favourable.	Non-intervention.		1.3
3150	Natural eutrophic lakes	11.8	25.6	Favourable.	Non-intervention.		11.8

Mugurves pļavas | *Nature Reserve (LV0528800)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Gulbene municipality, Stradi and Litene rural territories.

AREA: 317 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 245 of 10 April 2007, Regulation on Individual Protection and Use of the Mugurves Pļavas Nature Reserve.

Mugurves Pļavas Nature Reserve includes part of the floodplain of the meandering Pededze river and a small reach of river Mugurve, surrounded by forests. Grasslands cover 50 % of the nature reserve. Together with Sitas un Pededzes paliene and Pededzes lejtece Nature Reserves, the territory forms a single hydrological system, in which the processes taking place are dependent on the functioning of Pededze river and their tributaries to a large extent. Spring flooding (their duration and the covered area) is the most important hydrological process, influencing nature values in the territory.

Seven protected habitat types of EU importance are found in the nature reserve. The most important ones are wooded meadows and alluvial meadows. There are 31 rare and protected species, including five species of plants, mushrooms and lichens, seven invertebrate species, 18 bird and one mammal species.

The territory is important for the protection of bird breeding sites. It is the sixth most important for the protection of habitat types type 6530* *Fennoscandian wooded meadows* and 14th most important for protection of 6450 *Northern boreal alluvial meadows* in Latvia (1.5% and 1.7% of the total habitat area in the Natura 2000 network respectively). Currently, the grassland connectivity is high, and this is a prerequisite for the future sustainability of the site. The territory is important as a species dispersal corridor and as a core area for providing landscape-ecological integrity in the North-eastern Geobotanical District, together with Natura 2000 sites "Lubāna mitrājs" and "Jaunanna".

The most important species in the territory are *Crex crex, Bonasa bonasia, Porzana porzana, Circus aeruginosus, Tetrao tetrix*, and others. The area is also a possible lek site of Gallinago media.. The territory is among the ten most important Natura 2000 sites where the restoration of *Gallinago media* population is possible. Several rare bird species use the grasslands of the nature reserve as foraging sites, but are breeding in adjoining woodlands.

The nature reserve is one of the few localities of lichen *Flavoparmelia caperata* in Latvia. *Iris sibirica* grows in grasslands. Several dragonfly species can be found, such as *Ophiogomphus cecilia, Leucorrhinia albifrons* and *Leucorrhinia pectoralis*. Beatles *Osmoderma eremita* and *Liocola marmorata* are associated with old broadleaved trees. *Lutra lutra* and *Unio crassus* can be found in Pededze river.

2. Threats to habitat and species conservation

- The hydrological regime of the territory and hence the conservation of nature values are affected negatively by straightening of Mugurve river and drainage in the territory.
- The territory is influenced by the operation of hydroelectric power plant (HPP) on Pededze river at Jaunanna village. Since 2001, water discharge in Pededze river downstream from the HPP is decreased.
- Cessation of grassland management; increase of fragmentation.
- Removal of shrubs in grasslands is interfered by beaver dams and burrows. Beavers can also create impoundments in areas where they destroy biological and economic values, and prevent runoff of flood waters from grasslands in summer. Activities of beavers can interfere with habitat management.
- Overgrowing of oxbow lakes, increasing of their shading. Diversity of aquatic organisms is reduced due to clogging of oxbow lakes with oxygen-consuming leaf and twig litter.

3. Existing management of the protected habitats and its assessment

- Grasslands were actively managed until 1989, there were farmsteads and hay sheds in the territory.
- In 2004-2008, in the framework of the LIFE program "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), shrubs were cut around large oaks in wooded

meadows in an area of 5.5 hectares, shrubs were cut on alluvial grasslands in 16.85 hectares, first-time mowing in alluvial grasslands was carried out in an area of 31.15 hectares. Restoration efficiency has not been assessed.
- According to Rural Support Service, in 2014 50-70 % of the grasslands were managed in the scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- The diversity of habitats and the number of species is very high in the nature reserve, therefore the priority is the maintenance of both habitats and plant and bird habitats in a favourable conservation status.
- Restoration of grassland habitats in their maximum possible area and maintenance in favourable conservation status. Restoration of wooded meadows is the priority.
- Limitation of beaver activities, in order to prevent prolonged flooding of grasslands and to ensure their mowing.
- Restoration of *Gallinago media* population. Maintenance of populations of grassland-breeding waders in favourable conservation status.
- Conservation of *Osmoderma barnabita* habitats; provision of age continuity of broadleaf trees.
- Maintenance of oxbow lakes, preventing their overgrowth and filling with organic sediments.
- Provision of water flow in Mugurve river; removal of beaver dams; removal or decrease of large woody debris in river.

5. Necessary management and conservation measures

5.1. General measures

- Update of the Nature management plan, in particular regarding the areas (existing and where restoration is necessary), restoration and management of habitat type 6530* *Fennoscandian wooded meadows*.
- Evaluation of the possible merging of Mugurves pļavas and Sitas un Pededzes paliene Nature Reserves as they form a single hydrological and landscape-ecological system in which the processes depend on the functioning of Pededze river and its tributaries.
- Evaluation of the hydrological regime in grasslands, in order to create an adequate management plan.

5.2. Specific measures

5.2.1. Species

Osmoderma barnabita: felling of trees and shrubs around the old trees; marking and management of trees which are future habitats for this species.

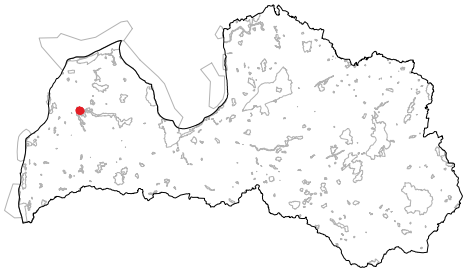
5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6530*	Fennoscandian wooded meadows	14.6	4.6	Bad.	Shrub cutting around oaks. Restoration. Maintenance.	Must be specified. Must be specified.	14.6
91F0	Riparian mixed forests	46.2	14.6	-	Non-intervention.		46.2
6510	Lowland hay meadows	9.5	3.0	Poor.	Restoration. Maintenance.	Up to 4	9.5
6450	Northern boreal alluvial meadows	168.8	53.2	Poor.	Restoration. Maintenance.	At least 50	168.8
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	7.2	2.3	Poor.	Restoration. Maintenance.	At least 4.5	7.2
3260	Natural river reaches and river riffles	60.0	18.9	-	Removal of beaver dams in Mugurve and Mugurupe rivers in order to ensure water discharge. Removal or reduction of large woody debris in sites with shore erosion, and in reaches with pebble-bed or boulder-bed.	On necessity - 0.1 – 0.5	
3150	Natural eutrophic lakes	18.0	5.7	Poor.	Cutting of shrubs and part of the trees in and around oxbow lakes, especially the ones that are drying-up, in order to decrease accumulation of organic litter (leaves, twigs) and filling of oxbow lakes with organic matter. Creation of open littoral zones suitable for aquatic invertebrates (dragonflies, caddisflies, mayflies etc) emerging to adults.		On necessity.

Information in Nature management plan of year 2005 is outdated, and grassland restoration sites must be specified during the new inventory. Grassland restoration must be carried out in an area of 60 hectares (grasslands overgrown with shrubs).

Nagļu un Ansiņu purvs | *Nature Reserve (LV0517300)*

1. Brief description



YEAR OF FOUNDATION: 1977.

LOCATION: Ventspils municipality Zlēkas rural territory.

AREA: 277 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Nagļu un Ansiņu purvs Nature Reserve is located in the lower reaches of Abava river, in the area rich in forests and mires. The value of the nature protection of the territory is determined by its unusual terrain – there is an inland dune in the middle part of the territory, separating Nagļu and Ansiņu Mires, and wet forests surrounding the mires. Nature reserve is bordering with Abavas senleja Nature Park; in vicinity there are other nature reserves and two micro-reserves established for the protection of birds. One of the micro-reserves (with its buffer zone) occupies about half of the nature reserve area. The nature reserve and surrounding micro-reserves and biologically valuable woodlands are interrelated not only geographically, but also ecologically as a species migration corridors and continuous forest ecosystem. The territory is important for the protection of active raised bogs, bog woodlands, and western Taïga. There are five EU protected habitat types in the area.

Twenty protected and rare species have been found in the territory – eight species of birds, six vascular plant, two moss, two mammal, one invertebrate and one amphibian species. *Trichophorum cespitosum* which is characteristic for Western Latvia, as well as *Odontoschisma sphagni* grow in mires. The territory is important for several rare bird species including *Bonasa bonasia, Tetrao tetrix*, and *Tetrao urogallus*. Also *Caprimulgus europaeus* and *Ficedula parva* are breeding here. *Tetrao urogallus* lek with at least four males is the main ornithological value.

2. Threats to habitat and species conservation

- One of the most important influencing factors is the hydrologic changes in the mire. With the modification of Nagļu Brook, water level in Nagļu Mire was lowered. Also natural watercourses were modified. The influence of these actions is long-lasting, affecting the quality of mire and wet forests.
- Forestry activities in the nature reserve and its direct vicinity (various types of felling, removal of dead trees, unsuitable time for logging (birds), and logging in wet forests).
- Forest groundfloor vegetation and ground-nesting birds can be negatively affected by artificial feeding of forest animals.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage forest and mire habitats.

4. Priorities of management and conservation

- Rewetting and the improvement of quality of wet habitats.
- Conservation of *Tetrao urogallus* leks and maintenance of their conservation status as favourable.
- Improving the integrity of protected forest habitats
- Improving the ecological quality of less valuable woodlands.

5. Necessary management and conservation measures

5.1. General measures

- Research of the hydrological regime of the complex of mires and wet forests; development of a project of hydrotechnical constructions including monitoring program for the evaluation of restoration results.
- Approval of the Regulations on the individual protection and use.
- Evaluation of the merging of territories of Maņģenes meži Nature Reserve and Abavas senleja Nature Park.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	60.9	22.0	Poor.	Non-intervention, except management of *Tetrao urogallus* leks. Rewetting in bog woodlands and mires (ditch damming or filling up).	10.0 According to results of research.	46.1
9010*	Western Taïga	26.9	9.7	Poor.	Non-intervention.		26.9
9080*	Fennoscandian deciduous swamp woods	2.7	‹1	Poor.	Non-intervention.		2.7
9000	Potential Protected woodland habitat	6.5	2.4	-	Non-intervention.		6.5
7120	Degraded raised bogs	18.8	6.8	Bad.	Rewetting in bog woodlands and mires (ditch damming or filling up).	According to results of research.	
7110*	Active raised bogs	18.4	6.6	Poor.	Non-intervention.		18.4

Nesaules kalns | *Nature Reserve (LV0511000)*

1. Brief description

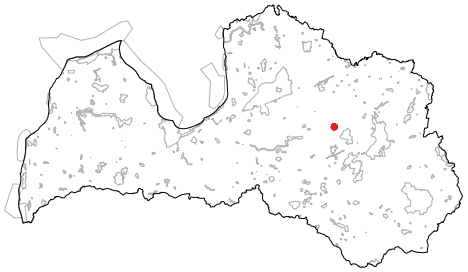
YEAR OF FOUNDATION: 1957.

LOCATION: Madona municipality Arona rural territory.

AREA: 66 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Nesaules Kalns Nature Reserve includes one of the highest and visually most impressive hilltops in the Vidzeme Upland. Hill slopes and basal area at Lake Nesaule are covered with western Taïga – old boreal forests with spruces (*Picea abies*) and with *Corylus avellana* understory. There is a woodland structure characteristic to almost pristine forests, with biologically-old trees, canopy gaps, and dead wood in various stages of decay. *Bonasa bonasia* is an important bird species in the territory. Orchids, for example, *Dactylorhiza fuchsii* and *Dactylorhiza maculata*, grow in wet forests.

2. Threats to habitat and species conservation

The value of the protected habitats may be decreased due to removal of dead wood, withering and withered trees.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	45.1	68.3	Poor.	Non-intervention.		45.1
7160	Fennoscandian mineral-rich springs and springfens	0.003	<1	Favourable.	Non-intervention.		0.003

Niedrāju-Pilkas purvs | *Nature Reserve (LV0509800)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Salacgrīva, Salacgrīva municipal town; Limbaži municipality Pāle rural territory.

AREA: 1029,8 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Niedrāju-Pilkas purvs Nature Reserve includes raised bog and surrounding forests. The area is encompassed by agricultural land; large forest massifs are located further away from the area. The nature reserve is crossed by a non-functioning narrow-gauge railway track bed in the north-south direction, dividing the mire in two parts. In eastern part of the mire there is an impressive mosaic of hummock-hollow microrelief and small bog pools. The western part is dryer, and mire edges are quite overgrown with pines (*Pinus sylvestris*).

The nature reserve is located in the North Vidzeme Biosphere Reserve. The area is important for the conservation of bogs and bog woodlands. There is a large number of protected bird species including *Bonasa bonasia, Tetrao tetrix, Pluvialis apricaria* and others. During the spring and autumn migration, *Anser fabalis* and *Anser albifrons* are present in the bog. *Leucorrhinia albifrons* reside in vicinity of dystrophic bog lakes.

2. Threats to habitat and species conservation

Although mire habitats are mostly in favourable conservation status, changes in hydrological regime can affect the territory adversely. On the borders of the mire is are a number of old ditches, which still have an impact.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forests and mires, as well as in habitats of species that need undisturbed, natural environment.
- Rewetting in parts of mire which are adversely affected by drainage (SW, NE, E edges).

5. Necessary management and conservation measures

5.1. General measures

Development of Nature management plan, including mire hydrology research and development of restoration result monitoring. Development of construction project for the rewetting, assessing the hydrological regime and planning of the necessary restoration of mire habitats in case if improvement of mire and bog woodland habitats is estimated as useful and technically feasible.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	319.0	31.0	Favourable.	Non-intervention. Rewetting – in bog woodlands and mires.	According to research results.	319.0
9080*	Fennoscandian deciduous swamp woods	10.2	<1	Favourable.	Non-intervention.		10.2
9010*	Western Taïga	43.1	4.2	Favourable.	Non-intervention.		43.1
7150	Depressions on peat substrates	37.4	3.6	Favourable.	Non-intervention.		37.4
7120	Degraded raised bogs	65.5	6.4	Bad.	Rewetting (ditch filling up or damming).	According to research results.	
7110*	Active raised bogs	394.3	38.3	Poor.	Non-intervention, except rewetting (ditch filling up or damming).	According to research results.	
3160	Natural dystrophic lakes and ponds	1.7	<1	Favourable.	Non-intervention.		1.7

Nīcas īvju audze | *Nature Reserve (LV0507700)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Rucava municipality Dunika rural territory.

AREA: 108 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Nīcas īvju audze Nature Reserve is located in Coastal Lowland, between Nīca and Bārta villages, including forests on the right bank of Ječupe river.

The area is wooded, dominated by wet (slightly-influenced) and drained forests. Wet forests with *Picea abies* and *Betula* spp., with admixture of broadleaved trees, are characteristic for the nature reserve, as well as swamp woods of *Alnus glutinosa* and *Betula* spp. The summer cottage village Ječi is located beside it.

The nature reserve was established for the protection of *Taxus baccata* which is a protected species in Latvia. There are also 38 other rare and protected species. Out of these, there are 10 herbaceous plants, six bird, four invertebrate, five moss and five lichen species. Examples of protected species are *Listera cordata, Festuca altissima, Carex loliacea, Serratula tinctoria, Frullania tamarisci, Bazzania trilobata,* and others. The most important birds are woodpeckers and *Bonasa bonasia*.

2. Threats to habitat and species conservation

- The population of *Taxus baccata* is affected by shading caused by the dense woodlands. This negatively affects opportunities of pollination and natural regeneration.
- Forests are mostly affected by the previous drainage and Ječupe river straightening, resulting in changes in hydrological regime that further promote excessive growth of shrubs in forest, and the expansion of *Picea abies*.
- Birds are influenced by the logging in the surrounding forests, by presence of old trees and standing dead trees here, as the nature reserve area is small.

3. Existing management of the protected habitats and its assessment

- Trees have been felled to decrease the shade; light conditions have improved but also the proportion of broadleaved trees has increased.

4. Priorities of management and conservation

- To preserve and increase the population of *Taxus baccata* and ensure its long-term existence.
- Ensure undisturbed natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Development of monitoring program, to evaluate the vitality of planted Taxus baccata.

5.2. Specific measures

5.2.1. Species

Condition of population of *Taxus baccata* within the nature reserve is considered as bad, there are less than 10 individuals forming the population. In order to increase the population of *Taxus baccata* it is necessary to obtain and root cuttings from the trees growing in the surroundings and in nature reserve. Planting of new *Taxus baccata* (at least 30-40 specimens) is necessary.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	18.2	16.8	Favourable.	Non-intervention.		18.2
9020*	Broad-leaved deciduous forests	11.2	10.4	Poor.	Non-intervention.		11.2
7230	Alkaline fens	0.1	<1	Bad.	Limiting of beaver activities (dam demolition, animal number reduction). Evaluation of the restoration of open mires (together with similar habitats outside the nature reserve).		0.1
7160	Fennoscandian mineral-rich springs and springfens	0.06	<1	Favourable.	Non-intervention.		0.06
91E0*	Alluvial forests	2.8	2.6	Poor.	Non-intervention.		2.8

Nīgrandes meži | *Nature Reserve (LV0531000)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Saldus municipality Nīgrande rural territory.

AREA: 62 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Nīgrandes meži Nature Reserve is located in an extensive massif of forests, at inflow of Zvērupe river into Losis river. The territory is important for the conservation of continuous *Alnus glutinosa* swamp woods. Protected species include: vascular plant *Polygonatum verticillatum*, moss *Frullania tamarisci*, lichens *Thelotrema lepadinum* and *Arthonia spadicea*.

2. Threats to habitat and species conservation

- Beavers (*Castor fiber*) cause the paludification of the territory (there is a high humidity level in the nature reserve also without the influence of beavers).
- Potentially, intense forestry activities are possible.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of area and integrity of protected habitats by providing non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types 9050 *Fennoscandian herb-rich forests with* Picea abies, *Western Taïga*, or 9080* *Fennoscandian deciduous swamp woods* is expected.

5. Necessary management and conservation measures

5.1. General measures

Update of habitat maps according to the latest approaches and methods.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	22.1	35.6	Poor.	Non-intervention.		22.1
9010*	Western Taïga	2.6	4.2	Favourable.	Non-intervention.		2.6
9000	Potential Protected woodland habitat	15.4	24.8	-	Non-intervention.		15.4
7160	Fennoscandian mineral-rich springs and springfens	3.3	5.3	Favourable.	Non-intervention.		3.3

Nomavas purvs | *Nature Reserve (LV0505600)*

1. Brief description

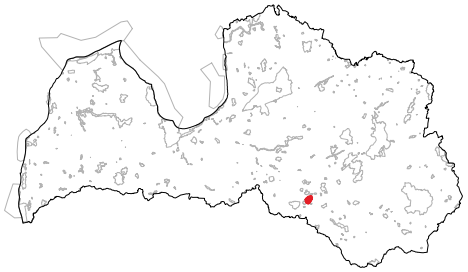
YEAR OF FOUNDATION: 1987.

LOCATION: Jēkabpils municipality Kalna rural territory; Viesīte municipality Viesīte town with rural territory.

AREA: 1285 ha.

NATURE MANAGEMENT PLAN: 2010 (2011–2021).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Nomavas purvs Nature Reserve is located in a region which is rich in woodlands and mires. It includes Nomavas Mire, Nomavas Lake, Baltais Lake and several small bog pools, as well as forest areas in surrounding of mire. Nomavas and Baltais lakes are both dystrophic lakes which is a rare habitat type in Latvia. The hydrological system of the northern part of the territory (about 900 ha) belongs to the Daugava drainage basin, but its southern side is part of the Lielupe basin. The main nature conservation value of the territory is the complex of mire and forest habitats which provides a habitat for rare and protected species. Bird fauna of the territory is very rich. Seven EU protected habitat types have been found in the nature reserve.

Examples of rare and protected species in the territory are: mosses *Odontoschisma denudatum* and *Anastrophyllum hellerianum*, birds *Bonasa bonasia, Pluvialis apricaria, Tringa glareola, Tetrao tetrix, Tetrao urogallus* and others. Protected dragonflies such as *Leucorrhinia albifrons* can be found at bog pools. Rare mushroom species *Geastrum quadrifidum, lichen Metzgeria furcata, invertebrate Ruthenica filograna* can be found in forests.

2. Threats to habitat and species conservation

- The existence of wet habitats in the territory is adversely affected by drainage, resulting in overgrowth with trees and groundcover composition changes.
- Nomava Lake is used for angling, and there is garbage and leftovers of fireplaces on its shores.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Restoration and maintenance of hydrological regime which is optimal for mires and wet forests.
- Undisturbed course of natural processes in natural bog and mire habitats which are slightly influenced by human, as well as in habitats of species that need undisturbed, natural environment.
- Removal of municipal waste from shores of Nomava Lake.

5. Necessary management and conservation measures

5.1. General measures

Hydrology research in the nature reserve and adjacent territories. Development and implementation of mire and forest restoration program which includes mire vegetation monitoring, in order to evaluate the success of restoration of bog and bog woodland habitats.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	298.4	23.2	Favourable.	Non-intervention, except rewetting in mires and forests.		298.4
9010*	Western Taïga	3.6	⟨1	Poor.	Non-intervention.		3.6
9000	Potential Protected woodland habitat	45.0	3.5		Non-intervention.		45.0
7150	Depressions on peat substrates	10.5	⟨1	Favourable.	Non-intervention.		10.5
7140	Transition mires and quaking bogs	1.4	⟨1	Favourable.	Non-intervention.		1.4
7120	Degraded raised bogs	549.2	42.7	Bad.	Rewetting (ditch blocking or filling up). Removal of trees.	549.2	
7110*	Active raised bogs	217.3	16.9	Poor.	Rewetting (ditch blocking or filling up).		217.3
3160	Natural dystrophic lakes and ponds	26.5	2.1	Poor.	Non-intervention.		26.5

Ojatu ezers | *Nature Reserve (LV0521100)*

1. Brief description

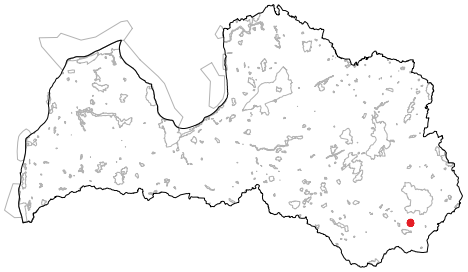
YEAR OF FOUNDATION: 1999.

LOCATION: Dagda municipality, Konstantinova rural territory.

AREA: 121 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ojatu ezers Nature Reserve is located in a lake-rich and scenic Latgale Region. It includes Ojotnīks (Ojatu) Lake and the surrounding mosaic of agricultural and forest lands. The outflowing Dubna River connects the lake to the nearby Lake Siversa. The water level of the lake was lowered at the beginning of the 20th century when the lake outflow was modified.

The area is important for the conservation of natural eutrophic lake and oligotrophic to mesotrophic plant communities on its shores. There are mixed spruce forests on terrain elevations and slopes, and transition mire on the western shore of Lake Ojatu.

Ojotnīks is one of the deepest lakes in Latvia, its maximum depth is 40,5 m. On the lake shore, there are colonies of protected species *Lobelia dortmanna, Isoëtes lacustris* and *Myriophyllum alterniflorum*. In some places, *Potamogeton rutilus* and *Subularia aquatica* can be found. Dragonfly *Leucorrhinia caudalis* is found. The lake is a suitable habitat for the *Cobitis taenia*. *Bonasa bonasia* can be found in the surrounding forests.

2. Threats to habitat and species conservation

The quality of the lake is rapidly decreasing, due to several factors:

- Effective functioning of a watercourse connecting Ojatu and Siversa Lakes is interrupted due to clogging. It promotes the wetting of littoral part and the soil nutrient leaching in the Ojatu Lake. Nutrients are more intercepted by *Myriophyllum* sp. and *Potamogeton* sp., their stands are increasing and causing suppression, shading and even disappearance of *Lobelia – Isoëtes* complex.
- Domestic waste water pollution from the houses located on the shores of the lake;
- Surface runoff from agricultural land;
- Increase of recreation activities in the territory which is not maintained and equipped for recreation;
- Uncontrolled use of motorized watercraft.

3. Existing management of the protected habitats and its assessment

Mowing and root removal of coastal aquatic macrophytes for the maintenance of some bathing sites was carried out in 2006. As a result, burial of lobelia habitats with decayed emergent vegetation residues was prevented. However, there is no information if plants of *Lobelia – Isoëtes* complex were not destroyed when roots of aquatic macrophytes and upper sediment layer were removed.

4. Priorities of management and conservation

- Restore the watercourse from Lake Ojatu to Lake Sivers;
- Ensure the function of the protective belts and prevent the increase of nutrient input in the lake.
  - Manage the protective belts. In cooperation with local operators, promote the conservation of coastal open areas as grasslands.
  - Organize and concentrate the movement of holidaymakers into the already existing recreation sites, improving the minimal necessary infrastructure - toilets, waste bins.
- Undisturbed course of natural processes in forest and mire habitats, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Following the requirements defined in the Law on protective belts; decrease the input of nutrient-rich water in the lake from the private residential area.
- Include a provision in municipal land use policy and building documents that, if sewage and sewerage systems are improved or constructed, the leak-proof systems must be planned.

- Establish a minimal necessary tourist infrastructure.
- Reduction of emergent vegetation in littoral zone in small areas where plants of *Lobelia-Isoëtes* complex are present, using precautionary approach.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	0.7	<1	Poor.	Non-intervention.		0.7
7140	Transition mires and quaking bogs	0.5	<1	Favourable.	Non-intervention.		0.5
3130	*Lobelia-Isoetes* lakes	28.0	23.1	Bad.	Regular reed removal from littoral zone, in order to eliminate the overgrowth of habitats suitable for lobelias and isoetids, with emergent vegetation and the burial with decayed reeds and leaves.		0.5

Oleru purvs | *Nature Reserve (LV0516000)*

1. Brief description

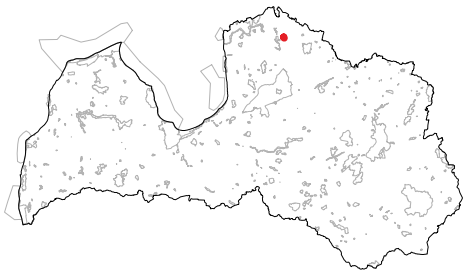
YEAR OF FOUNDATION: 1977.

LOCATION: Rūjiena municipality, Jeri rural territory.

AREA: 105 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Oleru purvs Nature Reserve is located in North Vidzeme Biosphere Reserve, at the former Oleri Manor, where transition mire with quaking bogs has developed in place of formerly drained and overgrown Oleru Lake. The water level of the lake was lowered around the year 1860 when a ditch from the lake to the river Oļa was excavated, after which the lake began to overgrow rapidly. The nature reserve also includes forests growing around the mire and forests on undulated terrain in the south where bog woodlands lie in depressions between dry pine forests.

The territory is important for the protection of bog woodlands and transition mires. There is a large diversity of plant species. *Hammarbya paludosa*, a protected orchid species, grows in the mire, and there is also a rare butterfly species *Lycaena dispar*.

2. Threats to habitat and species conservation

Changes of hydrological regime.

3. Existing management of the protected habitats and its assessment

So far no habitat management measures have been taken.

4. Priorities of management and conservation

Undisturbed natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	19.1	18.2	Favourable.	Non-intervention.		19.1
7140	Transition mires and quaking bogs	53.0	50.5	Favourable.	Non-intervention.		53.0
7110*	Active raised bogs	1.3	1.2	Favourable.	Non-intervention.		1.3

Orlovas (Ērgļu) purvs | *Nature Reserve (LV0502200)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Balvi municipality Lazduleja and Vectilža rural territories.

AREA: 2791 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Orlovas (Ērgļu) Purvs Nature Reserve is surrounded by a mosaic of woodlands, mires and grasslands. Territory includes one micro-reserve for the protection of capercaillie *Tetrao urogallus*, and there are several micro-reserves for *Tetrao urogallus* and *Aquila pomarina* near the territory.

The nature reserve is important for the conservation of active raised bogs, small transition mires and dystrophic lakes. Orlovas Mire in almost unaffected, with impressive mosaic of hummocks and hollows, sparsely overgrown with pines. There is a narrow belt of forest around the mire. Mire is rather wet, flat, with large open areas. On the eastern side of the bog there is Lake Orlova, surrounded by transition mires and quaking bogs.

Bog woodlands in the territory are almost unaffected, with very few drainage ditches. Drainage has been carried out in the territory, but the impact is small. Lake is the most influenced area, the ditch flows out of its northern part. Water level in Lake Orlova is lowered due to drainage. Part of the drainage ditches is overgrown. There is a dam on the ditch outflowing of the lake which partly helps to maintain water level in mire.

Several rare and protected species can be found in the nature reserve, particularly bird species such as *Gavia stellata, Clanga pomarina, Bonasa bonasia, Circus pygargus, Ciconia nigra, Tetrao tetrix, Tetrao urogallus*. Rare invertebrate species include *Lycaena dispar.*

2. Threats to habitat and species conservation

- Drainage of mire and woodlands.
- Litter left by anglers and hunters (north-eastern coast of the lake).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Complex hydrological regime research in the territory, with particular attention to bog woodlands and their rewetting possibilities. In Lake Orlova – assessment of the optimal lake water level, and necessary height of the dam for its maintenance.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	420.8	15.1	Bad.	Rewetting, according to research results: removal of trees from ditch berms, ditch blocking or filling up.		420.8
9080*	Fennoscandian deciduous swamp woods	1.2	<1	Poor.	Non-intervention.		1.2
9010*	Western Taïga	27	<1	Favourable.	Non-intervention.		27
7140	Transition mires and quaking bogs	24.2	<1	Favourable.	Non-intervention.		24.2
7120	Degraded raised bogs	7.2	<1	Poor.	Non-intervention.		144.9
7110*	Active raised bogs	1956.9	70.1	Favourable.	Non-intervention.		1956.9
3260	Natural river reaches and river riffles	0.2	<1	Poor.	Non-intervention – Rika river reach within the nature reserve.		0.2
3160	Natural dystrophic lakes and ponds	77.5	2.8	Poor.	Maintenance of optimal water level in the lake (according to hydrological research results).		77.5

Ovīši | *Nature Reserve (LV0521500)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Ventspils municipality Tārgale and Ance rural territories.

AREA: 5078 ha.

NATURE MANAGEMENT PLAN: 2014 (2015–2025).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 213 of 29 March 2005, Regulation on Individual Protection and Use of Ovīši Nature Reserve.

Ovīši Nature Reserve is located on the coast of the Baltic Sea at Irbe Strait. It borders with Irbes šaurums Protected Marine Area. A complex of wooded dunes and interdune depressions (*vigu-kangaru komplekss*) is characteristic to the area. "Kangari" are dune ridges located parallel to the sea, usually covered with dry pine (*Pinus sylvestris*) forests. Between "kangari" there are "vigas" – wet, almost linear interdune depressions, usually with fens or *Alnus glutinosa* swamp woods. There are 19 habitats of EU importance in the territory. Nature reserve is important for the protection of a complex of coastal dunes. Grey dunes of three types can be found in the area (*Dunes with Salix repens ssp. argentea* (Salicion arenariea); *Decalcified fixed dunes with* Empetrum nigrum; *Fixed coastal dunes with herbaceous vegetation*), diverse embryonic shifting dunes, white dunes (*Shifting dunes along the shoreline with* Ammophila arenaria), and humid dune slacks.

Coastal area between Ovīši and Lielirbe villages is one of the areas populated by Livs (Livonians) – people of ethnic group which is now extinct. This area is important for cultural history, with characteristic coastal fishermen villages and management practices including mowing and grazing of surrounding humid dune slacks, as well as establishment of shallow ditches for the drainage of wet depressions. In the Soviet period, Soviet military bases were established in coastal areas, and economic activities of local people were largely restricted. Open landscapes of grasslands and sands are established as a result of former agricultural management and military activities.

It is the sixth largest Natura 2000 territory for the protection of habitat type 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe*), fifteenth most important for 6120* *Xeric sand calcareous grasslands* in Latvia (4.72 % and 1.9 % respectively of total habitat area in Natura 2000 territories). From landscape-ecological point of view, the nature reserve is one of the most important core-areas in the northern part of Coastal Geobotanical District.

Nature reserve is rich in rare and protected species – six protected species of mammals, 22 bird, 15 invertebrate, two amphibian and one reptile species, five mushroom, eight moss, one lichen and 50 vascular plant species have been found in the territory. The territory is important for the protection of littoral species and species associated with Coastal Lowland. The largest locality of *Cephalanthera rubra* and the only locality of *Tofieldia calyculata* in Latvia is located in the nature reserve. Also *Dianthus arenarius* ssp. *arenarius, Linaria loeselii, Liparis loeselii, Alyssum gmelinii, Centaurium littorale, Lathyrus maritimus*, and other rare species grow in the area. The territory is important for the protection of western Taïga with rare bird species *Bonasa bonasia, Tetrao urogallus, Lululla arborea, Caprimulgus europaeus*. Invertebrate *Podisma pedestris* and natterjack toad *Bufo calamita* live in sands.

2. Threats to habitat and species conservation

- Grey dunes overgrow with trees and shrubs.
- Semi-natural grasslands overgrow with trees and shrubs; lack of management; in many places – mowing with grass shredding or leaving of mown grass on site.
- Paludification of semi-natural grasslands due to clogging of shallow ditches.
- In residential areas – transformation of semi-natural grasslands into lawns.
- Increasing and uncontrolled recreational load, excessive trampling in dunes. Coastal dunes are the most affected by recreation, especially in vicinities of villages and in sites where access to the sea has been established.
- Logging.
- Activities of beavers (*Castor fiber*), water level rise in river mouth.

3. Existing management of the protected habitats and its assessment

- In 2011, shrubs were felled in locality of *Liparis loeselii*, in alkaline fens located in humid dune slacks.
- In 2012, the bed of Olderupīte river was cleaned, in order to prevent the inundation of *Tofieldia calyculata* locality. The measure was insufficient. It is also necessary to repeat felling of trees.
- According to Rural Support Service, in 2014 most of the grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 20–30 % of the total area of grassland habitats received the support. Managed grasslands are adversely affected by leaving mown grass on site (and shredding), therefore eutrophication and increase of expansive species (especially *Deschampsia flexuosa*) can be observed.
- In 2014 - 2016, management of grey dunes (felling of trees and shrubs in an area of Irbe strait) was implemented by Nature Conservation Agency.
- In 2015, trees and shrubs were felled by JSC "Latvijas Valsts Meži".

4. Priorities of management and conservation

- Undisturbed course of natural processes in habitats, as well as in habitats of species that need undisturbed, natural environment.
- Improvement of the quality of wooded dunes: non-intervention in mature woodlands which have not yet reached the quality of protected habitat, or selective felling in middle-aged woodlands in order to improve their structure.
- Restoration and maintenance of coastal habitats, especially grey dunes, in a favorable conservation status.
- Avoidance of increased anthropogenic loads in localities of the most sensitive species.
- Restoration of semi-natural grasslands in their maximum possible area, and maintenance in a favorable conservation status. Restoration of habitat types 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* and 6120* *Xeric sand calcareous grasslands* is the priority.

5. Necessary management and conservation measures

5.1. General measures

- Construction of boardwalks and other infrastructure elements according to nature management plan, in order to redirect visitors to beach, therefore reducing disturbances to breeding birds and at the same time limiting wind erosion. In places where rampart of white dune is interrupted due to regular trampling, lightweight constructions are recommended, in order to limit further wind erosion.
- Eradication of invasive shrub *Rosa rugosa*: annual mowing (it does not destroy the locality but stops its expansion), grubbing of shrubs with roots, covering with black sheet of plastic and burial with sand in a period of one season.
- Research of hydrological regime in order to develop engineering solutions for the restoration and maintenance of drainage systems and for the cleaning of mouths of rivers flowing into the sea.
- Measures aiming at sand accumulation in sites which are subject to natural or anthropogenic erosion (fences of non-living wood; coating with pine or juniper twigs). Activities must be based on evaluation of dynamics of coastal processes in the territory of nature reserve.
- Development of grassland restoration and management plan. Plan must include evaluation of the necessity of restoration of local ditch system, and innovative solution for grassland restoration and management, as the development of conventional agricultural activities and grassland management is not expected in the nature reserve. The high level of habitat fragmentation indicates that the current area can not ensure favourable conservation status for grasslands in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered. Restoration of currently remained grasslands is the priority.
- Permanent co-operation and communication between the Nature Conservation Agency, the Latvian Rural Advisory Center, Rural Support Service, and owners and operators of grasslands, in order to promote sustainable and knowledge-based grassland conservation and to ensure ecosystem services.

5.2. Specific measures - habitats

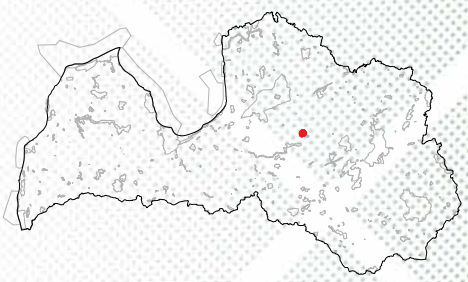
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	3.0	<1	Favourable.	Non-intervention.		3.0
91D0*	Bog woodland	53.9	1.1	Poor.	Non-intervention.		53.0
9080*	Fennoscandian deciduous swamp woods	446.7	8.8	Poor.	Non-intervention.		446.7
7230	Alkaline fens	0.1	<1	Poor.	Felling of shrubs.		0.1
7210*	*Cladium mariscus* fens	1.0	<1	Poor.	Felling of shrubs. Non-intervention.		0.1 0.9
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	16.3	<1	Bad.	Restoration. Maintenance.	16.3	16.3
6230*	Species-rich *Nardus* grasslands	5.5	<1	Bad.	Restoration. Maintenance.	5.5	5.5
6120*	Xeric sand calcareous grasslands	14.8	<1	Bad.	Restoration. Maintenance.	14.8	14.8
6000	Grasslands to be restored	37.0	<1	-	Restoration. Maintenance.	37.0	37.0
3260	Natural river reaches and river riffles	1.8	<1		Cleaning and maintenance of mouths of watercourses.		Lenght of reaches which must be maintained: 500 m
2190	Humid dune slacks	340.0	6.7	Bad.	Felling of shrubs, mowing of reeds, with removal or burning on site.	5.1	16
2180	Wooded dunes incl. corresponding to 9010* Western Taïga	3548.6	58.4	Favourable to poor.	Non-intervention. Improvement of stand structure (selective felling).	154.0	583.0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
2170	Dunes with Salix repens	0.3	⟨1	Bad.	Felling of trees and shrubs. Mowing of shoots.		0.3
2140*	Decalcified fixed dunes with Empetrum nigrum	1.3	⟨1	Poor.	Felling of trees and shrubs. Mowing of shoots.		1.3
2130*	Grey dunes	188.5	3.7	Poor.	Felling of trees and shrubs. Mowing of shoots.	30	140
2120	White dunes	109.9	2.2	Poor.	Non-intervention. Construction of boardwalks, surface coating with twigs, delimiting barriers.	2	
2110	Embryonic dunes	48.4	1.0	Favourable.	Non-intervention.		48.4

Semi-natural grasslands must be restored in their maximum possible area which is at least 74 ha, including historical grasslands which are currently occupied by shrubs and new forests or by perennial grasslands, fallow-lands and overgrowing dune slacks. Restoration measures include felling of trees and shrubs, milling of stumps or roots, restorative mowing or grazing. In nature management plan of 2016, restoration of 16.2 ha of grassland is indicated as a priority, but the rest of the area is currently not clarified (must be specified during the development of grassland restoration plan).

Palšu purvs | *Nature Reserve (LV0526200)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Vecpiebalga municipality Kaive rural territory; Ērgļi municipality Jumurda rural territory.

AREA: 633 ha.

NATURE MANAGEMENT PLAN: developed in 2004 (2004–2014), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Palšu purvs Nature Reserve includes Palšu Mire which is one of the largest raised bogs in the Vidzeme Upland. Several micro-reserves for the protection of rare bird species and woodland habitats are located in its vicinity. The nature reserve is significant for the protection of raised bogs with *Trichophorum cespitosum*, dystrophic lakes and bog woodlands, with a lot of hollows. Since 1960s, part of the bog is still used for peat milling. In Soviet times, dense network of ditches was established in Eastern part of the mire, to prepare it for peat extraction.

Five types of EU protected habitats are found in the territory, as well as several rare and protected plant and animal species. During the development of Nature management plan, one protected mammal species, two species of invertebrates, 21 bird, four moss species, and five vascular plant species were found. More protected species were added to the list in the later inventories. Examples of protected plant species are: orchid *Dactylorhiza incarnata*, mosses *Calypogeia sphagnicola*, *Anastrophyllum hellerianum*, *Lophozia ascendens*, invertebrate *Ophiogomphus cecilia*.

Part of the bog is an important habitat and stopover site for several rare and protected migratory bird species – *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Anser albifrons, Grus grus, Vanellus vanellus, Pluvialis apricaria, Charadrius dubius, Numenius phaeopus* and others.

2. Threats to habitat and species conservation

- Changed hydrological regime. Part of the mire is drained. Water level is lowered in several small bog pools and hollows in the eastern part of the mire.
- Peat extraction in the bordering area to the east of the nature reserve. Drainage effect can not be eliminated while peat extraction continues. Peat mineralisation occurs.
- Woodlands bordering the nature reserve are drained.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting in mire; slowdown of peat mineralization.
- Undisturbed natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Development and implementation of recultivation project for former peat milling fields, with the aim of restoring mire habitats after the completion of peat extraction.

5. Necessary management and conservation measures

5.1. General measures

- Creating a construction project for rewetting is required, assessing the hydrology and planning the necessary measures for the mire habitat restoration. Research must include also the assessment of drainage in surrounding areas.
- Update of habitat maps (especially for habitat type 91D0 *).

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	65.2	10.3	Poor.	Rewetting of bog woodland and mire habitats.		65.2
9010*	Western Taïga	13.7	2.2	Poor.	Non-intervention.		13.7
7150	Depressions on peat substrates	0.03	<1	Poor.	Non-intervention.		0.3
7120	Degraded raised bogs	210.6	33.3	Bad.	Rewetting (ditch filling up or damming, placement of waterproof membranes in areas bordering with peat milling fields), in complex with woodland rewetting. Removal of woody species in part of mire.	210.6	
7110*	Active raised bogs	326.6	51.6	Poor.	Rewetting (ditch filling up or damming, placement of waterproof membranes in areas bordering with peat milling fields), in complex with woodland rewetting. Removal of woody species in part of the mire.	326.6	
3160	Natural dystrophic lakes and ponds	5.0	<1	Poor.	Non-intervention. Assessment of rewetting possibilities for drained small lakes in vicinity of peat milling fields, in complex with raised bog restoration measures.	5.0	

Paltupes meži | *Nature Reserve (LV0534900)*

1. Brief description

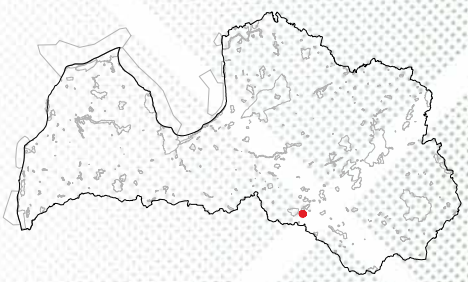
YEAR OF FOUNDATION: 2004.

LOCATION: Viesīte municipality Elkšņi rural territory.

AREA: 157 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Paltupes Meži Nature Reserve is located in a wide massif of forests, and it includes broadleaved and *Alnus glutinosa* woodlands. The territory is important for the conservation of deciduous swamp woods, hemiboreal natural old broad-leaved deciduous forests and wet deciduous forests. Woodlands in the eastern part of the territory and adjoining areas are drained, but a natural hydrological regime has remained in part of nature reserve, including the unmodified Patrupe river.

Woodlands are habitats for several rare and protected species, such as lichen Lobaria pulmonaria, mosses *Metzgeria furcata* and *Lejeunea cavifolia*, vascular plant *Poa remota*, several door snail *Clausiliidae* species – *Clausilia cruciata, Cochlodina orthostoma*. Large colonies of *Allium ursinum* grow at shores of Patrupe river.

2. Threats to habitat and species conservation

- Forest management resulting in decrease of volumes of dead wood and biologically-old trees.
- The hydrological regime of the territory is influenced by drainage. The development of *Alnus glutinosa* wet forests towards dryer forest site types can be observed. Rewetting possibilities should be considered very carefully.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types 9020* *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes* and 9050 *Fennoscandian herb-rich forests with* Picea abies is expected.

5. Necessary management and conservation measures

5.1. General measures

Update of habitat maps according to the newest methods.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	34.8	22.2	Bad.	Non-intervention.		34.8
9020*	Broad-leaved deciduous forests	28.4	18.1	Poor.	Non-intervention.		28.4
9010*	Western Taïga	2.4	1.5	Poor.	Non-intervention.		2.4
91E0*	Alluvial forests	2.6	1.7	Bad.	Non-intervention.		2.6
9000	Potential Protected woodland habitat	50.0	31.8	-	Non-intervention.		50.0
3260	Natural river reaches and river riffles	0.2	<1	Poor.	Non-intervention.		0.2

Paņemūnes meži | *Nature Reserve (LV0528900)*

1. Brief description

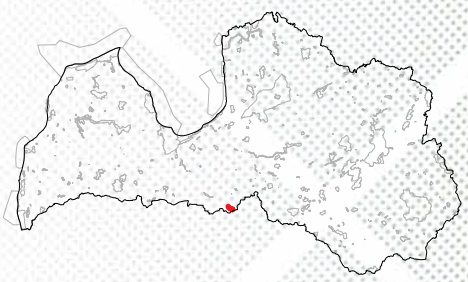
YEAR OF FOUNDATION: 2004.

LOCATION: Bauska municipality Brunava rural territory.

AREA: 800 ha.

NATURE MANAGEMENT PLAN: 2005 (2006–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Paņemūnes meži Nature Reserve is located in Zemgale Plain, close to Latvian-Lithuanian border, south-east of the Ērgļi farmstead of Brunava village. It includes woodlands typical for areas of the fertile soil of Zemgale Region. It is characterized by a natural structure of multi-aged woodlands. The territory and adjoining forests are very important for conservation of biodiversity in a landscape where intensive agricultural land is prevalent.

Five EU protected habitat types have been found in the nature reserve. The most important ones are deciduous swamp woods, humid and wet broad-leaved deciduous forests, and oak forests. The very old oaks (*Quercus robur*) throughout the territory are a characteristic feature of the nature reserve, both in the dry and wet sites. Many rare and protected species can be found – 24 species of protected invertebrates, seven species of birds, one mammal, one lichen, one mushroom and four vascular plant species. The most important bird species are *Bonasa bonasia, Ciconia nigra, Dendrocopos leucotos, Dendrocopos medius* and *Aquila pomarina*. Hazel dormouse *Muscardinus avellanarius* has been found in the nature reserve.

In the 1960s, forest roads were constructed and ditches were excavated in the area where the nature reserve is currently located. Several ditches were created instead of previous brooks and small rivers. The straightening of brooks was started already in the 1920s and 1930s, as evidenced by forest map of 1938.

2. Threats to habitat and species conservation

In the length of about 2 km, the territory at its southern border is crossed by Polotsk-Ventspils oil pipeline and a main communication cable. There is a risk of potential pollution due to oil pipeline accident or illegal connections.

3. Existing management of the protected habitats and its assessment

- In 2014, in the framework of the LIFE project "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371 NAT-PROGRAM) the felling and removal of spruces (*Picea abies*) in subcanopy and advance growth of oak forests was carried out in an area of 2.0 hectares. The aim of the measure was the prevention of the increased shade and soil acidification caused by spruce litter, and promotion of the regeneration of broadleaved trees. The results will be measurable over a longer period of time.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by ensuring non-intervention in woodlands which have not yet reached the quality of protected habitats. Woodland development towards habitat type 9160 *Sub-Atlantic and medio-European oak or oakhornbeam forests of the* Carpinion betuli is expected.
- Promotion of the development of broadleaved forests characteristic for the territory and conservation of their associated species by selective felling in spruce plantations in order to increase the proportion of broadleaved trees.
- Provision of conditions at the old oaks which are beneficial for the trees and their associated rare insects, lichens, polypores and birds.

5. Necessary management and conservation measures

5.1. General measures

- Inventory and mapping of old oaks; implementation of management recommended in the nature management plan.
- Maintenance of canopy gaps in forests, in order to ensure foraging resources for wild animals and birds.

5.2. Specific measures

5.2.1. Species

- Populations of rare plant species (*Gladiolus imbricatus, Platanthera chlorantha*, and *Agrimonia pilosa*) are threatened due to overgrowth of their localities. Therefore, grass on road verges and forest block roads (if accessible) must be annually mown and removed. Area: 2.5 ha.
- For the protection of *Muscardinus avellanarius*, habitat conservation according to the nature management plan must be implemented.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	57.5	7.1	Bad.	Non-intervention.		57.5
91D0*	Bog woodland	99.1	12.4	Bad.	Non-intervention.		99.1
9160	Oak forests	6.7	<1	Bad.	Non-intervention.		6.7
9080*	Fennoscandian deciduous swamp woods	106.8	13.4	Poor.	Non-intervention.		106.8
9020*	Broad-leaved deciduous forests	36.3	4.5	Poor.	Non-intervention.		36.3
9000	Potential Protected woodland habitat	208.7	26.1	-	Non-intervention. Increase of proportion of broadleaved trees in spruce plantations.	105.2	103.5

Pašulienes mežs | *Nature Reserve (LV0535000)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ilūkste municipality Šēdere rural territory.

AREA: 106 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Pašulienes mežs Nature Reserve is a part of a small, isolated forest massif. It borders with Daugavpils-Panevežys railway line in the north and with the territory of the oil transfer company JSC LatRosTrans in the west.

Near the Pašulienes mežs Nature Reserve there are Raudas meži, Sasaļu mežs, Pilskalnes Siguldiņa Nature Reserves, and a few micro-reserves which are established for the protection of rare bird species, forming an important complex of protected nature territories in the south-eastern part of Latvia. The forests of the nature reserve are little influenced by forestry, and the territory is not drained. Systematic forestry has taken place in the territory before the establishment of nature reserve. Now there are new woodlands which have regenerated naturally, and there is a large proportion of *Fraxinus excelsior* in species composition. The territory is not populated. Although it is close to Pašuliene village and several farmsteads, the territory is not visited a lot.

The nature reserve is important for the conservation of western Taïga, old broadleaved forests, swamp woods and alluvial forests which are also habitats for several typical, rare and protected species. More than 60% of the forests are protected habitats and correspond to the criteria of woodland key habitats. More than third of the woodlands are over 100 years old.

Of the rare species found, there are four moss, one lichen, and five vascular plant species. The most important of them are vascular plants *Dactylorhiza maculata, Huperzia selago, Glyceria lithuanica, Dactylorhiza fuchsii* (abundant), mosses *Bazzania trilobata, Lejeunea cavifolia, Fissidens arnoldii*, lichen *Lobaria pulmonaria*.

Five protected bird species have been found in the nature reserve: Picoides leucotos, *Picoides tridactylus, Lullula arborea, Dryocopus martius, Bonasa bonasia*. The territory is particularly important for woodpeckers.

2. Threats to habitat and species conservation

So far no significant negative threats have been found. The noise generated by oil transfer company SIA LatRosTrans and its direct vicinity are potential negative threats, as well as a possible event of a technical accident.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase in area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types 9050 *Fennoscandian herb-rich forests with* Picea abies, 9020* *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus *or* Ulmus) *rich in epiphytes,* and 9080* Fennoscandian deciduous swamp woods is expected.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps according to newest methods.
- Improvement of new woodlands by increasing the proportion of broadleaved forests and therefore creating potential habitats for protected species. Selective felling includes felling of *Picea abies* and *Betula* spp. and leaving *Fraxinus excelsior, Populus tremula, Quercus robur* and other broad-leaved species.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	3.6	3.4	Poor.	Non-intervention.		3.6
9020*	Broad-leaved deciduous forests	5.6	5.3	Bad.	Non-intervention.		5.6
9010*	Western Taïga	2.5	2.4	Bad.	Non-intervention.		2.5
91E0*	Alluvial forests	10.7	10.1	Bad.	Non-intervention.		10.7
9000	Potential Protected woodland habitat	55.0	51.9	-	Non-intervention. Selective felling in order to increase the proportion of broadleaved trees and aspen.	19.4	35.6

Pāces pļavas | *Nature Reserve (LV0531300)*

1. Brief description

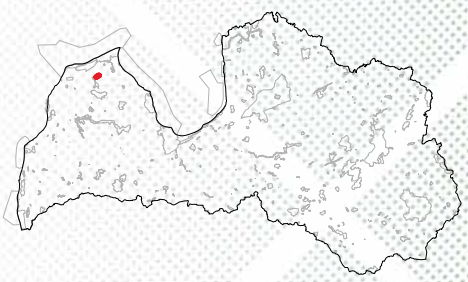
YEAR OF FOUNDATION: 2004.

LOCATION: Dundaga municipality Dundaga rural territory.

AREA: 83 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Pāces pļavas Nature Reserve is located in an extensive, continuous forest massif in the northern part of Kurzeme region. It includes Pāce ricer with its floodplains, and woodlands on the slopes of the river valley. In the south-western part, it borders with Raķupes ieleja Nature Reserve which includes the other part of Pāce river.

Nature reserve is important for the conservation of habitats of grasslands, rivers, as well as forests. More than half of the territory is occupied by Tilio-Acerion *forests of slopes, screes and ravines*. Also *Fennoscandian mineral-rich springs and springfens* can be found on slopes. The territory is located in a region where semi-natural grasslands are highly fragmented, therefore, together with Raķupes ieleja Nature Reserve, it is very important for the conservation of semi-natural grasslands in Kurzeme Region.

The most important protected plant species are *Allium ursinum, Dactylorhiza maculata, Orchis mascula*. Protected invertebrate species include O*smoderma barnabita, Liocola marmorata, Unio crassus, Ancylus fluviatilis, Graphoderus bilineatus, Ophiogomphus cecilia,* and others. Pāce river is significant for *Salmo salar*. The nature reserve is important for the conservation of diversity of bird species. The neighboring *Raķupe and Pāce* Important Bird and Biodiversity Area, as well as the nearby established micro-reserves for *Tetrao urogallus* and *Ciconia nigra* also indicate this.

2. Threats to habitat and species conservation

- Grasslands are overgrowing due to discontinuation of management; the restoration of abandoned grasslands is encumbered due to rootings of wind pigs (*Sus scrofa*). Grassland management is complicated due to the remote location and the lack of access roads. Overgrazing (too high grazing pressure) is the potential threat in pastures.
- Water level fluctuation caused by Pāce HPP (hydroelectric power plant) promotes bank instability and erosion. The given impact is multiplied by the beaver activity and beaver dam construction promoting destruction of former pebble and gravel grounds, covering them with sediments and thus destroying salmonid and lamprey spawning grounds.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 semi-natural grasslands only in the southern part of the nature reserve were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Here, conservation status of grasslands is favourable. In the rest part of the nature reserve, grasslands are highly overgrown and rooted by pigs.

4. Priorities of management and conservation

- Grassland habitat restoration and maintenance in a favourable conservation status in the maximum possible area, conserving elements of wooded grasslands.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of influence of large woody debris for the improvement of grassland habitat quality in grasslands along the river. Prevention of establishment of beaver dams and inundations in river reaches with pebble and boulder grounds.

5. Necessary management and conservation measures

5.1. General measures

- Inventory of grasslands, with particular attention to identification of wooded grasslands (including wooded pastures). Also historical information should be used – cartographic materials and memories from the local people about management in the past.
- Development and implementation of grassland restoration and management plan. It must include both the evaluation of currently known semi-natural grasslands (including recommendations on optimal grazing pressure, the efficiency of enclosure fences in areas where presence of grazing animals is undesirable),

plan for their restoration and maintenance, as well as evaluation of the restoration potential and maintenance of grasslands managed long time ago.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	35.2	42.4	Favourable.	Non-intervention.		35.2
9080*	Fennoscandian deciduous swamp woods	1.95	2.3	Favourable.	Non-intervention.		1.95
9020*	Broad-leaved deciduous forests	0.8	<1	Favourable.	Non-intervention.		0.8
9010*	Western Taïga	0.04	<1	Favourable.	Non-intervention.		0.04
91E0*	Alluvial forests	3.1	3.7	Poor.	Non-intervention.		3.1
8220	Siliceous rocky slopes	0.12	<1	Favourable.	Non-intervention.		0.12
7160	Fennoscandian mineral-rich springs and springfens	0.3	<1	Favourable.	Non-intervention.		0.3
6410	*Molinia* meadows	2.0	2.4	Poor.	Restoration. Maintenance.	0.0	2.0
6450	Northern boreal alluvial meadows	4.1	4.9	Poor.	Restoration. Maintenance.	3.1	4.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.8	<1	Poor.	Restoration. Maintenance.	0.0	0.8
6210	Semi-natural dry calcareous grasslands	5.5	6.6	Poor.	Restoration. Maintenance.	4.5	5.5
3260	Natural river reaches and river riffles	7.2	8.7	Poor.	Improvement of water flow rate in order to reduce the flood risk related to Pāce HPP. Removal or reduction of large woody debris in sites where they promote shore erosion, as well as in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality (habitat for *Unio crassus; Lampetra planeri, Ancylus fluviatilis*).	On necessity	

One-time grassland restoration measures are necessary in an area of at least 8 ha of currently known grassland habitats of EU importance, as well as in 10 ha of grasslands which are completely overgrown with secondary forest, but there are visible elements of wooded grasslands (possibly, also old wooded pastures). Due to lack of access roads and difficult terrain, (narrow grassland belts along rivers, with larger areas of grasslands in relatively broader parts of the floodplain), the most appropriate method of grassland restoration and management would be grazing (including mobile grazing).

Pāvilostas pelēkā kāpa | *Nature Reserve (LV0536500)*

1. Brief description

YEAR OF FOUNDATION: 2007.

LOCATION: Pāvilosta municipality, Saka rural territory, Pāvilosta town.

AREA: 42.04 ha.

NATURE MANAGEMENT PLAN: 2009 (2009–2019).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 394 of 27 April 2010, Regulation on Individual Protection and Use of the Pāvilostas Pelēkā Kāpa National Park.

Pāvilostas pelēkā kāpa Nature Reserve is located on the shore of the Baltic Sea and it includes the northern part of Pāvilosta town. The territory is important for the protection of open grey dunes. The grey dune of Pāvilosta is the widest grey dune in Latvia, reaching 818 m in width in some places. Most of the territory (89%) is occupied by two EU priority protected habitat types: 2140* *Decalcified fixed dunes with* Empetrum nigrum and 2130* *Fixed coastal dunes with herbaceous vegetation (grey dunes)* which are also protected in Latvia. The area is also an important recreational resource with a high landscape value. Coastal erosion occurs in the territory of nature reserve, and it is expected that part of the area (~ 2 ha) may be lost in the long-term (over 50 years).

Grey dunes are existent in the interaction of natural processes and human activities. The distribution of rare species is directly influenced by the intensity of disturbances. High levels of disturbance can completely eradicate the species. However, the management is insufficient now, leading to habitat overgrowth with trees and its further development into forest. In order to preserve the habitat for a long time, a balance must be ensured between the regular topsoil disturbance, which impedes the transformation of the area into a grassland or pine forest, and non-interference that prevents the destruction of ground vegetation and sand overblowing. For most of the species of the nature reserve, regular, intermediate disturbances and open grey dune habitats are necessary.

The sensitive grey dune habitats are a particularly valuable habitat for several species associated to sea coast, including rare and protected species which can be found only on the sea coast. There are 10 protected plant species, three mushroom, seven invertebrate and four bird species. In 2008, *Bufo calamita* was found. Extensive polygon-type localities with important protected plant species such as *Dianthus arenarius* ssp. *arenarius* and *Pulsatilla pratensis* are characteristic to the area. In total, four EU protected habitat types are located in the territory.

2. Threats to habitat and species conservation

- Grey dunes overgrow with trees and shrubs due to insufficient management.
- Due to lack of well-maintained trails, grey dune vegetation is trampled and damaged, sand erosion develops in terrain elevations, and sand is increasingly blown at the main tracks.
- Deciduous trees and shrubs establish themselves in the eutrophication areas. Light and humidity conditions are changing, threatening the xerophytic habitats of open dunes.

3. Existing management of the protected habitats and its assessment

In some places in the nature reserve, pines have been felled or uprooted, and removed, but this measure was insufficient in order to ensure the optimal conditions for species associated to grey dunes.

4. Priorities of management and conservation

Restoration and further maintenance of overgrown grey dunes.

5. Necessary management and conservation measures

5.1. General measures

- Re-purchase of land properties and their transfer to the possession of the Ministry of Environmental Protection and Regional Development of the Republic of Latvia in order to enable efficient management of the nature reserve.
- Establishment of recreation infrastructure on the western side of the nature reserve and in adjacent areas; establishment of infrastructure for nature education; maintenance of the car park.
- Monitoring of the efficiency of measures in order to adjust the further management measures. It is very important to continue coastal monitoring. This territory is also well-suited for the public monitoring.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
2180	Wooded dunes	2	4.8	Favourable.	Thinning of *Pinus sylvestris* woodlands, removal of litter below the trees.	2	
2170	Dunes with *Salix repens*	0.4	<1	Favourable.	Removal of trees and shrubs, in some places also topsoil removal. Elimination of invasive and expansive plant species (cutting, mowing, grazing, topsoil loosening).	20.2	10
2140*	Decalcified fixed dunes with *Empetrum nigrum*	19.6	46.7	Favourable.			
2130*	Grey dunes	18.2	43.3	Favourable.			

Pelcīšu purvs | *Nature Reserve (LV0531800)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ventspils municipality Usma rural territory.

AREA: 56 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Pelcīšu purvs Nature Reserve includes the overgrowing Lake Pelcene with transition mire and adjacent woodlands. The territory is one of the most valuable transition mires in Latvia in terms of biodiversity. There are peculiar plant communities, as well as stands of *Cladium mariscus*. Protected plant species *Liparis loeselii, Hammarbya paludosa*, rare *Carex heleonastes*, moss *Paludella squarrosa* can be found in the mire. Biodiverse areas of semi-natural grasslands, drained with shallow ditches, adjoin the western border of the nature reserve. The western border adjoins biodiverse natural grassland areas, which are covered with shallow ditches. Two-way flywheel *Graphoderus bilineatus* can be found in the territory.

2. Threats to habitat and species conservation

The existence of the protected habitats can be adversely affected by hydrological regime changes.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural mire and freshwater habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Taking inventory of semi-natural grassland territory which adjoins the border of nature reserve; considering its inclusion in the nature reserve, as well as its restoration and maintenance in a favourable conservation status.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	4.4	7.8	Favourable.	Non-intervention.		4.4
9080*	Fennoscandian deciduous swamp woods	18.8	3.3	Poor.	Non-intervention.		18.8
7210*	*Cladium mariscus* fens	14.1	25.2	Favourable.	Non-intervention.		14.1
7140	Transition mires and quaking bogs	9.1	16.3	Favourable.	Non-intervention.		9.1
7110*	Active raised bogs	4.4	7.8	Favourable.	Non-intervention.		4.4
3160	Natural dystrophic lakes and ponds	2.2	3.9	Favourable.	Non-intervention.		2.2

Pelēču ezera purvs | *Nature Reserve (LV0526700)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Preiļi municipality Pelēči rural territory.

AREA: 12 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Pelēču ezera purvs Nature Reserve is located on the coast of Lake Pelēči and it includes a mire which has developed when lake overgrew. The territory is small but important for the protection of transition mires and quaking bogs. The mire overgrows slowly in the course of natural processes.

The most important species are invertebrates *Leucorrhinia pectoralis*, plants *Liparis loeselii* and *Dactylorhiza cruenta*, and others.

2. Threats to habitat and species conservation

The existence of habitats is affected negatively by hydrological regime changes in the territory.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7140	Transition mires and quaking bogs	11.0	91.7	Favourable.	Non-intervention.		11.0

Piešdanga | *Nature Reserve (LV0517500)*

1. Brief description

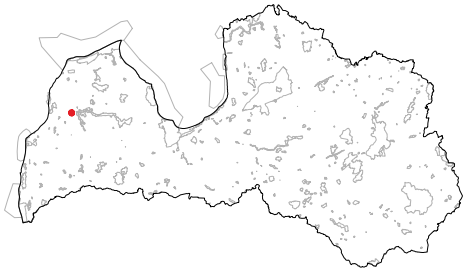
YEAR OF FOUNDATION: 1977.

LOCATION: Ventspils municipality Usma rural territory.

AREA: 10 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Piešdanga Nature Reserve is located on the right bank of Venta River. It includes steep, forested slope and river bank. The territory was established for the protection of the only locality of *Equisetum telmateia* in Latvia. The vitality of species in the locality is very high. Forests of slopes, screes and ravines and mineral-rich springs are located on the slope. More than 20 spring discharge sites can be found on the steep slope. It is unusual that plant communities characteristic for mires do not develop in such places; vegetation is characteristic to forests and also to eutrophic tall herb communities.

There are very rare vascular plant species *Scrophularia umbrosa* and *Lathyrus pisiformis* which are critically endangered in Latvia. There are also other protected plant species – *Dactylorhiza baltica, Dactylorhiza incarnata, Diphasiastrum complanatum,* and others.

Semi-natural grasslands can be found in the immediate vicinity of the territory. Inclusion of these grasslands in the nature reserve would increase its value and importance in ensuring the functionality of the Venta valley as a species dispersal corridor.

2. Threats to habitat and species conservation

The logging on the upper edge of Piešdanga terrace can cause soil landslides that can bury spring discharges and localities of protected plant species.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed natural processes in natural habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Inclusion of semi-natural grasslands adjacent to nature reserve would increase the value of the territory for ensuring of functionality of the Venta valley as a species dispersal corridor.

5. Necessary management and conservation measures

5.1. General measures

- Mapping and specification of the habitat areas.
- Decision on the change of nature reserve borders, to include semi-natural grasslands adjoining the territory.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	0.5	5.0	Poor.	Non-intervention.		0.5
9010*	Western Taïga	2.9	29.0	Favourable.	Non-intervention.		2.9
7160	Fennoscandian mineral-rich springs and springfens	0.007	<1	Favourable.	Non-intervention.		0.007
6430	Hydrophilous tall herb fringe communities	0.4	4.0	Favourable.	Non-intervention.		0.4

Pildas ezers | *Nature Reserve (LV0510600)*

1. Brief description

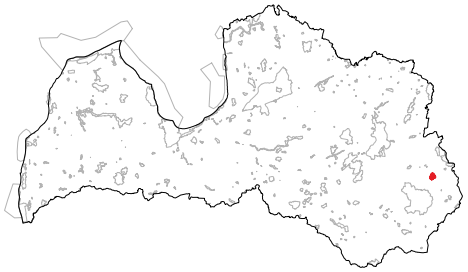
YEAR OF FOUNDATION: 1977.

LOCATION: Ludza municipality, Ņukšu and Isnauda rural territories.

AREA: 611 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Te Pildas ezers Nature Reserve includes Lake Pilda with nine islands and surrounding woodlands and grasslands. The territory is important for the protection of an outstanding natural eutrophic lake and forest habitats. The old, scenic broadleaved woodlands on islands are particularly biodiverse. In Vidussala, Pilda, Ozolu (Ūzūlu) and Liepu islands, vegetation has been studied. There are broadleaved forests (with *Quercus robur* and *Tilia cordata*) with rich herbaceous vegetation. The dense understory consists of *Padus avium, Lonicera* spp., *Sorbus aucuparia, Humulus lupulus*. Swamp woods with *Alnus glutinosa* can be found along the lake shore. There is a large variety of breeding waterbirds. The territory is particularly important as a foraging site for several bat species, including *Myotis dasycneme*. The most important animal species in the nature reserve are *Circus pygargus, Lutra lutra*, in the lake – *Cobitis taenia*. In old trees *Lasius fuliginosus* can be found.

2. Threats to habitat and species conservation

- In the northern part of the nature reserve, at the coastal part of the lake, economic activity is more intense, and grasslands are managed. The water quality in Lake Pilda can be affected negatively by internal drainage in the small areas next to the lake and their discharge in the lake.
- The outflow of Pilda (Ilža) river is clogged, water discharge is encumbered and it contributes to the coastal paludification. The previously open part of the lake between the islands is rapidly overgrowing with emergent vegetation.
- Littoral zone overgrows with emergent vegetation and becomes inaccessible to ducks and waders, thus reducing the potential species diversity. An overgrowth of the lake shores with dense emergent vegetation makes fish (*Esox lucius, Abramis brama*) spawning difficult or even impossible.
- On Pilda island, there is a colony of cormorants, which may promote the withering of large trees.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of cover of aquatic macrophytes in the lake between Pilda island and Pilda river outflow, as well as between Ozolu (Ūzūlu) and Vidus islands for the provision of water circulation and fish spawning, and for the slowdown of accumulation of aquatic macrophytes debris and eutrophication.

5. Necessary management and conservation measures

5.1. General measures

- Removal of beaver dams and naturally-formed clogs of dead plants in order to ensure water discharge and avoid acceleration of coastal paludification and eutrophication in Pilda (Ilža) river and in Leidiukšņa river which connects Lake Pilda and Lake Vidusezers.
- Removal or burning of dead reed mass which is accumulated on the border between mineral ground and aquatic environment in islands. This will promote water runoff from islands and protection of those coastal areas where the restoration of sandy habitats is possible, as well as prevent the paludification of the driest parts of islands and promote the conservation of their habitats.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	8.1	1.3	Favourable.	Non-intervention.		8.1
9080*	Fennoscandian deciduous swamp woods	9.1	1.5	Favourable.	Non-intervention.		9.1
9020*	Broad-leaved deciduous forests	19.5	3.2	Poor.	Non-intervention.		19.5
3150	Natural eutrophic lakes	268.4	43.9	Poor.	Mowing of aquatic macrophytes in the area between Pilda island and Pilda river mouth, between Ozolu and Vidus islands; between Capļu and Ozolu islands, in order to improve water circulation and fish migration and to reduce accumulation of decayed plants (once per 5 years).	3.0	
3260	Natural river reaches and river riffles	1.0	<1	Poor.	Mowing of aquatic macrophytes in Pilda river and in Leidiukšņa river (which connects Lake Pilda and Lake Vidusezers), as well as in mouths of Pilža and Leidiukšņa rivers, and outflow of Pilda river (once per 5 years).	1.0	

Pilskalnes Siguldiņa | *Nature Reserve (LV0524900)*

1. Brief description

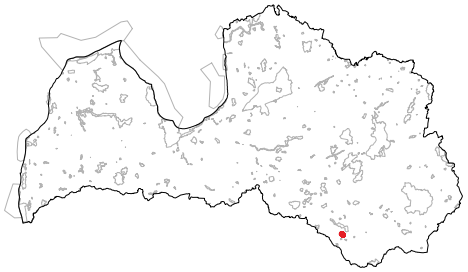
YEAR OF FOUNDATION: 1999.

LOCATION: Ilūkste municipality Pilskalne rural territory.

AREA: 71 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



The Nature Reserve is located in the southwestern part of Pilskalnes subglacial valley. It includes Dubupīte river valley which has developed influenced by glacial meltwaters. Dubezers, Pastarītis and Tartaks are exorheic lakes, and connected with Dubupīte river.

The nature reserve is important for the conservation of geomorphologically peculiar terrain and outstanding forests of slopes, screes and ravines. It is also an aggregation site of natural broad-leaved and broad-leaved-*Picea abies* woodlands which used to be characteristic to this part of Latvia. Initially, in 1983, Pilskalnes Siguldiņa was established as a dendrological reserve. For many years, the territory has been used for recreation, mainly for walks and nature education, as several nature trails and cycling routes have been established in here.

There are nine EU protected habitat types, and also several rare and protected species – nine bat, four bird, 24 invertebrate, seven lichen, one mushroom, 11 vascular plant species. The most important ones of these are invertebrate *Osmoderma barnabita*, and moss *Dicranum viride*. The high abundance of temperate species is explained by the location of nature reserve in seasonally the warmest region of Latvia. Rare plant species *Carex pilosa* and *Hypericum hirsutum* grow in forests. *Scirpus radicans* has been found in shore of Lake Dubezers, but moss *Aphanorhegma patens* – on sand bank. In rare woodlands on slopes, important species are lichens Lobaria pulmonaria, *Thelotrema lepadinum*, moss *Metzgeria furcata*, and others. Important animal species are birds *Dendrocopos leucotos* and *Ficedula parva,* and several species of bats, including *Myotis dasycneme* and *Pipistrellus pipistrellus*.

2. Threats to habitat and species conservation

- Slope forests are influenced by natural exogenous processes – erosion and landslides caused by surface runoff.
- Runoff from agricultural land and residential areas (in Lake Tartaka, overgrowth promoted by farm wastewater can be observed).
- Presence of visitors, especially in summertime, causes ground vegetation trampling and adversely affects the quality of habitats. In general, the impact is not critical.
- There is a risk that sluices located at Dubezers guesthouse may collapse, causing water level lowering in Lake Tartaka and deterioration of habitat type 3150 *Natural eutrophic lakes with* Magnopotamion or Hydrocharition - *type vegetation*.

3. Existing management of the protected habitats and its assessment

Voluntary work events (*talkas*) have been organized for the maintenance and restoration of nature trail. In result, visitors are mowing mainly along the trail, and the anthropogenic load to surrounding habitats is reduced.

4. Priorities of management and conservation

- Undisturbed course of natural processes in habitats, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of diverse and scenically attractive complex of ravines, natural forests and freshwater habitats.
- Optimal conditions for the existence of protected species.

5. Necessary management and conservation measures

5.1. General measures

- Development and approval of Individual regulations on protection and use for the territory.
- Maintenance and repair of nature trail (including protection against slope runoff and erosion).
- Restoration of sluices at Dubezers guesthouse in accordance with the requirements of the regulatory enactments, in order to prevent the risk of sluice collapse and shore erosion.

5.2. Specific measures

5.2.1. Species

- Partial felling shrubs and improvement of light conditions in locality of *Hypericum hirsutum* (area: 0.05 ha).
- Liberation (insolation improvement) of large trees in order to improve *Osmoderma barnabita* habitats in woodlands.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0	Alluvial forests	0.9	1.2	Favourable.	Non-intervention.		0.9
9180*	Slope forests	43.2	60.8	Favourable.	Non-intervention. Felling of shrubs. Felling for landscape improvement.	 0.8 0.057	42.3
9160	Oak forests	1.8	2.5	Favourable.	Non-intervention. Felling of shrubs.	 0.1	1.7
9080*	Fennoscandian deciduous swamp woods	0.6	<1	Poor.	Non-intervention.		0.6
9050	Herb rich spruce forests	2.7	3.8	Favourable.	Non-intervention.		2.7
7220*	Petrifying springs	0.1	<1	Favourable.	Non-intervention.		0.1
7160	Fennoscandian mineral-rich springs and springfens	0.2	<1	Favourable.	Non-intervention. Removal of municipal waste from springs (on necessity).		0.2
3260	Natural river reaches and river riffles	0.16	<1	Bad.	Demolition of beaver dams. Removal of municipal waste from river.	0.16	0.16
3150	Natural eutrophic lakes	2.2	3.1	Poor.	Removal of fallen logs and twigs from Lake Dubezers, leaving some scenically impressive logs (in Dubezers and Tartaka Lakes: leaving about 10 fallen logs is recommended). Elimination of beaver dams. Partially: felling of shrubs and small trees in a 10 m wide belt along the bank (on necessity).	2.2	

Platenes purvs | *Nature Reserve (LV0531700)*

1. Brief description

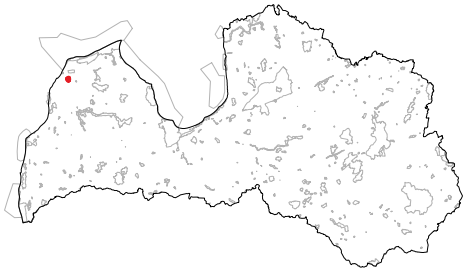
YEAR OF FOUNDATION: 2004.

LOCATION: Ventspils municipality Tārgale rural territory.

AREA: 455 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Platenes purvs Nature Reserve is located near Ventspils town and it borders with drained agricultural lands, new forests, and Ventspils-Rīga motorway. In the northern and north-eastern part of the Platene Mire, outside the territory, there is a drained, open territory, where a wind power park is located. Territory is also influenced by ditches excavated outside the nature reserve in adjacent forests, including ditches which are recently excavated and restored.

Near the border of the area there is a straightened Platene River. In the southern part of the nature reserve and also outside the territory, peat was extracted in the first half of the 20th century.

The nature reserve is important for the conservation of calcareous fen. Platene Mire is one of the largest locations of this habitat in Latvia. There are also other EU protected habitat types: deciduous swamp woods, bog woodlands and western Taïga.

P*rimula farinosa, Dactylorhiza cruenta, Carex davalliana, Liparis loeselii, Gymnadenia conopsea*, and *Pinguicula vulgaris* are the most important protected plant species in the nature reserve. Other important protected species are birds *Bonasa bonasia, Tetrao tetrix*, invertebrate *Vertigo geyeri*.

2. Threats to habitat and species conservation

- The hydrology of Platene Mire is changing due to drainage carried out outside the nature reserve. Peripheral part of the mire overgrows rapidly with trees (mainly *Betula* spp., also *Pinus sylvestris*).
- The initiative of landowners to transform mires to forests, to receive financial support of Rural Support Service.
- Fens may be influenced negatively by activities of beavers.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting; maintenance of conditions optimal for wet forests.
- Maintenance of open mire areas preventing their overgrowth and degradation.
- Undisturbed natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

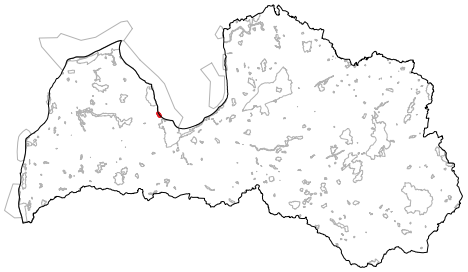
- Habitat inventory and mapping.
- Hydrology research in the entire mire complex; evaluation of the possibilities of: rewetting, reducing overgrowth with trees, reducing the fragmentation of the open mire.
- When implementing management and conservation measures, the priority of mire habitat conservation should be considered as higher than the priority of bog woodland conservation.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	36.1	7.9	Poor.	Non-intervention. Rewetting (in complex with rewetting in mires).	According to research results.	36.1
9080*	Fennoscandian deciduous swamp woods	14.2	3.1	Poor.	Non-intervention.		14.2
9010*	Western Taïga	2.1	<1	Favourable.	Non-intervention.		2.1
7230	Alkaline fens	101.5	22.3	Favourable to poor.	Detailed hydrology research; restoration of water level if necessary. Felling of trees and shrubs in some areas, in order to reduce mire fragmentation.	According to research results.	

Plieņciema kāpa | *Nature Reserve (LV0514800)*

1. Brief description



YEAR OF FOUNDATION: 1987.

LOCATION: Engure municipality, Engure rural territory.

AREA: 56.60 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Plieņciema kāpa Nature Reserve includes an expressive dune ridge (height 5.2 to 16.3 m) along the coast of Gulf of Rīga, covered with old pine woodland, and the last deflation hollow in Latvia – Vabu Laukums or Baltā Kāpa (the White Dune) at Plieņciems village. The territory is characterized by terrain which typical for a dynamic coast. In the pine forest, communities characteristic for xerophytic habitats and sands can be found. It is located in direct vicinity of residential area and the sea, therefore it is very attractive both to local residents and tourists, and there is a high anthropogenic load in summers.

The most important habitats of the territory are embryonic shifting dunes, wooded dunes and white dunes (shifting dunes along the shoreline with *Ammophila arenaria*). The rare and protected species found here are associated with well-insolated, sparse dry pine woodlands. Five rare and protected plant species have been found in the nature reserve, the most important of them are *Dianthus arenarius* ssp. *arenarius, Pulsatilla patens,* and *Jovibarba sobolifera*. Seven rare and protected bird species (such as *Jynx torquilla, Lullula arborea, Columba oenas*) and two specially protected invertebrate species have been found in the nature reserve. A significant value of the nature reserve is the rich population of *Nothorhina punctata*.

2. Threats to habitat and species conservation

- Dunes are excessively trampled by visitors; ground vegetation is trampled and damaged. This causes erosion in terrain elevations, and sand blowing at the main trails.
- Eutrophication is promoted by pollution in the territory. As a result, characteristic plant communities are gradually changing, and trees and shrubs are appearing.
- Motor vehicle use contributes to sand erosion, and damages the ground vegetation.
- The quality of woodland dune habitat is reduced by removal of fallen logs and twigs. This decreases the biodiversity, and with a particularly negative impact on the occurrence of rare invertebrate species.
- Open dunes overgrow with trees and shrubs in the course of succession. This reduces the area and quality of grey dunes and white dunes.

3. Existing management of the protected habitats and its assessment

In 2014, the dunes have been strengthened, which is currently considered to be sufficient. Management measures have been specified within the framework of the Kurzeme Planning Region project "Coastal and Maritime Spatial Planning in Pärnu Bay Area in Estonia and Coastal Municipalities of Latvia". Measures were carried out in *Fixed coastal dunes with herbaceous vegetation (grey dunes), Shifting dunes along the shoreline with* Ammophila arenaria *(white dunes),* and *Embryonic shifting dunes*. Fences of woven branches were restored along the trails and in sites which were excessively trampled.

4. Priorities of management and conservation

- Conservation of the quality of habitats of the nature reserve by decreasing the recreation load by redirecting visitors to less sensitive areas.
- It is necessary to ensure the balance between regular disturbances to dune vegetation, which prevents the overgrowth of the area with the trees, and non-interference that ensures the preservation of the groundfloor vegetation.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Establishment of recreational and educational infrastructure elements – well-maintained trails, stairs, barriers, information signs, in some places also boardwalks and toilets. The infrastructure should aim at redirection the visitor flow to places outside the nature reserve.
- Construction of a car park outside the nature reserve; installation of restricting barriers to reduce the negative impact of vehicles.
- It is recommended to increase the area of the nature reserve by 24.26 ha, up to the natural border of dune ridge (including such habitats as white dunes, grey dunes, wooded dunes, *Alnus glutinosa* swamp woods).
- Development of Integrated conservation and management plan for the Engure municipality, or Coastal thematic plan, which would specify the measures to decrease the anthropogenic load in the nature reserve.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	1.9	3.3	Poor.	Non-intervention.		1.9
91E0*	Alluvial forests	0.03	<1	Poor.	Non-intervention.		0.1
2180	Wooded dunes	47.9	84.6	Poor.	Felling of shrubs and deciduous trees in some areas. Non-intervention in the rest of territory.	0.5	 47.9
2130*	Grey dunes	6.1	10.8	Favourable.	Establishment or restoration of dune strengthening by woven twigs, fences, surface coating with twigs of pines or junipers. Non-intervention.	1 1.5	 3.6
2120	White dunes	0.4	<1	Bad.	Establishment or restoration of dune strengthening by woven twigs, fences, surface coating with twigs of pines or junipers. Non-intervention.	0.1	 0.3
2110	Embryonic dunes	0.11	<1	Bad.	In acute situations – establishment or restoration of dune strengthening by woven twigs, fences, surface coating with twigs of pines or junipers. Non-intervention.	0.05	 0.06

Pluču tīrelis | *Nature Reserve (LV0517100)*

1. Brief description

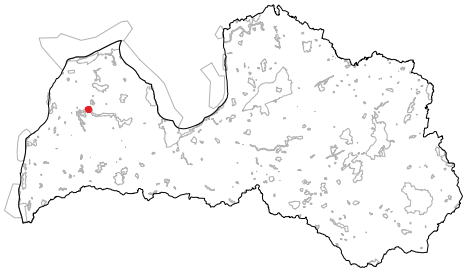
YEAR OF FOUNDATION: 1977.

LOCATION: Ventspils municipality, Usma and Ugāle rural territories.

AREA: 737,72 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Pluču tīrelis Nature Reserve is located in a wooded area, which is only slightly affected by human activity, between the Lake Usma and the Abava River. The territory is ecologically related to adjoining Druviņu Tīrelis Nature Reserve and Abavas senleja Nature Park, and their nature values. Several micro-reserves for the protection of bird species have been established on the territory of the nature reserve and in its immediate vicinity. Therefore, the area is significant as unified and continuous complex of nature values.

The nature reserve is important for the protection of active raised bogs and bog woodlands. There are several *Tetrao urogallus* leks. The population of *Tetrao tetrix* in the territory is one of the largest in Kurzeme Region. The central part of nature reserve is occupied by Pluču Tīrelis which is an active raised bog of western type, with a complex of hummock-hollow microrelief. At the periphery of the nature reserve there are biologically valuable forests with rare species of plants and animals.

Concerning species, birds are the most important in the territory, with nine rare and protected species found. The relatively large, open and minimally affected raised bog is the breeding site of *Pluvialis apricaria*. There are also at least two leks of Tetrao tetrix, and *Tetrao urogallus* lek with at least three displaying males. *Caprimulgus europaeus, Ficedula parva* are also particularly noteworthy species, as well as several species of woodpeckers, and the presence of large predatory birds.

One rare moss species (*Odontoschisma sphagni*) and three rare vascular plant species have been found in the area. *Trichophorum cespitosum* is one of the dominating plant species on hummocks in the entire bog massif. Also two protected invertebrate species have been found - *Chalcophora mariana* and *Laphria gibbosa*.

2. Threats to habitat and species conservation

The hydrological regime of the nature reserve has been changed – peat extraction has been done in Pluču Mire. A channel is excavated around the bog (Seržu Brook); oil pipeline route is constructed near the nature reserve, as well as drainage ditches and other artificial watercourses are established. At present, drainage is the main factor threatening nature values of the territory. Due to drainage, the amount of water in the bog, its peripheral part and adjacent areas is significantly reduced. This has caused increased overgrowth with pines and dwarf shrubs, *Sphagnum* mosses have disappeared from groundcover in some places, indicating the degradation of mire and forest habitats.

Due to maintenance of oil pipeline "Polotsk-Ventspils", hydrological regime in the direct vicinity of nature reserve is changed.

Overgrowing of mires contributes to the disappearance of habitats for protected bird species such as *Pluvialis apricaria* and *Tetrao tetrix*.

Logging in the direct vicinity of nature reserve promotes the fragmentation of forest habitats and adversely affects the birds during their breeding period.

Beaver dams and large woody debris in the lower reaches of Seržu Brook, as well as in Ostupe river reaches with riverbed of sand and gravel, promotes slowdown of the stream, water temperature rise, decrease of dissolved oxygen, covering sand and gravel with sediments, and disappearance of habitats suitable for oxygen-sensitive invertebrates.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage more and forest habitats.

4. Priorities of management and conservation

- Preservation of the quality of mire habitats by rewetting Pluču Mire.
- Undisturbed course of natural processes in natural habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increasing the area and integrity of protected habitats by non-intervention in woodlands that have not yet reached the quality of protected habitats.

- Maintenance of Tetrao urogallus leks in favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological regime research; development of building project before the implementation of rewetting.
- Legislative action establishing the code type C for the Natura 2000 site because of the high density of EU protected bird species in the area.
- Optimization of the borders. At present, habitats are not mapped in the entire territory, and the inclusion of two adjacent micro-reserves as well as one partially included micro-reserve must be considered.
- Assessment of the merging of Pluču Tīrelis Nature Reserve and Abavas Senleja Nature Park.
- Maintenance of *Tetrao urogallus* leks according to the ecological requirements of the species.

5.2. Specific measures

5.2.1. Species

There is an active, medium-sized lek of *Tetrao urogallus* with about three displaying males. Necessary management measures must be conducted according to expert recommendations.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	155.2	21.0	Favourable.	Non-intervention. Management of *Tetrao urogallus* leks. Rewetting in bog woodlands and raised bog.	According to opinion of expert. According to research results.	155.2
9080*	Fennoscandian deciduous swamp woods	0.6	<1	Poor.	Non-intervention.		0.6
9010*	Western Taïga	79.5	10.8	Favourable.	Non-intervention. Management of *Tetrao urogallus* leks.	According to expert recommendations.	79.5
7140	Transition mires and quaking bogs	0.7	<1	Favourable.	Non-intervention.		0.7
7120	Degraded raised bogs	93.2	12.6	Bad.	Rewetting (dam construction or ditch filling up).	93.2	
7110*	Active raised bogs	235.1	31.9	Favourable.	Rewetting (ditch blocking or filling up).	235.1	
3260	Natural river reaches and river riffles	0.5	<1	Poor.	Ensuring the water flow rate. Removal or decrease of beaver dams and large woody debris in sites where riverbed with gravel or pebbles indicate on river riffles of high quality (suitable for *Lampetra planeri* spawning).		
3160	Natural dystrophic lakes and ponds	0.13	<1	Poor.	Non-intervention.		0.13

Plunču ezera meži | *Nature Reserve (LV0535100)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Talsi municipality, Ģibuļi rural territory.

AREA: 83 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Plunču ezera meži Nature Reserve is located in the middle of Kurzeme Region. It borders with Plunču Lake, as well as with mosaic of forests and open landscape. The straightened Briežupe river forms the south-western border of the nature reserve. The nearest protected area is Abavas Senleja Nature Park.

The nature reserve includes biologically valuable wet forests in the terrain depression on the shores of the lake, as well as small islet with mineral ground in the middle of the depression, and transition mires and quaking bogs around the mouth of the Briežupe river. The territory is important for the protection of bog woodlands, swamp woods and western Taïga. It is an aggregation site of woodland key habitats. Examples of rare and protected moss species are *Scapania* sp., *Riccardia multifida, Jungermannia leiantha, Anastrophyllum hellerianum, Odontoschisma denudatum*. Protected vascular plant species: *Huperzia selago, Carex paupercula, Dactylorhiza incarnata*.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

To raise the issue of including Plunču Lake in the nature reserve. Currently the lake is in the possession of the Ministry of Environmental Protection and Regional Development.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	11.4	13.7	Poor.	Non-intervention.		11.4
9080*	Fennoscandian deciduous swamp woods	15.4	18.5	Favourable.	Non-intervention.		15.4
9010*	Western Taïga	11.4	13.7	Poor.	Non-intervention.		11.4
7140	Transition mires and quaking bogs	1.7	2.0	Poor.	Non-intervention.		1.7

Pokratas ezers | *Nature Reserve (LV0502300)*

1. Brief description

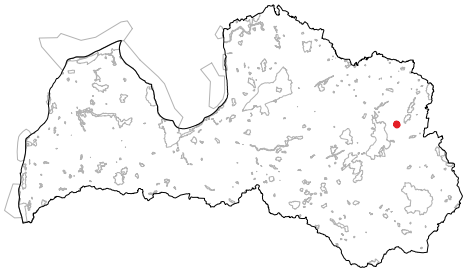
YEAR OF FOUNDATION: 1977.

LOCATION: Rugāji municipality Rugāji rural territory.

AREA: 53 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Pokratas Ezers Nature Reserve is located in a territory with a slightly undulated terrain. It includes Lake Pokrata and its adjoining area. The average depth of the lake is 1.1 m. It is difficult to access the lake as there are wetlands on its banks. It is highly eutrophic.

The territory is very important for the conservation of water chestnut *Trapa natans*. Lake Pokrata is one of the three localities of this species in Latvia; here, *Trapa natans* is found north of its main species distribution range. It is estimated that *Trapa natans* population in Lake Pokrata consists of 23 000 plants.

Bog woodlands and swamp woods in small areas can be found around the lake.

2. Threats to habitat and species conservation

- Structures of natural forests are threatened by visitation of the territory and recreation. For example, dead wood is used in campfires.
- The visitor infrastructure is insufficient; therefore lake habitat is adversely affected by recreation load (for example, litter).

3. Existing management of the protected habitats and its assessment

- Existing protection (prohibition of angling and boat use) and management so far has contributed to the existence of *Trapa natans* population and a slight increase in its occupied area.

4. Priorities of management and conservation

Conservation and maintenance of conditions suitable for *Trapa natans*.

5. Necessary management and conservation measures

5.1. General measures

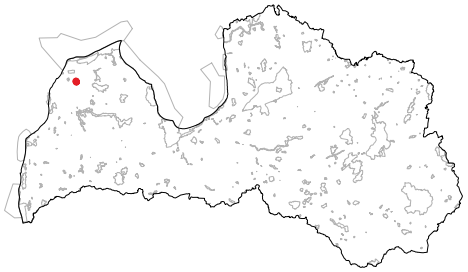
- Reduction of anthropogenic load on lake and its shore by establishment of visitor infrastructure (container-based toilets, firewood); promotion of tourism to the lake must be prevented. Viewing of *Trapa natans* should be organised from one or few well-maintained viewpoints.
- Maintenance of the lake ecosystem in a favorable conservation status by reduction of leaf and twig litter volumes fallen into water. Selective mowing of aquatic macrophytes in case if cover of *Trapa natans* is decreasing due to shade.
- Restriction of use of any floating structures in lake through *Trapa natans* colonies, except for research and management measures which are coordinated with the responsible nature protection institution.
- Informing agriculture and forestry operators in Lake Pokrata drainage basin on the importance of Good Agriculture Practice in the management of land and protective belts, with the aim of reducing the input of plant nutrients into Lake Pokrata and slowdown of its eutrophication.
- Monitoring of *Trapa natans* (including regular photography from certain fixed points).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	3.7	7.0	Favourable.	Non-intervention.		3.7
9080*	Fennoscandian deciduous swamp woods	0.6	1.1	Poor.	Non-intervention.		0.6
3150	Natural eutrophic lakes	10.4	19.6	Poor.	Non-intervention. Restriction of spread of *Nuphar lutea, Potamogeton* spp., and *Myriophyllum spicatum,* by mowing (from boat) and removal.		10.3 0.1

Popes zāļu purvs | *Nature Reserve (LV0531900)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Ventspils municipality, Pope rural territory.

AREA: 78 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Popes zāļu purvs Nature Reserve is located near the Pope forest massif. The territory is important for the conservation of mineral-rich springs, alkaline fens and calcareous grasslands, as well as for conservation of bog woodlands and forests with spring discharges. Springfens and grasslands were used for the haymaking earlier, but now are heavily overgrown with trees and shrubs.

Pope Fen is one of two localities of *Saussurea alpina* ssp. *esthonica* in Latvia. Other rare plant species are also found here, such as *Lathyrus linifolius, Carex davalliana, Pinguicula vulgaris*, and others. The area is also important for the conservation of localities of rare snail species - *Vertigo angustior* and *Vertigo geyeri*.

2. Threats to habitat and species conservation

- Changes in the hydrological regime, including in the adjacent areas; it is important to conserve the function of springs and to ensure that groundwater table is not lowering.
- Natural succession – the overgrowth of open fens and grasslands threaten the rare plant species, including the very rare *Saussurea alpina* ssp. *esthonica*.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Maintaining optimal hydrological regime for wet habitats of mires, grasslands and forests.
- Management and restoration of springfens and wet grasslands, avoiding their overgrowth with trees and shrubs and preserving species diversity (including protected species) typical for these habitats.
- Undisturbed course of natural processes in forest, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Habitat mapping using the latest methods.
- Monitoring hydrological regime in order to assess the potential changes in groundwater table that may be caused by mining in quarries in the vicinity of nature reserve (potentially - also the creation of new quarries).
- Monitoring the influence of management– in fen, grasslands, and in locality of *Saussurea alpina* ssp. *esthonica*.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	5.7	7.3	Poor.	Non-intervention.		3.4
7230	Alkaline fens	8.6	11.3	Poor.	Felling of trees and shrubs in the overgrowing part of the mire. Mowing and grass removal.	8.6	Annually or at least once per 2–3 years.
7160	Fennoscandian mineral-rich springs and springfens	1.2	1.5	Favourable.	Non-intervention.		1.2
6410	*Molinia* meadows	3.4	4.4	Bad.	Restoration. Maintenance. When planning management activities, it is strictly necessary to consider the ecological requirements of *Saussurea alpina* ssp. *esthonica*.	3.4	3.4
6000	Grasslands to be restored	Up to 6.0	7.7	-	Restoration. Maintenance.	Up to 6.0	Up to 6.0

Posolnīca | *Nature Reserve (LV0535200)*

1. Brief description

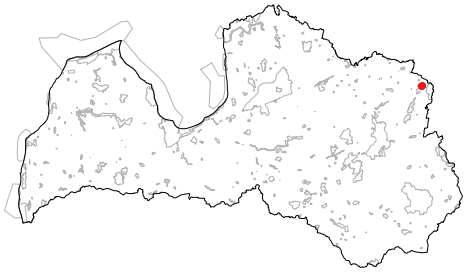
YEAR OF FOUNDATION: 2004.

LOCATION: Viļaka municipality, Žīguri rural territory.

AREA: 63.7 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Posolnīca Nature Reserve is located in a large forest massif. Its territory consists of Posolnīcas Kalni - esker-like ridge which extends from west to east. Ridge length is 1.5 km, relative height is 15 m, and the maximum absolute height is 137.8 m above sea level. Ridge is surrounded by areas of previously wet and paludified forest areas which were drained in Soviet times. The dominating species in canopy and subcanopy layers are Scots pine (*Pinus sylvestris*) and Norway spruce (*Picea abies*); but their proportions differ in various sites on the ridge. Pine woodlands are more common on eastern and western slopes of the ridge, but spruce woodlands dominate on northern slopes.

The territory is important for the conservation of a rare habitat type which is protected in Latvia and in Europe – *Coniferous forests on, or connected to, glaciofluvial eskers*. Plant species *Dracocephalum ruyschiana, Onobrychis arenaria, Diphasiastrum complanatum, Pulsatilla patens* grow on well-insolated slopes of pine woodlands. Protected insect species *Buprestis mariana* is associated to large pine snags or logs. In total, nine protected vascular plant species, one beetle species and five bird species have been found in the territory.

The entire territory of the nature reserve is a part of two micro-reserves for the protection of capercaillie (*Tetrao urogallus*) and their buffer zones. Also several micro-reserves for protection of other bird species are located nearby. The territory is well suitable for *Bonasa bonasia*. Also *Caprimulgus europaeus* and *Aegolius funereus* have been found here.

2. Threats to habitat and species conservation

- Historical information shows that the forest was burned in the early 20th century, and then artificially restored. In 1970s, the territory was fertilised with potassium and nitrogen fertilizers. Fertilization has contributed to eutrophication; junipers have disappeared from the territory, and vigorous growth of spruces can be observed.
- Due to lack of natural disturbances – wildfires – and due to eutrophication, advance growth of spruces develops in dry pine forests, reducing the insolation, changing environmental conditions, and influencing the vegetation composition.

3. Existing management of the protected habitats and its assessment

- In the Nature management plan (2005) selective felling (thinning) of spruces in the whole territory of the nature reserve is recommended (except in terrain depressions), as well as patch-like topsoil scarification.
- In 2016 the JSC "Latvijas valsts meži" coordinated the planned activity - management of 8.6 hectares. Since the managed sites border with the capercaillie micro-reserve and meet the requirements of the habitat of capercaillie, the preservation of a certain number of spruces as hiding places for capercaillie is necessary (10-15 wide-crowned spruces per hectare).

4. Priorities of management and conservation

- Preservation of communities of species which are typical for coniferous forests on, or connected to, glaciofluvial eskers, as well as protected species characteristic for this habitat type.
- Partial restoration of dry pine forests characteristic for this territory.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

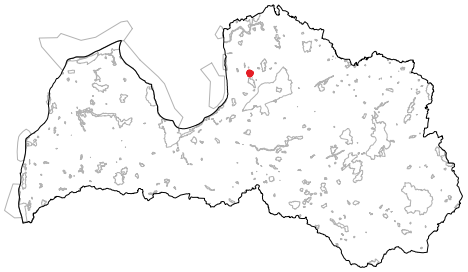
- Habitat mapping according to the recent methods.
- Development of a tactical plan for prescribed burning.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9060	Coniferous esker forests	63.7	100	Bad.	Felling of spruces in advance growth and subcanopy. Prescribed burning.	10.0 3.0	

Purgaiļu purvs | *Nature Reserve (LV0508400)*

1. Brief description



YEAR OF FOUNDATION: 1987.

LOCATION: Limbaži municipality, Limbaži and Umurga rural territories.

AREA: 340 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

The main value of the Purgaiļu purvs Nature Reserve is western-type raised bog with *Trichophorum cespitosum*, and bog woodlands. Typical hummock-hollow microrelief is characteristic for the raised bog. The territory is significant for the breeding of waterbirds. Important bird species are *Podiceps auritus, Anas crecca, Tetrao tetrix, Grus grus, Pluvialis apricaria, Tringa glareola, Larus canus, Larus argentatus*. Also *Lutra lutra* can be found here.

Two protected moss species are found in the bog woodlands - *Schistostega pennata* and *Odontoschisma denudatum*.

2. Threats to habitat and species conservation

Decrease of the quality of raised bog due to drainage. Total overgrowth of wooded meadows in the nearest future.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Rewetting and water level stabilisation in those parts of bog woodlands and mire which are affected by drainage.
- Undisturbed course of natural processes in forest and mire habitats which are also habitats of waterbirds and other important species.
- Restoration of wooded grassland habitat.

5. Necessary management and conservation measures

5.1. General measures

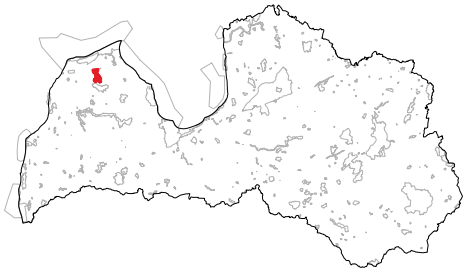
- Hydrological regime research; development of a construction project for rewetting. Measure includes also development of a monitoring programme and methods for the evaluation of restoration success.
- Evaluation of the current borders and the possibility to include the entire area of wet habitats (at eastern border of the territory).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	57.8	17.0	Poor.	Non-intervention, except rewetting in complex of mire and bog woodlands.		57.8
9160	Oak forests	2.0	<1	Favourable.	Non-intervention.		2.0
9010*	Western Taïga	9.1	2.7	Poor.	Non-intervention.		9.1
7140	Transition mires and quaking bogs	0.2	<1	Favourable.	Non-intervention.	0.1	
7120	Degraded raised bogs	5.9	1.7	Bad.	Rewetting (ditch blocking or filling up) in northern and north-eastern parts of the territory.	5.97	
7110*	Active raised bogs	196.1	57.7	Favourable to poor.	Rewetting (ditch blocking or filling up).	196.1	
6530*	Fennoscandian wooded meadows	1.9	0.6	Bad.	Restoration. Maintenance.	1.9	1.9
3160	Natural dystrophic lakes and ponds	4.4	1.3	Favourable.	Non-intervention, except rewetting in the mire.		4.4

Raķupes ieleja | *Nature Reserve (LV0514200)*

1. Brief description



YEAR OF FOUNDATION: 1987.

LOCATION: Dundaga municipality Dundaga rural territory; Talsi municipality Valdgale rural territory; Ventspils municipality Puze and Ance rural territories.

AREA: 2204 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 23 of 15 January 2008, Regulation on Individual Protection and Use of Raķupes Ieleja Nature Reserve.

Raķupes ieleja Nature Reserve includes one of the most remarkable almost unmodified river valleys in Latvia – Raķupe river valley with alluvial grasslands and large oaks (*Quercus robur*) and groups of them. Raķupe river is meandering, with several oxbow lakes and slow water flow. The territory includes also a reach of Pāce river. Together with Raķupe, it ensures the regular flooding of alluvial grasslands in springtime. The territory includes also the Dūmiņpurvs Mire. The southern part of the territory includes moist mixed and pine (*Pinus sylvestris*) forests outside the Raķupe river valley, mainly on its left bank, along the Pesteļvalks river up to the Dūmiņpurps Mire. Several micro-reserves for the protection of bird species are established in the nature reserve and its adjoining territory.

There are 17 EU protected habitat types in the nature reserve. Raķupes ieleja together with Pāces pļavas nature reserve is an Internationally Important Bird and Biodiversity Area in Latvia (LV073).

Western Taïga, bog woodlands, *Alnus glutinosa* swamp woods, as well as mineral-rich springs and springfens and sandstone outcrops (*Siliceous rocky slopes with chasmophytic vegetation*) can be found fragmented in the nature reserve. Almost all protected grassland habitats of EU importance which can be found in Latvia, can be found here, including also wooded grasslands which can potentially be restored. The most important ones are *Northern boreal alluvial meadows* and Molinia *meadows on calcareous, peaty or clayey-siltladen soils*, as well as *Fennoscandian lowland species-rich dry to mesic grasslands* and *Semi-natural dry grasslands and scrubland facies on calcareous substrates*. The territory is located in a region where semi-natural grasslands are heavily fragmented, therefore, together with the Pāces pļavas nature reserve it is very important for the conservation of semi-natural grasslands in Kurzeme Geobotanical District.

The nature reserve is a habitat for at least 95 bird species, 25 of which are protected. Several other protected species have been found: 22 vascular plant, 2 mushroom, 9 moss, 25 invertebrate and 6 fish species.

During the breeding season, there is a high number of *Crex crex*. Also bird species *Bonasa bonasia, Ciconia nigra, Haliaeetus albicilla, Tetrao tetrix, Tetrao urogallus* and others have been found. Important plant species are *Allium ursinum, Dentaria bulbifera, Juncus squarrosus*, several orchid species, such as *Corallorhiza trifida, Listera cordata,* and others. Rare moss species include *Montia fontana, Barbilophozia attenuata* and *Odontoschisma elongatum*.

Of the invertebrate species, the most important ones are *Osmoderma barnabita, Unio crassus, Dorcus parallelopipedus*, *Lycaena dispar*, and *Leucorrhinia caudalis*.

2. Threats to habitat and species conservation

- Drainage and gradual overgrowth of Dūmiņpurvs Mire. Hydrological regime of the mire is significantly influenced by drainage ditches in the western part. There is a deep main ditch along the southern part of mire.
- Part of the bog woodlands is drained or influenced by drainage. Drainage also contributes to increased overgrowth of capercaillie (*Tetrao urogallus*) leks.
- The hydrological regime of alluvial grasslands is altered by drainage. There are systems of ditches, and Raķupe river is straightened before its confluence to Pāce river.
- The restoration of abandoned grasslands is complicated due to rootings of wild pigs (*Sus scrofa*). Intense rooting has occurred during the last years. Overgrazing (too high grazing pressure) is a possible threat in grazed grasslands.
- The water level fluctuations in the lower reaches of Pāce river are caused by Pāce hydroelectric power plant which is located outside the nature reserve. Often, the volume of water in Pāce river is insufficient. This threatens fish resources and *Unio crassus* population.

- Development of shrubs and younger trees around the old, wide-crowned oaks. This threatens their growth conditions and habitats and potential habitats of rare invertebrate species, especially *Osmoderma barnabita*.
- Water quality in Raķupe river is adversely affected by water entering the river from the peat extraction site in the upper reaches of the river.
- Beaver (*Castor fiber*) dams and large woody debris promote slowdown of the water flow, shore erosion, cover of sand and gravel with sediments, and disappearance of river riffle areas (habitat of U*nio crassus*; suitable for spawning of *Lampetra planeri* and salmonids).

3. Existing management of the protected habitats and its assessment

- In 2012, improvement of *Tetrao urogallus* leks was carried out in forests by selective felling of spruces (*Picea abies*). The diversity of forest structural elements was reduced by this measure.
- In 2014, within the scope of EU LIFE project "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), semi-natural grasslands were restored and managed in large areas. The influence of management on the quality of grasslands has not yet been evaluated.
- According to Rural Support Service, in 2014 less than half of the total area of grasslands was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".
- Pines were felled in part of the raised bog, in an area of 35 ha, in order to restore suitable habitats for birds.
- In 2015-2017, with financial support of Fish Fund and Latvian Environmental Protection Fund, in addition to natural spawning sites, a new spawning site of *Lampetra planeri* was created and artificially extended in Raķupe, in the territory of nature reserve. Boulders, course gravel and pebbles were put and smoothed in the river. The place is also considered suitable for *Unio crassus*.

4. Priorities of management and conservation

- The diversity and species number of semi-natural grasslands is very high therefore the priority of the nature reserve is the conservation of both habitats and species habitats (of plants, birds) in a favourable conservation status.
- Restoration of semi-natural grassland habitats at the maximum possible area (increasing the existing area by at least 30 hectares); their maintenance in favorable conservation status.
- Rewetting in Dūmiņpurvs Mire, wet forests and grasslands.
- Gradual improvement of insolation conditions at large oaks and other broadleaved trees, while forming a landscape of wooded grasslands.
- Undisturbed course of natural processes in forest, outcrop and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of the functioning of priority oxbow lakes by preventing their overgrowth and filling with organic sediments.
- Maintenance of optimal conditions for rare species of birds and invertebrates.
- Maintenance of open conditions in springfens.
- Maintenance and extension of natural and artificial river areas which are suitable for spawning of salmonids and lampreys, as well as habitats for *Unio crassus*. Removal of large woody debris in these river reaches.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological research and development of a project for restoration of the natural hydrological regime, including the restoration of old channel of Raķupe river.
- Inventory of grassland habitats, particularly evaluating the occurrence of juniper formations and old wooded grasslands.
- Development of grassland restoration and management plan including the inventory of all grasslands (including perennial grasslands and overgrown grasslands which do not correspond to the criteria of EU protected habitats). The high level of habitat fragmentation indicates that the current area can not ensure favourable conservation status of grasslands in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered (at least 30 ha). Restoration of grasslands which were assessed as EU protected habitats in the beginning of the 21st century but are currently overgrown and does not correspond to criteria of EU protected habitats is the priority. Plan must include also the evaluation of the condition of currently known grasslands (including the recommendations on optimal grazing pressure, the efficiency of enclosure fencings in areas where presence of grazing animals is undesirable), and plan of restoration and maintenance.

- Development of a construction project for the prevention of influence of drainage of Dūmiņpurvs Mire.
- Inventory and functionality assessment of oxbow lakes. Partial improvement of insolation conditions on shores of certain oxbow lakes; removal of fallen logs and organic litter (leaves, twigs) for the improvement of oxygen conditions and for the improvement of biodiversity characteristic for oxbow lakes.

5.2. Specific measures

5.2.1. Species

- The conservation status of *Tetrao urogallus* population is considered as poor. Necessary conservation measures include: felling of *Picea abies* advance growth (in order to prevent overgrowth of lek central part) and construction of four dams on ditches (to decrease the drainage of lek sites).
- For the conservation of protected dragonfly species, light conditions on shores of oxbow lakes must be improved by felling of trees in area of 0.2 hectares (in sites which are suitable for rare dragonflies). Felling of saplings along the shores of oxbow lakes – once per three years.
- For the conservation of *Osmoderma barnabita, Lasius fuliginosus* and *Liocola marmorata* – improvement of light conditions at old *Quercus robur* and other large broadleaved trees; creation of wooded grassland habitats by gradual (over the course of several years) felling of shrubs and saplings around the oaks and other broadleaved trees. After the felling, mowing or grazing in sites around the trees must be continued (on necessity).

5.2.2. Habitats

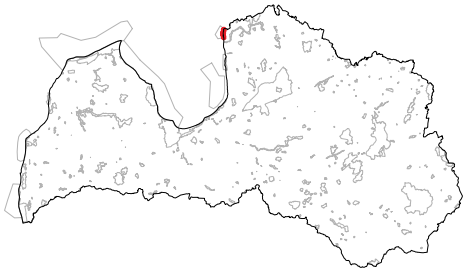
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	10.6	<1	Poor.	Non-intervention, except management of *Tetrao urogallus* leks. Evaluation of rewetting in complex with mires.		10.6
9080*	Fennoscandian deciduous swamp woods	1.7	<1	Poor.	Non-intervention.		1.7
9010*	Western Taïga	56.1	2.5	Poor.	Non-intervention, except management of *Tetrao urogallus* leks.		56.1
2180	Wooded dunes	90.0	4.1	Poor.	Non-intervention, except management of Tetrao urogallus leks.		90.0
7160	Fennoscandian mineral-rich springs and springfens	1.3	<1	Poor.	Non-intervention, except felling of trees and shrubs in winter when the ground is frozen.		1.3

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7120	Degraded raised bogs	134.4	6.1	Poor.	Rewetting (ditch blocking): construction of six dams on ditches in W and S parts of the mire; in W part – filling of ditch by bulldozing. Felling of excess trees for the creation of habitats suitable for birds.	134.1 80	
6510	Lowland hay meadows	1	<1	Favourable to poor.	Restoration. Maintenance.	1	1
6450	Northern boreal alluvial meadows	84.8	3.8	Poor.	Restoration. Maintenance.	42.4	84.8
6410	Molinia meadows	8.3	<1	Poor.	Restoration. Maintenance.	4.7	8.3
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	23	1.0	Poor.	Restoration. Maintenance.	5.6	23.0
6230*	Species-rich Nardus grasslands	0.7	<1	Bad.	Restoration. Maintenance.	0.7	0.7
6210	Semi-natural dry calcareous grasslands	5	<1	Poor.	Restoration. Maintenance.	3.0	5.0
6120*	Xeric sand calcareous grasslands	0.8	<1	Bad.	Restoration. Maintenance.	0.8	0.8
6000	Grasslands to be restored	62.0	2.8	-	Restoration. Maintenance.	62.0	62.0
3260	Natural river reaches and river riffles	35.0	1.6	Poor.	Removal or reduction of large woody debris; demolition of beaver dams in sites where riverbed with gravel or pebbles indicate on river rapids of high quality.	On necessity.	
3150	Natural eutrophic lakes	5.0	<1	Poor.	Felling of trees and shrubs in oxbow lakes, especially in seasonally drying out ones.	0.3	

One-time grassland restoration measures are necessary in an area of at least 62 ha. Grassland restoration measures include felling of trees and shrubs, shredding of roots, restorative mowing or grazing, insolation improvement at wide-crowned trees of wooded grasslands, and restoration and creation of wooded grasslands. It is necessary to build bridges over Raķupe river for the needs of grassland management measures (sites are specified in the nature management plan).

Randu pļavas | *Nature Reserve (LV0509100)*

1. Brief description



YEAR OF FOUNDATION: 1962.

LOCATION: Salacgrīva municipality town of Ainaži; Salacgrīva municipality town of Salacgrīva.

AREA: 290.5 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2014).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 124 of 10 February 2009, Regulation on Individual Protection and Use of the Randu Pļavas Nature Reserve.

Randu Pļavas Nature Reserve includes a complex of coastal grasslands and lagoons which is unique for Latvia. It is located in the coast of Gulf of Riga, Vidzeme Region coast. The territory is covered mainly by grasslands, and almost all of coastal habitat types can be found here. There are 16 EU protected habitat types, as well as a great diversity of rare plant species and communities. The territory is Important Bird Area of the EU; it is a concentration site for breeding waders and waterbirds during their nesting, migration and moulting. The nature reserve is the most important site in the country for the conservation of habitat type 1630* *Boreal baltic coastal meadows*. From landscape-ecological point of view, it is a priority area for sustainable conservation of continuous grassland area biodiversity in the North-Vidzeme Geobotanical District. Earlier, Randu grasslands were used for pasturing and haymaking, and this was the main precondition for the maintenance of coastal meadow vegetation typical for this region. However, grasslands are now overgrowing due to management cessation, thus losing the diversity of species and habitats.

Randu Pļavas is a territory particularly important because of its rare and protected plant species. It is the most significant locality of *Angelica palustris* in Latvia. Randu Pļavas is the only locality in Latvia for several plant species, for example, *Carex mackenziei, Eleocharis parvula, Sonchus humilis*. Coastal grasslands is a very rare habitat in Latvia, therefore the distribution of halophytic grassland species is limited. Species associated to coastal grasslands are: *Centaurium littorale, Juncus gerardii, Plantago maritima, Glaux maritima, Trifolium fragiferum, Blysmus rufus*.

The nature reserve is a habitat for at least 18 protected bird species. The most important are *Calidris alpina schinzii* and *Sterna paradisaea* whose breeding in the territory is threatened, as well as *Philomachus pugnax*, *Sterna albifrons, Limosa limosa, Tringa totanus, Anthus campestris*, and others. There are also 12 rare and protected invertebrate species, such as *Leucorrhinia pectoralis* and *Laphria gibbosa*. Also a natural habitat of *Bufo calamita* (rare in all its distribution area) is found in this area.

2. Threats to habitat and species conservation

- Irregular and inappropriate grassland management (mown grass left on site, very late mowing) degrades the quality of grassland habitats, endangers the population of *Angelica palustris*.
- Lack of grassland management, and abandonment, causing the dominance of *Phragmites australis* and overgrowth of grasslands with shrubs.
- Clogging of the shallow drainage system, causing grassland paludification, and hindering their management.
- Establishment and spread of invasive species *Heracleum sosnowskyi*.
- Due to lack of grassland management, open areas suitable for breeding of several bird species disappear. Moreover, their nesting success is reduced by the presence of trees and shrubs which serve as landing place for nest predators. The disappearance of Sterna paradisaea and Calidris alpina schinzii is related to the lack of suitable nesting habitats – open sand banks for *Sterna paradisaea* and open grasslands with very low grass for *Calidris alpina schinzii*.
- Aļģu Islet is potentially the most suitable for *Sterna paradisaea* but it is almost completely overgrown with reeds. Reeds grow also around the islet in lagoon (depth up to 1 m) which complicates their mowing and elimination.
- The areas suitable for spawning of *Bufo calamita* decrease due to overgrowth of beaches with reeds. Consequently, the preservation of their population in the nature reserve is threatened.
- Habitats are also affected by coastal processes such as accumulation of sediment drift causing the formation of sand banks and lagoons. In the southern

part of the territory, sand dune is developing which blocks the drainage ditches and promotes grassland paludification. Drifted sediments fill the area of Vēršupīte river mouth and interrupt the migration of fish and lampreys in the river.

3. Existing management of the protected habitats and its assessment

- In the framework of the EC LIFE program "Protecting and Management of Coastal Habitats in Latvia Coastal Habitats in Latvia" (LIFE02NAT/LV/8498) in 2003 - 2005 grasslands were mown in area of 14 hectares, grazed in 21 hectares (five cows were purchased). During the grazing, the protection status of grasslands improved significantly in pastures. Grazing was not regulated, therefore overgrazing and decrease of populations of rare species (such as *Gladiolus imbricatus*) occurred due to overgrazing in some places. Grazing was ceased in 2009 due to unfavourable socioeconomic conditions. Later haymaking was carried out in scope of various projects and also in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". However, as the management was episodic and based only on projects, the deterioration of grasslands continued. In 2014 and 2015, shredding of roots of reeds was carried out in small area, which had good results.
- In scope of the LIFE project mentioned above, also biotechnical measures were carried out in Ainaži in 3 hectares for the restoration of foredunes. Dune restoration was successful, but it is necessary to repeat such measures, due to the expansion of *Salix* spp. and gramineous plants.
- The Blusupīte river mouth was cleared of shrubs and reeds in 750 meters long sector. However, the overgrowth of river continues as the causes of pollution have not been eliminated.
- In the framework of the LIFE program "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371 NAT-PROGRAM) in 2015, a 300 m long sector of Vēverupīte river mouth was cleaned of sediments and reeds. As a result, the water flow in a cleaned river sector was restored, and migration of fish and lampreys has been observed.
- In 2017, reeds were removed from the driest part of Aļģu islet. Reeds were mown, removed an burned.

4. Priorities of management and conservation

- Restoration and management of grassland habitats, ensuring the conservation of their protected species. The priorities are: restoration of *Calidris alpina schinzii* nesting habitats and restoration of halophytic habitats (there is no contradiction between the priorities as similar management is necessary for both).
- Preservation of habitats suitable for *Bufo calamita* and its spawning habitats.
- Management of population of beavers.
- Hydrology research before the potential cleaning of drainage system (important for the conservation of habitat types 1630* *Boreal baltic coastal meadows* and 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae), and localities of *Angelica palustris*)
- Prevention of grassland paludification; improvement of the drainage system.
- Prevention of overgrowth of lagoons; conservation of the protected plant and animal species (birds, invertebrates) in these areas.
- Prevention of overgrowth of beaches and sand banks; conservation of the protected plant and animal species (birds, invertebrates) in these areas.
- Maintenance of the water flow rate in Vēršupīte river.

5. Necessary management and conservation measures

5.1. General measures

- The Nature management plan (conceptual management plan of the territory) must be updated, specifying the borders and condition of habitats; habitat maps must be created for areas which are not mapped.
- Sustainable long-term management by signing contracts about the management of the territory with one or few operators, and giving a clear guidance on the necessary activities.
- Develop the species conservation plan for Calidris alpina schinzii in the territory of nature reserve; precise explanations on grassland restoration measures and reedbed limitation must be included.
- Develop a management plan for *Angelica palustris* localities, in order to ensure favourable conservation status for the species.
- Limit the activities of beavers. Beaver dams must be demolished on necessity if they clog the ditches and contribute to paludification of surrounding areas.
- If the cleaning of drainage systems is planned in the territory, a complete hydrology research must be carried out. It must include the study of water flows and their pattern (how much water comes when the sea water level changes, how much from other

places), for how long it stays in the territory. It should be taken into account that there are many small, old ditches in the area, as well as ditches excavated in the Soviet times. It must be clear which of them are currently functioning and which are not. On the basis of hydrological research, drainage project for the restoration of the old drainage system must be developed. Old drainage ditches must be restored and their clogging prevented.
- Evaluate the possibility of lagoon restoration. In the case of a positive conclusion, develop and implement a lagoon restoration project.
- Inventory and elimination of *Heracleum sosnowskyi,* preventing its further spread.

5.2. Specific measures

5.2.1. Species

- Create shallow pools suitable for *Bufo calamita* spawning in the sandy beach, establish spawning areas in flooded depressions. Remove reeds in the territory specified in the Nature management plan in order to preserve and enlarge the area suitable for *Bufo calamita*. Maintain and improve the picnic site and car parking site in the areas specified in the Nature management plan, ensuring the preservation of suitable habitat for *Bufo calamita*. Spawning areas must be monitored every year; shallow pools should be cerated on necessity.
- Condition of *Sterna paradisaea* population is considered as bad. Species habitat restoration plan should be developed. Remove vegetation from Aļģu Islet (the farthest to north), to create nesting habitat suitable for *Sterna paradisaea* (0.2 hectares). Experimentally, create one artificial islet for *Sterna paradisaea* nesting (10X 10m).
- Condition of *Calidris alpina schinzii* population is considered as bad. Necessary conservation activities include grassland restoration and maintenance in area of 131 hectares.
- Annual restoration of suitable habitats for *Angelica palustris* in the largest localities in the nature reserve – according to data of Natura 2000 species monitoring.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	5.9	2.0	Poor.	Non-intervention.		5.9
6510	Lowland hay meadows	0.93	⟨1	Bad.	Restoration. Maintenance.	0.93	0.93
6410	*Molinia* meadows	0.92	⟨1	Bad.	Restoration. Maintenance.	0.92	0.92
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.25	⟨1	Bad.	Restoration. Maintenance.	1.25	1.25
6230*	Species-rich *Nardus* grasslands	2.1	⟨1	Bad.	Restoration. Maintenance.	2.1	2.1
6210	Semi-natural dry calcareous grasslands	9.7	3.3	Bad.	Restoration. Maintenance.	9.7	9.7
6120*	Xeric sand calcareous grasslands	4.11	1.4	Bad.	Restoration. Maintenance.	4.11	4.11

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6000	Grasslands to be restored	74.5	25.6	-	Restoration. Maintenance.	74.5	74.5
2180	Wooded dunes	120	41.3	Favourable to poor.	Increase of heterogeneity (primarily in new plantations) – creation of groups, openings, gaps, preserving the large trees.	20	
2130*	Grey dunes	27	9.3	Favourable to poor.	Mowing with grass removal, or grazing. Removal of trees and shrubs.	15	5
2120	White dunes	16	5.5	Favourable to poor.	Dune restoration by removal of shrubs and herbaceous plants.	5	
2110	Embryonic dunes	7	2.4	Favourable to poor.	Non-intervention.		7
1640	Sandy beaches with perennial vegetation	5.6	1.9	Favourable.	Non-intervention.		5.6
1630*	Coastal meadows	49.32	17.0	Bad.	Restoration. Maintenance.	36.2	49.32
1310	Annuals colonising mud and sand	2.9	1.0	Favourable to poor.	Non-intervention.		2.9
1210	Annual vegetation of drift lines	2.8	<1	Favourable.	Non-intervention.		2.8
1150*	Coastal lagoons	14	4.8	Poor.	Reed mowing or burning. Excavation in water inflow area in the S part of the lagoon (roughly 200 m, at least 10-15 m wide, about 5 m deep), to avoid filling with sediments) in order to maintain water flow and withdrawal of accumulated sediments. In complex with coastal grasslands.	14	
3260	Natural river reaches and river riffles	0.5	<1	Favourable.	Maintenance of River Vēverupīte water flow by reed mowing. In case of river mouth clogging with sediments, mechanical sediment excavation is permitted.		On necessity 0.2

One-time restoration measures are necessary both in abandoned semi-natural grassland habitats (75.5 ha) and in reedbeds and degraded grasslands (75 ha) which currently can not be assessed as EU protected habitats. It is necessary to analyze the possibilities and necessity of drainage system restoration. Reedbeds must be evaluated to conclude which parts must be restored to grasslands and which should be left as reedbeds.

Raudas meži | *Nature Reserve (LV0529700)*

1. Brief description

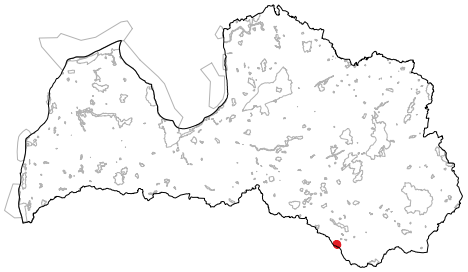
YEAR OF FOUNDATION: 2004.

LOCATION: Ilūkste municipality Šēdere rural territory.

AREA: 211 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



The main values of the Raudas meži Nature Reserve are old mixed broadleaved forests, as well as forests on slopes in the deep valley with side ravines of the Ilūkste river. In smaller areas, there are valuable woodlands of western Taïga, and also fragmented areas with oak woodlands as well as bog woodlands and deciduous swamp woods.

Ciconia nigra and *Aquila pomarina* are breeding in the territory. Old and almost unaffected forests are habitats for several rare and protected plant species, such as *Bromopsis benekenii*, *Carex brizoides, Carex paupercula*, *Carex pilosa, mosses Dicranum viride, Bazzania trilobata, Geocalyx graveolens*, and others.

2. Threats to habitat and species conservation

River riffle areas are threatened by activities of beavers.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of woodland fragmentation. Increasing the area and integrity of deciduous and oak (*Quercus robur*) habitats by targeted management of new spruce (*Picea abies*) plantations or by providing non-intervention in woodlands which have not yet reached the quality of protected habitat. The development towards protected habitat types *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes, Fennoscandian herb-rich forests with* Picea abies or *Sub-Atlantic and medio-European oak or oakhornbeam forests of the Carpinion betuli* is expected.

5. Necessary management and conservation measures

5.1. General measures

Development of Nature management plan and Individual regulations on protection and use.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	3.5	1.6	Bad.	Non-intervention.		3.5
9180*	Slope forests	19.2	9.1	Favourable.	Non-intervention.		19.2
9160	Oak forests	5.7	2.7	Poor.	Non-intervention.		5.7
9080*	Fennoscandian deciduous swamp woods	1.6	<1	Favourable.	Non-intervention.		1.6
9020*	Broad-leaved deciduous forests	56	26.5	Favourable.	Non-intervention.		56
9000	Potential Protected woodland habitat	37.5	17.8	-	Creation of forest gaps or corridors in new spruce plantations to promote natural regeneration of broadleaved trees.	37.5	
9010*	Western Taiga	10	4.7	Poor.	Non-intervention.		10
3260	Natural river reaches and river riffles	1.5	<1	Poor.	Regular removal of fallen logs cut by beavers.		1.5

Raunas Staburags | *Nature Reserve (LV0503300)*

1. Brief description

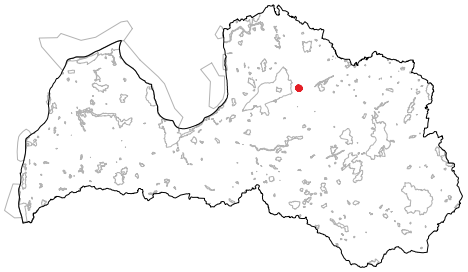
YEAR OF FOUNDATION: 1987.

LOCATION: Rauna municipality Rauna rural territory.

AREA: 25 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Nature Reserve is established to protect a unique geological formation Raunas Staburags. Raunas Staburags is a cliff of barrage tufa, which has developed under long-term influence of calcium-rich springs. The nature reserve is located in the valley of Rauna river. It includes also small areas of Tilio-Acerion *forests of slopes, screes and ravines*, semi-natural grasslands, *Calcareous rocky slopes with chasmophytic vegetation* and *Petrifying springs with tufa formation* (Cratoneurion).

Alpine butterwort *Pinguicula alpina*, replanted from the Daugavas Staburags (larger cliff of barrage tufa at Daugava River, lost in 1966 due to construction of hydroelectric power plant), was present in the territory earlier but disappeared in the end of 20th century. Raunas Staburags was the last known locality of this species in Latvia.

Rare and protected bird species of the territory include *Dryocopus martius, Alcedo atthis, Ficedula parva*. The nature reserve is also particularly suitable for *Lutra lutra*. Rare snail species *Ena montana* lives on the banks of river. Rare cyclostome and fish species can be found in Rauna and Klampupe rivers – *Lampetra planeri* and *Cottus gobio*.

2. Threats to habitat and species conservation

- Excessive visitor load, which contributes to trampling of spring discharge (central spring – Raunas Staburags).
- Forestry operations, promoting the trampling of spring discharge.
- Spread of invasive plant species *Heracleum sosnowskyi* and *Impatiens glandulifera*.
- Semi-natural grasslands disappear due to management cessation.
- Habitats in Rauna and Klampupe rivers are threatened due to management cessation.

3. Existing management of the protected habitats and its assessment

- Habitat conservation and management measures so far have been carried out only in the most expressive central part, for the conservation of Raunas Staburags – habitat type 7220* *Petrifying springs with tufa formation* (Cratoneurion).
- In 2016, in scope of EU LIFE programme project "Conservation and management of Priority wetland habitats in Latvia" (LIFE13 NAT/LV/000578), the eradication of *Heracleum sosnowskyi* and felling of shrubs around Raunas Staburags was carried out. Also earlier there were attempts to eradicate *Heracleum sosnowskyi*, some individuals were dug out, but usually they recovered within the same year. In 2016, digging of *Heracleum sosnowskyi* was carried out twice, in June and late August, and it was successful – all plants were extracted and removed from the territory, and no individuals of this species were observed in September.
- Felling of shrubs (last carried out in 2016) was aimed at improving the scenery of outcrop and, partly, for the reduction of shading and overgrowth. As a result, outcrop is better visible, but leaving of felling residues in piles in dispersed spring discharge sites and on slope has a negative influence as ground vegetation is covered, growth of mosses and vascular plants is disturbed, and the landscape visual attraction is reduced.
- Nature trail, stairs and information board are maintained, but the trampling of Staburags can still be observed.
- In the spring discharge located in northern part of the territory (this spring is developing barrage tufa), mature trees and understory were felled for the extraction of timber, and only separate mature trees were preserved. This activity has encouraged the spread of invasive plant species Impatiens

glandulifera, and it establishes also in spring, in site where groundfloor was damaged during the logging. It is also possible that in some places the preservation and spread of spring-characteristic moss species was encouraged by reduction of shade.

4. Priorities of management and conservation

- Maintenance of open springs and outcrops of barrage tufa, without the cover of trees and shrubs.
- Restriction of spread of invasive species *Heracleum sosnowskyi* and *Impatiens glandulifera*.
- Limitation of spring and discharge trampling caused by visitors.
- Provision of water discharge.
- Restoration of semi-natural grasslands is not a priority but it is recommended as it increases the total biodiversity of the territory, and grasslands have educational potential.

5. Necessary management and conservation measures

5.1. General measures

- By restoration of visitor infrastructure (stairs, restricting barrier, information board explaining the spring sensitivity to the trampling), it is necessary to prevent visitors crossing the river and climbing on barrage tufa (Staburags). No access to the nature reserve from the right bank of river (there is a road to Ziedugravas farmstead) should be planned.
- Preparation of additional information for the information board on the threats to spring and the prohibition of its trampling.
- Eradication of invasive species and prevention of their spread. In the whole territory, particularly in habitat type 7220*, the inventory of invasive species is necessary every year, in early June and late August (it is necessary to map the results, in order to know exactly where the tasks were done and which areas must be visited specifically in the following years), with weeding of *Heracleum sosnowskyi* and transportation away from the territory. It is necessary to map the distribution of *Impatiens glandulifera*, and start its weeding and removal from the territory before the blossoming; eradication in habitat type 7220* and its direct vicinity is the priority.
- Restoration of semi-natural grasslands.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	0.35	1.4	Bad.	Non-intervention.		0.35
8210	Calcareous rocky slopes	0.004	<1	Poor.	Non-intervention.		0.004
7220*	Petrifying springs	0.5	2	Poor.	Eradication of *Heracleum sosnowskyi* (digging up). Eradication of *Impatiens glandulifera* (digging up). Felling of some trees and shrubs (on necessity). Limitation of trampling by visitors (barriers, information, other solutions). Evaluation of restoration of *Pinguicula alpina* locality.		0.5 0.5 0.5 0.5
7160	Fennoscandian mineral-rich springs and springfens	0.1	<1	Favourable.	Non-intervention. Eradication of *Heracleum sosnowskyi* (digging up). Eradication of *Impatiens glandulifera* (digging up). Felling on some trees and shrubs (on necessity).		0.1 0.1 0.1 0.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.1	<1	Bad.	Restoration. Maintenance.	0.1	 0.1
6510	Lowland hay meadows	0.9	3.6	Bad.	Restoration. Maintenance.	0.9	 0.9
3260	Natural river reaches and river riffles	1	4	Poor.	Non-intervention. Control of beaver activities; removal of large woody debris (on necessity).		1

Rauza | *Nature Reserve (LV0528000)*

1. Brief description

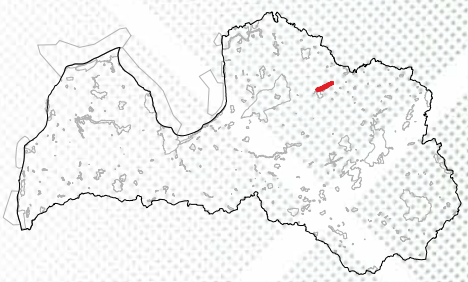
YEAR OF FOUNDATION: 2004.

LOCATION: Rauna municipality Rauna rural territory.

AREA: 812 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2013).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Rauza Nature Reserve includes a section of Rauza river, as well as small parts of Šepka and Ludze rivers, with surrounding grasslands and fragments of deciduous (mainly *Alnus incana* and *Betula* spp.) woodlands. Natural reaches of Rauza and Šepka rivers are particularly important habitats for the freshwater pearl mussel *Margaritifera margaritifera* and thick shelled river mussel *Unio crassus* whose populations are large here.

The most important habitats of nature reserve are lowland hay meadows and river riffle areas (Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation).

The territory is located in a region of intensively used agricultural land. Agricultural lands with semi-natural grasslands are located in the nature reserve. Grasslands cover a significant part of the nature reserve, especially at lower reaches of Rauza river. Part of them is unmanaged and overgrowing. In some places, alluvial grasslands are bordered by dryer grasslands, forming a habitat complex which is beneficial for many rare species. This is a suitable habitat for rare snail species *Vertigo geyeri* and butterfly *Papilio machaon*.

From landscape-ecological point of view, the territory is important for the semi-natural grasslands of North-Vidzeme Geobotanical District. The area of currently known grasslands of EU importance is relatively small which can be explained by the incomplete inventory and mapping; potentially, they cover at least 350 hectares. In total, 35 protected species have been found in the territory. Of them, 11 are invertebrates, three fish, nine bird, five mammal, seven plant species. Old woodlands are small and scattered. Out of these, the most important ones are forests located in river valley and on valley slopes, suitable for rare bird species *Dendrocopus leucotos, Picoides tridactylus, Dryocopus martius, Ficedula parva, Aquila pomarina, Glaucidium passerinum, Caprimulgus europaeus,* and others. Rare plant species *Lycopodium annotinum, Huperzia selago, Platanthera chlorantha*, moss *Trichocolea tomentella* can be found in forests.

Natural reaches and riffle areas of Rauza and Šepka rivers are important habitats for protected fish species – *Lampetra fluviatilis, Thymallus thymallus, Cottus gobio, Salmo trutta*. Also *Lutra lutra* live here.

2. Threats to habitat and species conservation

- Beaver dams and large woody debris in river promote the slowdown of the river stream, covering pebble and boulder bed with sediments, and the disappearance of habitats suitable for *Margaritifera margaritifera* and *Unio crassus.* The vitality of *Margaritifera margaritifera* is reduced due to warmed up water in beaver inundations and the decrease of dissolved oxygen.
- Beaver dams and large woody debris in the river act as barriers to migration of fish, including *Salmo trutta* which are hosts for glochidias and ensure the dispersal of *M. margaritifera*.
- The amount of *Salmo trutta* in the river is insufficient for the development of sustainable population of *M. margaritifera.*
- The existence of *M. margaritifera* and *Unio crassus* is threatened by biogene input in Rauza river (particularly ammonium nitrate), from the overgrown Rauza upstream areas.
- Changes in natural water regime – there are several dams and reservoirs (Rauza millpond on Šepka river, Mensku Pond at Kapusils Road) which cause too low (or absent) water level in river and can totally destroy the pearl mussels located downstream of dams.
- River crossings created for vehicles can destroy individual specimens of pearl mussels and create oil pollution.
- Illegal fishing.
- Dolomite extraction in a quarry; the discharge of accumulated groundwater in Vecpalsa river.
- Overgrowth of semi-natural grasslands with trees and shrubs; fragmentation; hydrological regime changes due to activities of beavers.

3. Existing management of the protected habitats and its assessment

- In the years 2005 and 2006, a project supported by Latvian Environmental Protection Fund "Protection of Pearl Mussel Habitats" was carried out in the nature reserve. It included reduction of beavers (hunting and demolition of beaver dams), *Salmo trutta* infestation with glochidia, in order to ensure long-term persistence of pearl mussel population. The reduction of beavers was efficient only during the project period, and population recovered after it. The infestation with glochidia was carried out only with individual salmonids. Ten years after the experiment, a small number of juvenile pearl mussels is also found in the river. Currently, they are so small that their sampling is difficult and therefore the efficiency of the measure can not be objectively evaluated.
- Management of river riffle areas has been episodic and based on individual projects; habitat quality and condition of rare species populations deteriorate again when projects have ended.
- The demolition of beaver dams was organized also in 2008, in collaboration with Nature Conservation Agency and hunters' associations. In 2012, a voluntary work event (*talka*) was organized – a large clog of woody debris was removed and boulders for the creation of riffle were placed in river. In 2015, another *talka* was organized and one large clog was removed, and riffles with boulders were created.
- In 2014, association "Zaļā Pēda" implemented a project "River Recovery in the Northeast of Vidzeme" (1-08/371/2014) supported by Latvian Environmental Protection Fund. The project included signing contracts for the demolition of beaver dams in nature reserve for a period of one year.
- According to Rural Support Service, in 2014 70 % of the known area of habitat types 6510 and 6270*, and almost all of 6450 was managed (29 ha). Most of the grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands", large part of the grasslands in nature reserve (about 300 ha) do not have a status of biologically valuable grassland; their management is not supported by this measure and they overgrow.

4. Priorities of management and conservation

- Implementation of management and protection measures in complex with measures in Launkalne and Šepka Nature Reserves.
- Maintenance of river riffles suitable for *Margaritifera margaritifera* and *Unio crassus*, and their juveniles.
- Creation and maintenance of sustainable *Margaritifera margaritifera* population in river.
- Restoration and maintenance of semi-natural grasslands in favourable conservation status in an area of at least 350 hectares.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Control of illegal fishing both in nature reserve and in Vecpalsa river (downstream of nature reserve).
- Additional measures for the creation of buffer zone and artificial wetlands at the animal farm that is still operating.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of merging three Nature Reserves – Rauza, Šepka and Launkalne – in one Natura 2000 territory because Rauza river valley (where two nature reserves are located) and Ludze (tributary of Rauza) river valley form a single physical and geographical territory.
- Development of a new nature management plan.
- Development of grassland restoration and management plan. The currently known area of semi-natural grasslands is only 43 hectares large but the total area of grasslands is over 305 hectares. According to the cartographic material, these areas are semi-natural grasslands which are overgrowing but can be restored. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered. Inventory and mapping of grasslands is necessary, particularly in the southern part of nature reserve and north from Ludzītes farmstead.
- Evaluation of drainage systems which are located in catchment area of rivers of nature reserve, and their created pollution. Development of an action plan for its reduction or prevention. If necessary – cooperation with landowners for the creation of sedimentation ponds or wetlands on the main ditches discharging the biogene pollution.
- In river reaches flowing through agricultural land – improvement of the efficiency of river protective belts by creation of shore vegetation mosaic of grasslands, trees and shrubs, thus ensuring continuous interception of nutrients throughout the year.

- Development and implementation of a project for river riffle restoration by creation of boulder stacks and artificial river rapids.
- Removal of the water flow regulator at Kapusils Road, according to expert recommendation.
- Construction of bridges instead of existing river crossings.
- Inventory of river reaches influenced by hydroelectric power plants.
- Creation of wetlands or sedimentation ponds in sites where pollution is entering the river; for example, creation of sedimentation ponds for the treatment of Launkalne village waste water.
- Establishment of sedimentation pond and buffer zone at pig farm "Lejas Eķītes", in order to decrease biogene input in Rauza river.
- Establishment of small dams in lower reaches and straightened tributaries in order to avoid rapid seasonal water level fluctuations and to reduce the negative impact of drainage (detailed description in nature management plan).
- Increase of control in order to reduce illegal fishing.
- Individual work with landowners of areas adjacent to river, with the aim of creation and maintenance of conditions for *Margaritifera margaritifera*.

5.2. Specific measures

5.2.1. Species

- Population of *Margaritifera margaritifera* consists of 1120-3000 specimens. Population condition is bad.
- Artificial infestation of *Salmo trutta* with glochidia once per two years; evaluation of a possible artificial breeding of pearl mussel juveniles.
- Prevention of beaver activities in river reaches where pearl mussels can be found or where suitable conditions can be created (particularly in Rauza downstream of Kapusila Road and in Šepka river ~ 1 km from river mouth).
- Maintenance of multi-aged population of *Salmo trutta* in a river by regular (annual) release of juvenile fish.
- In the open river reaches, creation of mosaic of near-shore trees which create scattered shade on river water, in order to decrease water temperature in river reaches suitable for pearl mussels.
- Monitoring and result control of all the activities.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	8.8	1.1	Bad.	Non-intervention.		8.8
9010*	Western Taïga	9.9	1.2	Bad.	Non-intervention.		9.9
9000	Potential Protected woodland habitat	25.5	3.1	-	Creation of canopy gaps. Leaving of fallen logs in young pine and spruce woodlands. Measures beneficial to *Tetrao urogallus* population: maintenance of leks, felling of understory and advance growth in compartments adjoining the leks.		25.5
6510	Lowland hay meadows	27.5	3.4	Poor.	Restoration. Maintenance.	According to expert recommen-dations.	 27.5
6450	Northern boreal alluvial meadows	4.3	<1	Favourable.	Restoration. Maintenance.	According to expert recommen-dations.	 4.3
6430	Hydrophilous tall herb fringe communities	2.6	<1	Favourable.	Non-intervention.		2.6
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	8.3	1.0	Poor.	Restoration. Maintenance.	2.5	 8.3
3260	Natural river reaches and river riffles	2	<1	Poor to bad.	Removal of large woody debris, beaver dams and beaver inundations (2 times per year). Reduction of overgrowth with macrophytes in upper reaches of Rauza river (once per 5 years). Reduction of beaver population (especially in Rauza river, downstream of Kapusils Road, and Šepka river ~ 1 km upstream of its mouth), annually.	1.0	2.0

Riesta-Džūkstenes purvs | *Nature Reserve (LV0515100)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Tukums municipality Lestene rural territory.

AREA: 347 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Riesta-Džūkstenes purvs Nature Reserve is located in the terrain depression and is surrounded by intensively managed agricultural land. The most part of the nature reserve is occupied by a raised bog. Bog woodlands and drained deciduous forests cover its edges. A small part of the territory is occupied by transitional mire. Three EU protected habitat types have been found in the territory. Mire has developed by overgrowing a lake.

Several protected bird species can be found in the nature reserve, such as *Circus pygargus, Ciconia nigra, Pernis apivorus* and others. Protected plant species characteristic to bog woodlands are *Lycopodium annotinum* and *Calypogeia sphagnicola*.

2. Threats to habitat and species conservation

Drainage of the marsh and its surroundings has caused the overgrowth with trees. Previously the mire was threatened by small-scale peat extraction.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats

4. Priorities of management and conservation

Improving the quality of raised bogs by removing excess trees, thus ensuring favourable conditions for the protected bird and other species.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	107.7	31.0	Poor.	Non-intervention.		107.7
7140	Transition mires and quaking bogs	41.2	11.9	Favourable.	Non-intervention.		41.2
7120	Degraded raised bogs	111.0	32.0	Poor.	Non-intervention. Tree felling.	According to expert recom-mendations.	111.0

Rožu purvs | *Nature Reserve (LV0506500)*

1. Brief description

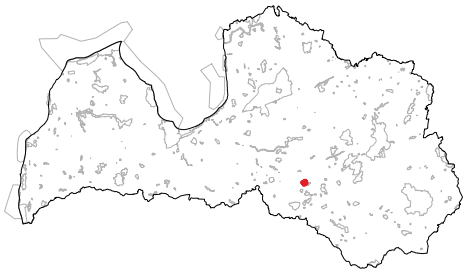
YEAR OF FOUNDATION: 1987.

LOCATION: Sala municipality, Sala and Sēlpils rural territories.

AREA: 1010.62 ha.

NATURE MANAGEMENT PLAN: 2011 (2011–2026).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Rožu purvs Nature Reserve is located in an area rich in forests and mires. It includes raised bog, bog woodland, transition mire, also swamp woodlands with *Alnus glutinosa* in smaller areas, and western Taïga.

Raised bog with bog lakes, pools and hollows is located in the central part of the territory, and the peripheral part consists of various woodlands – mainly bog woodlands which have developed both naturally and after the drainage. In total, there are nine habitat types of EU importance, and 30 protected species: five plant species, seven mammal species, 15 bird species, three invertebrate species.

Mire complex is an important breeding site for *Pluvialis apricaria, Tringa glareola, Grus grus*, and other species of birds. In forests of the peripheral part of the mire, *Pandion haliaetus, Clanga pomarina, Bonasa bonasia, Tetrao tetrix, Tetrao urogallus* can be found. There are also rare species of invertebrates, such as *Leucorrhinia pectoralis* and *Euomphalia strigella*. Moss species *Hammarbya paludosa* is a particularly important protected plant species.

2. Threats to habitat and species conservation

- Drainage. In the latter half of the 20th century, a network of ditches was established in the south, southwest and western sides of the territory. After the construction of peat dams on the ditches in 2012, drainage impact is reduced.
- Across the border of the territory, several hundred square meter large areas of invasive species *Heracleum sosnowskyi* have been found. Currently, it is only a potential threat.

3. Existing management of the protected habitats and its assessment

The construction of peat dams in 2012 was carried out with good results, within the framework of the LIFE program "Restoration of Raised Bog Habitats in the Especially Protected Nature Areas of Latvia" (LIFE08 NAT/LV/000449). The increase of water level and decrease of its fluctuations was achieved in the southern part of bog.

4. Priorities of management and conservation

- Maintenance of optimal hydrological regime in the mire.
- Water level monitoring in the mire after rewetting.
- Vegetation monitoring after rewetting.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Monitoring of water level and vegetation to evaluate the changes after blocking the ditches.
- Water level and vegetation monitoring should be carried out according to the methods described in the Nature management plan.
- If *Heracleum sosnowskyi* is found in the territory, its elimination must be started immediately.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	334.5	33.1	Poor.	Non-intervention, except maintenance of the existing dams.		334.5
9080*	Fennoscandian deciduous swamp woods	4.3	<1	Favourable.	Non-intervention.		4.3
9020*	Broad-leaved deciduous forests	0.3	<1	Poor.	Non-intervention.		0.3
9010*	Western Taïga	6.7	<1	Poor.	Non-intervention.		6.7
7160	Fennoscandian mineral-rich springs and springfens	0.03	<1	Favourable.	Non-intervention.		0.03
7140	Transition mires and quaking bogs	68.3	6.8	Favourable.	Non-intervention, except maintenance of the existing dams.		68.3
7120	Degraded raised bogs	144.1	14.3	Bad.	Non-intervention, except maintenance of the existing dams.		144.1
7110*	Active raised bogs	426.4	42.2	Favourable.	Non-intervention, except maintenance of the existing dams.		426.4

Rucavas īvju audze | *Nature Reserve (LV0508000)*

1. Brief description

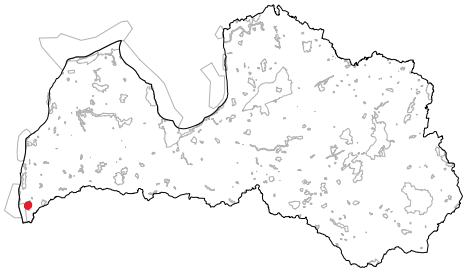
YEAR OF FOUNDATION: 1987.

LOCATION: Nīca municipality Nīca rural territory.

AREA: 206 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Rucavas īvju audze Nature Reserve is one of the largest known natural localities of *Taxus baccata* in Latvia and one of the few localities of wild-growing *Hedera helix var. baltica*, as well as one of the four *Cypripedium calceolus* localities in Latvia. Wet forests with *Betula* spp., *Picea abies* and *Alnus glutinosa* are the most common habitats in the territory, with admixture of *Fraxinus excelsior* and *Tilia cordata*. There are four EU protected habitat types.

At least 31 protected species can be found in the nature reserve. Forests are a habitat for vascular plants such as *Festuca altissima, Dentaria bulbifera, Ranunculus bulbosus*, mosses *Lejeunea cavifolia, Neckera complanata, Bazzania trilobata, Porella platyphylla, Anastrophyllum hellerianum, Frullania tamarisci, lichens Pertusaria pertusa, Thelotrema lepadinum*, and others. Rare snail species *Clausilia bidentata* and *Macrogastra ventricosa* can be found in wet deciduous forests, *Vertigo geyeri* - in alkaline fens. Birds *Bonasa bonasia, Picoides martius, Tetrao tetrix*, and *Lanius collurio* live in forests.

2. Threats to habitat and species conservation

- The drainage and the ban on forestry activities (various types of thinning) has promoted the excessive growth of shrubs in forest, and the expansion of *Picea abies*.
- Populations of *Taxus baccata* and *Hedera helix var. baltica* are negatively affected by shade and the high density of trees.
- *Taxus baccata* is potentially threatened by digging or cutting.

3. Existing management of the protected habitats and its assessment

- In 2006, felling in order to improve light conditions was carried out in northern part of the nature reserve. *Picea abies* were felled in the projection areas of *Taxus baccata* trees. In summer 2016, the viability of *Taxus baccata* was assessed as good.

4. Priorities of management and conservation

- Continue the improvement of *Taxus baccata* insolation by felling other trees and shrubs.
- Undisturbed natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of the existing hydrological regime or optimal rewetting in habitats of wet forests and mires.

5. Necessary management and conservation measures

5.1. General measures

- Management measures in fen must be coordinated with measures in the neighbouring Ječu Purvs and Ķirbas Purvs Nature Reserves.
- Hydrology research and development of building project if rewetting is necessary. The measure includes the preparation of monitoring program and methodology to assess the efficiency of the restoration work.
- Habitat mapping and clarification of habitat areas.
- Revision of the borders of nature reserve, evaluating the extension of territory, including the territory located between the nature reserves where also *Taxus baccata* is found.

5.2. Specific measures

5.2.1. Species

- Condition of population of *Taxus baccata* within the nature reserve is considered as poor, there are about 30 individuals forming the population. Necessary conservation and management measures include: development of recommendations for the appropriate cutting; cutting of some trees and shrubs in the direct vicinity of *Taxus baccata* is necessary, but some trees must be left in the south and south-west areas to provide partial shading in sunny days in the winter and early spring. Trees and shrubs that produce shadows must be cut in the localities. To avoid withering of *Taxus baccata* trees, mulching (covering the stem with litter from surroundings) is recommended in autumn. Propagation by seeds from the local material, with the aim of planting the new trees in the nature reserve.
- Condition of population of *Hedera helix var. baltica* within the nature reserve is considered as favourable, size of the locality is about 10m^2. Necessary activities are finding and felling trees which create shade to *Hedera helix*. The exact area will be determined during the planning of felling in the localities.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	1.2	⟨1	Poor.	Non-intervention, except rewetting, if it is necessary according to research results.		1.2
9080*	Fennoscandian deciduous swamp woods	9.8	4.7	Favourable.	Non-intervention, except rewetting, if it is necessary according to research results.		9.8
9020*	Broad-leaved deciduous forests	2.4	1.2	Favourable.	Non-intervention.		2.4
7230	Alkaline fens	0.4	⟨1	Bad.	Non-intervention, except rewetting, if it is necessary according to research results.		0.4

One-time restoration measures are necessary both in abandoned semi-natural grassland habitats (75.5 ha) and in reedbeds and degraded grasslands (75 ha) which currently can not be assessed as EU protected habitats. It is necessary to analyze the possibilities and necessity of drainage system restoration. Reedbeds must be evaluated to conclude which parts must be restored to grasslands and which should be left as reedbeds.

Rukšu purvs | *Nature Reserve (LV0531200)*

1. Brief description

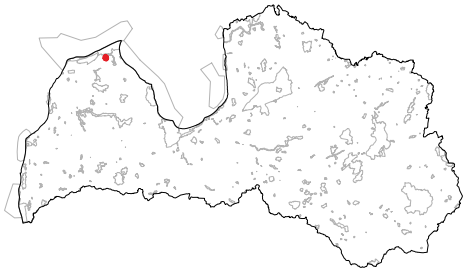
YEAR OF FOUNDATION: 2004.

LOCATION: Dundaga municipality Dundaga rural territory.

AREA: 216 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Rukšu purvs Nature Reserve includes a western-type raised bog with *Trichophorum cespitosum*. This is one of the few concentric mires in Latvia – hummocks, pools and hollows are arranged in a circle from the mire centre to its edges. Raised bog is surrounded by bog woodlands and in smaller areas also by swamp woods. The territory is important for birds breeding in mires, such as *Pluvialis apricaria, Tringa glareola, Grus grus, Lanius collurio*, and others.

2. Threats to habitat and species conservation

Drainage. Ditches are excavated in the eastern part, and peat has been extracted in quarries.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Preservation of hydrological regime; rewetting at eastern edge of the mire.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

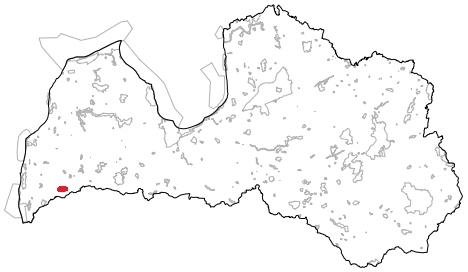
- Hydrological regime research; rewetting if supported by research results. It also includes the development of a monitoring programme and methods for the evaluation of restoration success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	42.5	19.7	Favourable.	Non-intervention. Rewetting (ditch filling or blocking).	42.5	According to research results.
9080*	Fennoscandian deciduous swamp woods	0.9	>1	Poor.	Non-intervention.		0.9
7150	Depressions on peat substrates	100.8	46.7	Favourable.	Non-intervention.		100.8
7110*	Active raised bogs	58.6	27.1	Poor.	Non-intervention. Rewetting (ditch filling or blocking) in E part of mire.		58.6
3160	Natural dystrophic lakes and ponds	2.16	1.0	Favourable.	Non-intervention.		2.16

Ruņupes ieleja | *Nature Reserve (LV0524500)*

1. Brief description



YEAR OF FOUNDATION: 1977.

LOCATION: Priekule municipality Priekule and Gramzda rural territories; Vaiņode municipality Vaiņode rural territory.

AREA: 605 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2026).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Ruņupes ieleja Nature Reserve includes a biodiverse and scenic part of the Ruņa river valley, with almost undisturbed slope forests, as well as with mixed broadleaf forests along the banks of the river. The territory is located in an area of intensively used agricultural land. In the part of Ruņa river that is located in the nature reserve there is a deep valley and one of the largest stream gradients in Latvia. Ruņa valley is also geologically important. It is the largest locality of cemented deposits - calcrete conglomerates of Quaternary age in Latvia.

Ruņa river is the most important nature value of the territory with the protected habitats of forests, spring discharges and outcrops, and species related to these habitats. There are 12 protected habitat types in the nature reserve. Habitats are of high quality; they function as a unified system and are important for biodiversity protection both locally, and at Latvian and European level.

In the nature reserve, 71 species protected in Latvia and 41 EU specially protected species have been found, as well as several other species which are rare in Latvia. Out of these, there are 21 protected vascular plant species, eight mushroom, one lichen, two algae, and 18 moss species. There is one of the few and richest localities of *Corydalis cava* in Latvia, the most abundant locality of *Polygonatum verticillatum*, and also localities of *Lunaria rediviva, Astragalus danicus, Seseli libanotis, Lathyrus niger, Poa remota*, moss *Dicranum viride*, and others. Six rare and protected moss species grow on Ozolbrunči outcrops (calcrete conglomerates), such as *Fissidens arnoldii, Fissidens gracilifolius, Porella platyphylla*, and *Thamnobrym alopecurum*. There are many old and biologically important trees, especially *Quercus robur,* suitable for invertebrates *Osmoderma barnabita* and *Anthrenochernes stellae*. *Carpinus betulus*, which is rare in Latvia and grows only in the south-southwestern part of the county, on the northern border of its distribution area, can also be found in the nature reserve. There are 20 specially protected bird species in the area, such as *Aquila pomarina, Pernis apivorus, Cygnus cygnus, Alcedo atthis, Lullula arborea*. European tree frog *Hyla arborea* can be found here.

Out of the 21 rare and protected invertebrate species, the most important one is butterfly species the Clouded Apollo *Parnassius mnemosyne*. Ruņa river is a habitat for *Unio crassus, Astacus astacus* (large population), *Lampetra planeri, Cottus gobio* and *Lampetra fluviatilis*. Also 11 protected mammal species have been found in the territory, including seven species of bats, and Muscardinus avellanarius.

2. Threats to habitat and species conservation

- Biogene runoff from surrounding agricultural land – indirect influence which is threatening the species associated with river.
- Overgrowth of grasslands and forest gaps – threatening the population of *Parnassius mnemosyne* as feeding habitats for adult butterflies disappear.
- There are no well-maintained trails, picnic sites, etc. in the territory, therefore increase in the number of visitors potentially may have an adverse effect on natural habitats.
- In the part of Ruņa river that is located in the nature reserve, there are 60 beaver dams (inventory of 2016) that make migration of salmonid fish (*Salmo trutta*) difficult or even impossible. Beaver dams also promote shore erosion, precipitation of sediments and burial of habitats suitable for *Unio crassus*.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 grasslands were not registered for support in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

In 2014, shrubs were cut in part of the overgrown grasslands. In 2016, a project supported by Latvian Environmental Protection Fund was implemented: a part of small grasslands and forest gaps were restored. The impact of restoration on grassland quality is not evaluated yet.

4. Priorities of management and conservation

- Grassland management, restoration of forest gaps to semi-natural grassland habitats, and their maintenance in a condition suitable for *Parnassius mnemosyne*.
- Undisturbed course of natural processes in forest, outcrop and spring discharge mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Prevention of formation of beaver dams and beaver impoundments in reaches where river bed is covered with pebbles and boulders, in order to ensure suitable conditions for *Lampetra planeri* and salmonids, as well as for maintenance of *Unio crassus* population.

5. Necessary management and conservation measures

5.1. General measures

- Relocation of forest animal feeding sites outside the nature reserve.
- Evaluation of the necessary changes of the nature reserve borders (incorporation of woodland with oaks).
- Water quality monitoring of Ruņa river (for the control of runoff from agricultural lands).
- Development of restoration plan for grasslands and forest gaps. It should include restoration of *Parnassius mnemosyne* feeding habitat, restoration of semi-natural grasslands, and restoration success monitoring.
- Removal of large woody debris and beaver dams from pebble-bed and boulder-bed reaches, in order to ensure migration and habitats for *Lampetra* spp. and salmonids.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	51.3	8.5	Favourable.	Non-intervention.		51.3
91D0*	Bog woodland	1.9	<1	Poor.	Non-intervention.		1.9
9180	Slope forests	81.3	13.4	Favourable.	Non-intervention.		81.3
9160	Oak forests	10.9	1.8	Favourable.	Non-intervention.		10.9
9080*	Fennoscandian deciduous swamp woods	0.4	<1	Poor.	Non-intervention.		0.4
9050	Herb rich spruce forests	21.0	3.5	Favourable.	Non-intervention.		21.0
9020*	Broad-leaved deciduous forests	145.2	24.0	Favourable.	Non-intervention.		145.2
9010*	Western Taïga	89.0	14.7	Poor.	Non-intervention.		89.0
8210	Calcareous rocky slopes	0.02	<1	Poor.	Non-intervention.		0.02
7220*	Petrifying springs	0.1	<1	Poor.	Non-intervention.		0.1
7160	Fennoscandian mineral-rich springs and springfens	3.1	<1	Favourable.	Non-intervention.		3.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	3.7	<1	Bad.	Restoration. Maintenance	0.0	3.7
6000	Grasslands to be restored	14	2.3	-	Restoration. Maintenance	14.0	14.0
3260	Natural river reaches and river riffles	25.1	4.1	Poor.	Ensure the water flow rate. Removal or decrease of beaver dams and large woody debris in sites where riverbed with boulders or pebbles indicate on river rapids of high quality (habitat of *Unio crassus*; suitable for *Lampetra planeri* spawning). Water quality monitoring in Ruņupe river.		25.1

Rušonu ezera salas | *Nature Reserve (LV0512100)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Riebiņu municipality Rušona rural territory.

AREA: 38.5 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2026).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Rušonu ezera salas Nature Reserve includes nine of the 18 islands of the Lake Rušonu. Most of the area of the islands is covered by highly valuable oak forests and old broad-leaved deciduous forests which occupy 65.2% of the total area of the nature reserve. The biodiversity of the territory is characterised by 13 protected species. Protected plant species include *Digitalis grandiflora* and *Pulmonaria obscura*. Lichen species - *Arthonia bysacea*. Plants *Hydrilla verticillata* and *Scolochloa festucacea* grow in littoral parts of the islands of Lake Rušonu.

On Bērzu Island, 1.15 ha of the broad-leaved deciduous forests is destroyed due to a colony of cormorants *Phalacrocorax carbo*. Also the invasive shrub *Sambucus racemosa* is found on this island.

2. Threats to habitat and species conservation

- Protected habitats and species are negatively influenced by a colony of *Phalacrocorax carbo* of the Bērzu Island.
- The spread of *Sambucus racemosa* is a significant threat.
- Recreation is a potential threat as accumulation of household waste, trampling and destruction of dead wood (used in campfires) occur due to visitors.
- Entire area of the nature reserve is potentially threatened by Jaunaglona dam, which is in a critical condition.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

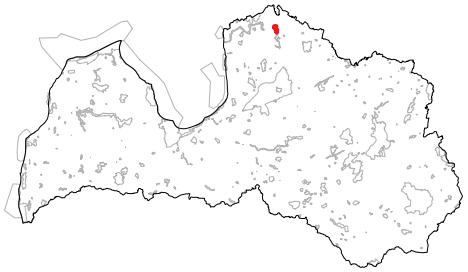
- Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Measures to decrease the population of *Phalacrocorax carbo*.
- Reduction of the spread of *Sambucus racemosa*.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	10.4	27.0	Favourable, poor.	Non-intervention.		10.4
9020*	Broad-leaved deciduous forests	14.3	37.1	Favourable, poor.	Non-intervention.		14.3
					Reduction of the influence of *Phalacrocorax carbo* in the Bērzu Island. Felling of *Sambucus racemosa* and further cutting of regrowth in Bērzu island.	6.0	

Rūjas paliene | *Nature Reserve (LV0535400)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Mazsalaca municipality Sēļi rural territory; Rūjiena municipality Vilpulka and Jeri rural territory.

AREA: 444 ha.

NATURE MANAGEMENT PLAN: 2006 (2006–2016), validity extended until 2021.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

The central element of the Rūjas Paliene Nature Reserve is Rūja river which is located in an ancient bed of Lake Burtnieks. The territory includes the largest complex of grasslands in Rūja natural floodplains.

Semi-natural grasslands cover more than half of the nature reserve. Wet, flooded in springtime semi-natural grasslands are located in river floodplains; in smaller areas, there are also mesic and moist grasslands. There is a relatively large number of water bodies – oxbow lakes of various shapes and in various stages of development, as well as beaver inundations and periodically dying-out water bodies. There are middle-aged woodlands dominated by *Betula* spp. and *Alnus incana*; in small areas also *Quercus robur* woodlands which have developed when grassland management was discontinued and grasslands overgrew. There are 11 EU protected habitat types. The most important ones are 6450 *Northern boreal alluvial meadows* (the seventh most important territory in the country according to its total area in Natura 2000 territories) and 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) (12th most significant territory).

Landscape-ecologically, grasslands are linked to Vidusburtnieks and Burtnieku Ezera Pļavas Nature Reserves, and together they form a species dispersal corridor. Grassland management should be planned in a complex manner for all territories together, considering that Vidusburtnieks and Rūjas Paliene Nature Reserves are among the ten most important Natura 2000 territories for the protection of *Gallinago media*, but Burtnieku Ezera Pļavas are among the ten most important territories for the protection of grassland-breeding waders.

In total, 26 protected bird species are found in nature reserve. 20 of these are included in Birds Directive. The surrounding of Rūja river and Lake Burtnieki is the largest *Gallinago media* displaying area in Northern Latvia, and also an important breeding site for *Crex crex*. The territory is included in the Important Bird and Biodiversity Area *Rūjas Zivju Dīķi* („Rūja Fish Ponds") (LV037). Rūja Fishponds is the former fish farm, which was established in Rūja river floodplain and the adjoining low territory in 1979. After 10 years of operation it was closed. Important species in the territory are *Circus pygargus, Tetrao tetrix, Porzana porzana, Lanius collurio, Remiz pendulinus*, and others.

Eight protected invertebrate species have been found in the territory, such as *Ophiogomphus cecilia, Unio crassus*. There are six very rare butterfly species (including *Lycaena dispar*); some of them are located on the border of their distribution range.

Four protected vascular plant species grow in semi-natural grasslands, the locality of *Cnidium dubium* is particularly important. Also *Dactylorhiza incarnata* and *Platanthera sp.* can be found.

Large drainage works have been carried out in river floodplain and in surrounding of nature reserve. Rūja river was straightened 90-100 years ago. Tortuous natural river channel has remained in a small reach at Oļa river mouth. Peat is currently extracted near the nature reserve, in Rūja Mire. North of the nature reserve, at "Elmetes" farmstead, there is a scenically attractive territory – former wooded grassland landscape with oaks which now grow in forest.

2. Threats to habitat and species conservation

- Floodplain habitats are fragmented due to drainage carried out in 1960s – 1980s. It also promotes faster water discharge from nature reserve territory, causing faster water level lowering during the spring floods. Topsoil in grasslands dries out faster, which promotes grassland overgrowth with shrubs and trees. Belts of shrubs establish along the ditches, the territory becomes fragmented and less suitable to *Gallinago media*.
- Part of grasslands is overgrown due to management cessation.
- Large woody debris in river promotes slowdown of the water flow, covering of pebbles and boulders with sediments, and disappearance of habitats suitable for *Unio crassus*.

- Overgrowth of oxbow lake shores; increase of shade. Clogging of oxbow lakes with leaf and twig litter increases oxygen consumption and decreases the potential biodiversity of aquatic organisms.
- Due to drainage and lowering of Lake Burtnieks water level, the mineralization of peaty soils occurs; released nutrients enter Rūja river and Lake Burtnieks, promoting eutrophication.

3. Existing management of the protected habitats and its assessment

- In the framework of the LIFE programme project "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), in 2005 and 2006 shrubs in alluvial grasslands were felled in an area of 218 hectares. First-time mowing was carried out in 267 hectares, prescribed burning in 14 hectares.
- According to Rural Support Service, in 2014 about 80 % of habitat type 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and 54 % of 6450 *Northern boreal alluvial meadows* were managed. Other habitat types ware managed in smaller areas: 6270* and 6410 (17% and 26 % respectively), 6120 and 6230* - only 1-2 %.

4. Priorities of management and conservation

- Both the habitat diversity and amount of species are very high in the nature reserve, therefore the priorities are the conservation of habitats (particularly 6450 *Northern boreal alluvial meadows* and 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae)), and habitats of plants and birds in a favourable conservation status. However, in large continuous grassland territories the priority is maintenance of habitats suitable for *Gallinago media*.
- Restoration of grasslands habitats to the maximum possible area; their maintenance in a favourable conservation status. Mitigation of drainage influence on hydrological regime of grasslands.
- Improvement of *Gallinago media* habitat; maintenance of favorable conditions for existence of population.
- Liberation of oaks (improvement of light conditions) for the improvement of habitats for invertebrates.
- Prevention of river clogging; prevention of disappearance of habitats suitable for *Unio crassus*.
- The restoration of Rūja river natural flow would promote the conservation of nature values in nature reserve. It can be achieved either by permanent closure of Imanta and Ķoņi hydroelectric power plants, or by increasing their ecological discharge and construction of fishways.

5. Necessary management and conservation measures

5.1. General measures

- Drainage impact mitigation in floodplain grasslands. Complete ditch filling or construction of small dams is preferable. The planned management measures are described in nature management plan. However, grassland management possibilities after the wetting must be assessed before the implementation of measures. Since the development of nature management plan (2006), understanding on the impact of grassland management methods on conservation status of grasslands and birds has improved, and restoration measures must be planned in a way that grassland mowing and grass removal is possible after the rewetting.
- Liberation (improvement of light conditions) of old oaks which are habitats for rare lichen and insect species.
- Merging of Burtnieka Ezera Pļavas, Vidusburtnieks and Rūjas Paliene Nature Reserves into one protected nature territory, in order to promote integrated and landscape-ecologically justified management and conservation of grasslands. Evaluation of the possibility of restoration of wooded grasslands at Elmetes farmstead and their incorporation into nature reserve.
- Monitoring of grassland habitats, grassland-breeding waders and *Gallinago media*.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	10.21	2.3	Poor.	Restoration. Maintenance.	10.2	10.2
6450	Northern boreal alluvial meadows	261.10	58.8	Poor.	Restoration. Maintenance.	118	261
6410	*Molinia* meadows	12.49	2.8	Bad.	Restoration. Maintenance.	9.0	12.5
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	9.06	2.0	Bad.	Restoration. Maintenance.	7.5	9.06
6230*	Species-rich *Nardus* grasslands	0.98	⟨1	Bad.	Restoration. Maintenance.	0.98	0.98
6120	Xeric sand calcareous grasslands	2.04	⟨1	Bad.	Restoration. Maintenance.	2.0	2.0
6000	Grasslands to be restored	30.0	6.7	-	Restoration. Maintenance.	30.0	30.0
4030	European dry heaths	0.25	⟨1	Poor.	Liberation of junipers.	0.25	
3260	Natural river reaches and river riffles	11.0	2.5	Poor.	Maintenance of water flow: removal or reduction of large woody debris in sites with bank erosion and in sites with pebbles and boulders in riverbed. Once per 5 years.	0.5	
3150	Natural eutrophic lakes	3.2	0.7	Poor.	Oxbow lakes. If more than 50 % of surface is shaded by trees and shrubs near the shore, their partial felling is permissible (attraction of *Leucorrhinia pectoralis*). Once per 5 years.	1.0	
91E0*	Alluvial forests	9.3	2.1	Favourable.	Non-intervention.		9.3

One-time grassland restoration measures are necessary in an area of at least 147 hectares of grasslands. Measures include felling of shrubs, their root milling, reed reduction, and subsequent mowing or grazing.

Sakas grīņi | *Nature Reserve (LV0535500)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Pāvilosta municipality Saka rural territory.

AREA: 170 ha.

NATURE MANAGEMENT PLAN: 2004 (2004–2014).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Sakas grīņi Nature Reserve is located in sandy lowland (which appeared in earlier development stages of the Baltic Sea) with weak surface and underground runoff. The territory is covered with poor, periodically wet pine forest (forest type *grīnis*). In woodlands of this type, ground is waterlogged in spring and autumn, and very dry in summer, although the groundwater table is high. Poor drainage has caused paludification in the terrain depressions.

The territory includes wet heaths with *Erica tetralix* which is a very rare habitat in Latvia and in Europe. This is one of the most vital and best remained localities of *Erica tetralix* in Latvia. In Latvia, habitats with *Erica tetralix* are found only on the western coast of the country, mainly in Saka and Ziemupe municipalities.

The marine climate with milder winters and longer vegetation period is suitable for atlantic species – *Erica tetralix*, *Myrica gale* and *Trichophorum cespitosum*.

Three EU protected habitat types can be found in the nature reserve. Out of these, the most important one is 4010 *Northern Atlantic wet heaths with* Erica tetralix. Bog woodlands cover comparatively large area, and areas of western Taīga are smaller. In total, 13 protected plant and seven protected bird species have been found in the territory. Examples of protected plant species are *Pinguicula vulgaris, Juncus squarrosus, Dactylorhiza baltica*. Forest habitats are important for *Bonasa bonasia* and *Tetrao tetrix*. Also *Lullula arborea* and *Lanius collurio* can be found in the nature reserve.

2. Threats to habitat and species conservation

- Drainage is one of the reasons for heath overgrowth with trees and shrubs, increase of cover of *Molinia caerulea*, disappearance of *Sphagnum* spp. and *Erica tetralix*.
- Lack of wildfires. Wildfires occurred regularly in wet heaths in 20th century and earlier, and they promoted the development of wet heaths, including wet heaths with *Erica tetralix*.
- Due to lack of management (grazing), in the driest areas wet heaths overgrow with *Molinia caerulea*. It is an expansive plant species which is outcompeting *Erica tetralix*.
- Degeneration or aging of *Calluna vulgaris*.
- Potential lowering of water level if activities are carried out outside the nature reserve in its vicinity, for example, restoration and maintenance of drainage systems.

3. Existing management of the protected habitats and its assessment

Experimental management activities of wet heaths were organized by JSC "Latvijas Valsts Meži". In December 2006, trees and shrubs were selectively cut in wet heaths. In March 2007, heath mowing and topsoil loosening was carried out in another site. Management success was monitored, and it was concluded that management had a positive impact and mowing was efficient. However, due to the short duration of the study, conclusions of the long-term changes can not be made[18].

4. Priorities of management and conservation

- Selective felling of trees and shrubs in heaths with *Erica tetralix*, in sites with low proportion of *Molinia caerulea*, according to the expert's opinion.
- Facilitation of *Erica tetralix* spread by *Molinia caerulea* mowing. For better results, the measure should be combined with rewetting.
- Monitoring of management success.
- Hydrological regime research and monitoring in wet heaths.
- Rewetting in wet heaths if the latest results indicate that the situation has gotten worse. Supporting the establishment of conditions optimal for *Erica tetralix* both in the potential habitat type 4010 *Northern Atlantic wet heaths with* Erica tetralix and in the existing one.

[18] Salmiņa, L. 2008. Mežu un slapju virsāju ar grīņa sārteni Erica tetralix L. Eksperimentālā apsaimniekošana dabas liegumā "Sakas grīņi". Grām.: Auniņš A. (red.) Aktuālā savvaļas sugu un biotopu apsaimniekošanas problemātika Latvijā. Latvijas Universitāte, Rīga, 111-122.

5. Necessary management and conservation measures

5.1. General measures

- Approval of Individual regulations on protection and use. According to the project of Individual regulations on protection and use included in the Nature management plan, the territory is divided in two zones – the regulated regime zone (111 ha) and nature reserve zone (59 ha), in order to ensure the protection of nature values and optimize the protection regime.
- Repeated hydrological research and monitoring in wet heaths and in territory adjacent to nature reserve; data of one year of research should be compared with the observations of period 2007-2013.

5.2. Specific measures

5.2.1. Species

Promotion of the spread of *Erica tetralix*. In driest places in the nature reserve, there is a high cover of *Molinia caerulea* which is a competitor to *Erica tetralix*. In these sites, abundance of *Erica tetralix* is low. In order to find out whether mowing of *Molinia caerulea* promotes the distribution of *Erica tetralix,* an experiment is necessary including maximally low mowing of *Molinia caerulea* in sample plots. After mowing, all mown material must be gathered and removed. Vegetation survey (according to the method described in Nature management plan) is necessary before and after the measure.

5.2.2. Habitats

Hydrological regime research; development of building project for the improvement of hydrological regime. Evaluation of restoration of habitat type 4010 in territories with wet pine woodlands, including 91D0* *Bog woodland* of low quality. Long-term conservation of wet heaths is the priority in this area, therefore preference should be given to sites where the restoration of this habitat is possible, compared to non-intervention that is relevant to habitat type 91D0*.

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	72.4	42.6	Bad.	Non-intervention. Complex hydrological regime stabilisation in the entire nature reserve.	According to hydrological research results.	72.4
9010*	Western Taïga	1.5	<1	Poor.	Non-intervention.		1.5
4010	Northern Atlantic wet heaths with *Erica tetralix*	35.8	21.0	Bad.	Selective cutting of trees and shrubs in sites dominated by *Sphagnum* moss and dwarf shrubs, where cover of *Molinia caerulea* is low (gradually, after the expert conclusions). Mowing of *Molinia caerulea.* Complex hydrological regime stabilisation in the entire nature reserve.	Areas must be specified; possible sites are 88th block 1st compartment (part) and 4th compartment (part). According to hydrological research results.	

Saltais purvs | *Nature Reserve (LV0506000)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Jēkabpils municipality, Leimaņi and Kalna rural territories.

AREA: 102 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Saltais purvs Nature Reserve includes EU protected habitat types – raised bog, bog woodland and transition mires and quaking bogs. The territory is located next to the Ābeļi Nature Reserve and habitats of protected bird species.

2. Threats to habitat and species conservation

Drainage carried out in the surrounding areas has contributed to the negative changes in the hydrological regime; mire has overgrown with pines and reeds.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Rewetting in wet forests and mires.

5. Necessary management and conservation measures

5.1. General measures

Research of hydrological regime. Development of a construction project for rewetting, if it is concluded that restoration of hydrological regime is possible. This measure also includes development of a monitoring programme and methods for the assessment of restoration success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	31.2	30.6	Poor.	Non-intervention. Rewetting in complex with mire.	31.2	
7140	Transition mires and quaking bogs	3.4	3.3	Poor.	Rewetting if possible (in complex with raised bog).	3.4	
7120	Degraded raised bogs	52. 1	51.1	Bad.	Felling of trees. Rewetting, if necessary.	52.1	

Sasaļu mežs | *Nature Reserve (LV0504400)*

1. Brief description

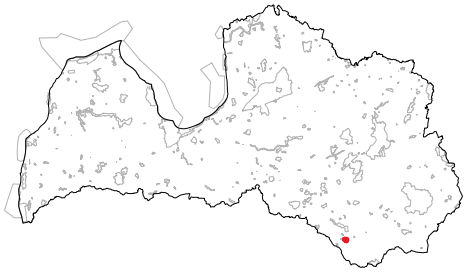
YEAR OF FOUNDATION: 1977.

LOCATION: Daugavpils municipality, Svente rural territory.

AREA: 204 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Sasaļu mežs Nature Reserve is located on the southern side of a larger forest area, including the visually expressive Lake Sasaļu, as well as surrounding *Pinus sylvestris* and *Betula* spp. woodlands. There is Lake Melnezers which is a suffosion sinkhole by its origin. Other EU protected habitats are found in the nature reserve in smaller areas such as swamp woods and mineral-rich springs and springfens. Rare and protected animal species include *Myotis daubentoni*, *Eptesicus nilssonii*, and *Clausilia cruciata*. The territory is an important habitat for several EU protected bird species, especially for *Circus aeruginosus, Bonasa bonasia, Dendrocopos leucotos, Dryocopus martius, Picus canus,* and others.

2. Threats to habitat and species conservation

Typically there is a large amount of tourists and anglers in the area around Lake Sasaļu, and several illegal angling sites have been established. It is expected that recreational load will increase, having a negative influence on the quality of lake habitats. Dead wood in the forests around the lake has been removed, and used in campfires.
Invasive species spiny-cheek crayfish *Orconectes limosus* spreads here.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Decrease of recreation pressure.

5. Necessary management and conservation measures

5.1. General measures

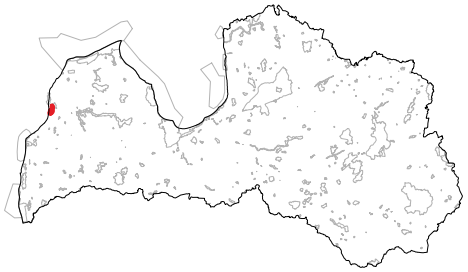
- Development of operational regulations of Lake Sasaļu which include also aspects of public access infrastructure.
- Increased control in the nature reserve during the bathing season, preventing the use of wood in the campfires.
- Research on the *Orconectes limosus* (invasive species) population size and possible elimination solutions.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	1.1	<1	Poor.	Non-intervention.		1.1
7160	Fennoscandian mineral-rich springs and springfens	1.8	<1	Favourable.	Non-intervention.		1.8
3150	Natural eutrophic lakes	26.9	13.2	Poor.	Non-intervention, except the limitation of spread of *Orconectes limosus* (according to research results).		26.9

Sārnates purvs | *Nature Reserve (LV0517200)*

1. Brief description



YEAR OF FOUNDATION: 1987.

LOCATION: Ventspils municipality; Užava and Jūrkalne rural territories.

AREA: 1423 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

The most important value of the Sārnates purvs Nature Reserve is the active raised bog which occupies most of the territory. Bog woodlands are concentrated in the central part of the nature reserve. Old boreal forests (western Taïga) are found on the edge of the mire. There is also Lake Pāže which is a natural eutrophic lake. Transition mire has developed on its banks. Lake is gradually overgrowing. There is an old and overgrown ditch around the mire; perhaps once the mire was prepared for peat extraction. Due to drainage, mire is heavily overgrown with pines (*Pinus sylvestris*), especially in its southern part. Seven EU protected habitat types can be found in the territory.

There are several EU protected bird species such as *Ficedula parva, Circus aeruginosus, Anser albifrons, Circaetus gallicus, Pluvialis apricaria, Caprimulgus europaeus, Anser fabalis.*

The territory is important for *Tetrao tetrix*. There are also other protected species in the nature reserve – plant *Trichophorum cespitosum* and invertebrate *Clausilia cruciata*.

2. Threats to habitat and species conservation

- Previous drainage. The southern part of the nature reserve is particularly influenced, where there is a dense network of drainage ditches.
- Part of the Sārnate Mire is highly degraded due to reduction of open bog area and mire overgrowing with pines.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats. The only semi-natural grassland located in the nature reserve is overgrowing.

4. Priorities of management and conservation

- Rewetting in habitats of wet woodlands and mire.
- Removal of undesirable trees in mire habitats which are overgrown due to drainage.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed natural environment.
- The biodiversity of the nature reserve is increased by semi-natural grasslands. However, their restoration is not a priority as their area is small and their biodiversity is important only locally.

5. Necessary management and conservation measures

5.1. General measures

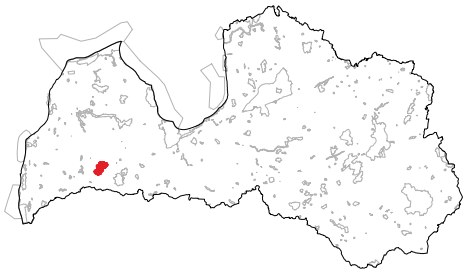
Hydrological regime research. Development of a construction project if it is concluded that the restoration of hydrological regime is possible. This measure includes also the development of a monitoring programme and methods for the evaluation of restoration success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	85.8	6.0	Bad.	Non-intervention. Rewetting in complex with mire (ditch blocking or filling up).		85.8
9010*	Western Taïga	16.8	1.2	Favourable.	Non-intervention.		16.8
9080	Fennoscandian deciduous swamp woods	4.55	<1	Favourable	Non-intervention.		4.55
7140	Transition mires and quaking bogs	15.2	1.1	Favourable.	Non-intervention.		15.2
7120	Degraded raised bogs	163.4	11.5	Bad.	Rewetting (ditch blocking or filling up). Felling of trees, particularly in southern part of Sārnate mire.	153.4 153.4	
7110*	Active raised bogs	774.2	54.4	Poor.	Rewetting.	774.2	
3150	Natural eutrophic lakes	2.4	<1	Poor.	Non-intervention.		2.4
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	5.4	<1	Bad.	Restoration. Maintenance.	5.4	5.4

Sātiņu dīķi | *Nature Reserve (LV0525500)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Saldus municipality Pampāļi, Zirņi, Kursīši and Novadnieki rural territories.

AREA: 3758 ha.

NATURE MANAGEMENT PLAN: 2017 (2017–2025).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Sātiņu dīķi Nature Reserve consists of two separate, nearby areas with systems of ponds which were established in different periods of the 20th century, as well as wet forests and agricultural lands. There are about 30 ponds of various sizes, some of which exist since the 1930s. Some of the ponds are still used for fisheries, while others are overgrown. There are also a large number of ditches and regulated watercourses.

The nature reserve is an important place for breeding and migratory birds. Despite the artificial origin of the ponds, there is a significant amount of breeding birds, as well as migratory birds during their migration period. The territory is Important Bird and Biodiversity Area, and it is also recommended for the list of Ramsar sites. Six micro-reserves are established for the protection of rare bird species.

Birds cause considerable damage to fisheries by feeding on fish and their feed, and it is therefore important to find ways to compensate for the damage they cause. Significant part of the territory (83 ha) is covered by beaver inundated areas which are also important for foraging of birds. Also unmanaged ponds are significant habitat for various birds and amphibian species, however, it is expected that their areas will decrease in the future due to overgrowth, especially if water level in ponds is not maintained. One of the most important values of the nature reserve is grasslands that should be managed regularly. However, most of the agricultural land is currently not managed, and it overgrows. Forests are dominated by *Betula* spp. and *Picea abies*, and *Pinus sylvestris* in Daku and Raņķu Mires. The increasing distribution of *Alnus incana, Betula* spp. and *Populus tremula* is promoted by overgrowth of agricultural lands.

There are 12 EU protected habitat types which cover 13 % of the nature reserve. The largest areas are covered by bog woodlands, western Taïga and deciduous swamp woods. Smaller areas are occupied by other habitats of woodlands and grasslands. The most important of them are oak forests and wooded meadows located between Dzenīši and Birznieki farmsteads, north of Pļavnieki ponds. Wooded meadows are characterized by clusters of large, wide-crowned oaks (*Quercus robur*) of high landscape value. The rest of the former wooded meadows are overgrown with shrubs. In Raņķu (Zaļmuguru) Mire, peat was extracted around the 1930s. Overgrowing ditches are still visible. Former peat extraction fields are overgrown with vegetation characteristic to bog pools.

The territory is located in Kurzeme Geobotanical District, in a part which is poor with in semi-natural grasslands; therefore it is very important for the conservation of grassland biodiversity and reduction of grassland fragmentation, as a species migration corridor and core area. If semi-natural grassland habitats would be restored, their area would be sufficient for the maintenance of their biodiversity in the long term.

In total, at least 79 protected species have been registered in the nature reserve. There are 67 protected bird species, 36 of which are breeding or can be observed regularly. There are eight protected species of plants and 11 protected species of mammals.

Landscape mosaic with ponds and beaver-inundated areas are an excellent place for foraging and breeding for species such as *Circus pygargus, Haliaeetus albicilla, Pandion haliaetus, Philomachus pugnax, Pernis apivorus, Bonasa bonasia, Tetrao tetrix, Cygnus cygnus, Porzana porzana, Pluvialis apricaria, Crex crex*, and others. Important plant species are *Serratula tinctoria, Dactylorhiza baltica, Orchis mascula, Pimpinella major,* moss *Ricciocarpos natans*. Invertebrates: *Leucorrhinia pectoralis, Lycaena dispar, Ophiogomphus cecilia*. Ponds and wetlands of the territory are used as foraging sites by 9 protected bat species. They are also a significant habitat for *Lutra lutra*, and fish species *Rhodeus sericeus*.

2. Threats to habitat and species conservation

- Management discontinuation of grasslands including wooded meadows. Overgrowth. Grass mowing with shredding and leaving on site.
- Hydrological regime changes and habitat degradation in mires and wet forests due to drainage.
- Lack of management in ponds; non-maintenance of water level. It may result in overgrowing of ponds,

adversely affecting protected species of birds, amphibians and bats.

3. Existing management of the protected habitats and its assessment

Reed mowing is carried out in several ponds which are important habitats for birds, invertebrates and bats. The effect is going to be long-lasting if mowing is continued regularly.

Grasslands are managed in fragments. Part of them was managed by grass shredding at least until 2013. It affected the condition of grassland habitats and species negatively. According to Rural Support Service, in 2014 most of the grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 32 % of habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) and 47 % of 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* received the support.

4. Priorities of management and conservation

- Restoration and management of semi-natural grasslands in the maximum possible area, including restoration of perennial grasslands and fallow-lands that do not comply with requirements of EU protected grassland habitats. These grasslands should be restored to semi-natural grasslands. Also semi-natural grasslands overgrown with shrubs and woodlands must be restored.
- Restoration of habitat type 6530 * *Fennoscandian wooded meadows* in sites where former elements of wooded grasslands can be found.
- Management of ponds. Maintenance of shallow water in unmanaged ponds, including reed mowing and restriction of overgrowth, in order to ensure diverse habitats and foraging sites not only for birds but also for invertebrates, bats, and other animal species.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Restoration of optimal hydrological regime in bog woodlands and swamp woods. Evaluation of possibilities and necessity of rewetting in other drained woodlands.
- In sites where western Taïga woodlands have developed on peaty substrate in bog woodlands which are drained for a lengthy period (for example, south-eastern part of Daku Mire), the habitat development towards bog woodlands is expected after the improvement of hydrological regime.

5. Necessary management and conservation measures

5.1. General measures

- Development of construction project for hydrological regime stabilization in wet habitats. Complete removal (filling up) of drainage system can be considered as the optimal management measure in sites where it influences swamp woods, for example, western part of Dzērvīšu Mire and northern part of Zaļmuguras Mire (areas are indicated in Nature management plan).
- Evaluation of the functionality of drainage system (influence on protected habitats; economic significance) in Daku Mire – Dzērvīte forest massif, where long-term preservation of the area with the main objective of nature conservation is intended. It is expected that habitats of EU importance will develop in the entire area in the future.
- Management of ditches and maintenance of shallow water level in unmanaged ditches, including reed mowing in fish ponds and restriction of overgrowing; total area: 730 ha. The management of the ponds for the purpose of fishery production corresponds to the nature conservation interests and should be continued, including the restoration, rebuilding and other necessary work done in ponds.
- In ponds which are not used for fishery and for recreation, a shallow (0.1 – 0.5 m) water should be maintained throughout the year. If necessary, damaged dams and other pond hydrotechnical structures must be repaired to maintain the necessary water level and prevent the overgrowing of ponds with trees and shrubs.
- Restoration of habitat type 653* *Fennoscandian wooded meadows* in areas where the elements of wooded grasslands have still remained (mainly, wide-crowned oaks earlier grown in open landscape). Total area to be restored: 10.9 ha.
- Restoration and management of semi-grassland habitats in accordance with the nature conservation plan.
- An important prerequisite to begin grassland restoration is the cooperation between the Nature Conservation Agency and landowners, and the owners' cooperation in grassland management. Construction and repair of access roads is necessary.
- In addition, it is necessary to investigate the area of the long-established grasslands which are drained with shallow ditches. Such grasslands are adjacent to southern border (between Zaņa river and border of the nature reserve), south-eastern (Līdakas farmstead) and eastern (Rupeikas, Priednieki farmsteads) borders. The incorporation of these areas in nature reserve and their restoration must be evaluated.

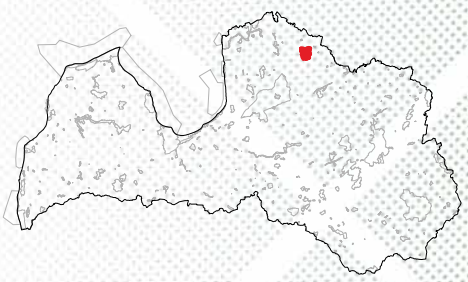
5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	156.2	4.2	Poor.	Non-intervention.		156.2
91D0*	Bog woodland	196.3	5.2	Poor.	Non-intervention, except rewetting, in complex with mire (ditch blocking or filling up).	According to research results.	
9020*	Broad-leaved deciduous forests	11.2	<1	Bad.	Non-intervention.		11.2
9080*	Fennoscandian deciduous swamp woods	60.8	1.6	Poor.	Non-intervention, except rewetting, in complex with mire (ditch blocking or filling up).	According to research results.	
9160	Oak forests	6.4	<1	Bad.	Non-intervention.		6.4
7110	Active raised bogs	12.5	<1	Bad.	Non-intervention, except rewetting (ditch blocking or filling up).	According to research results.	
7120	Degraded raised bogs	2.6	<1	Bad.	Non-intervention, except rewetting (ditch blocking or filling up).	According to research results.	
6210	Semi-natural dry calcareous grasslands	4.4	<1	Bad.	Restoration. Maintenance.	4.4	4.4
6270	Fennoscandian lowland species-rich dry to mesic grasslands	7.4	<1	Bad.	Restoration. Maintenance.	7.4	7.4
6410	*Molinia* meadows	14.9	<1	Bad.	Restoration. Maintenance.	14.9	14.9
6510	Lowland hay meadows	11.6	<1	Bad.	Restoration. Maintenance.	11.6	11.6
6530*	Fennoscandian wooded meadows	8.6	<1	Bad.	Restoration. Maintenance.	8.6	10.9
6000	Grasslands to be restored	173	4.6	-	Restoration. Maintenance.	173.0	173.0

One-time grassland restoration measures are necessary in an area of at least 204 ha (including 31 ha of habitats of EU importance). Measures and the exact sites of grassland restoration are specified in Nature management plan.

Sedas purvs | *Nature Reserve (LV0526800)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Strenči municipality Seda municipal town with rural territory and Plāņi rural territory; Burtnieki municipality Ēvele rural territory; Valka municipality Ērģeme rural territory.

AREA: 7257.7 ha.

NATURE MANAGEMENT PLAN: 2006 (2007–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 478 of 26 May 2009, Regulation on Individual Protection and Use of Sedas Purvs Nature Reserve.

Sedas purvs Nature Reserve includes an extensive wetland complex in North Vidzeme, developed in a site of previous peat extraction fields. Before the peat extraction began, Sedas Mire was one of the largest mires in Latvia. For the purposes of peat extraction, a dense network of ditches was established in the territory in 1950s, as well as roads and railroads. There are several pumping stations (one is still operating). Seda river with partially flooded alluvial grasslands is located in the northern part of nature reserve. The mire is surrounded by bog woodlands. There are also outstanding boreal forests (western Taïga) on inland dunes. Peat extraction is currently continued in the central part of the mire.

The most part of the territory is occupied by finished peat extraction fields with ponds. Fragments of unmodified raised bogs can be found as individual islets. The shallow water bodies and reedbeds is an excellent breeding site for waterbirds. It serves also as a foraging and stopover site for migratory birds. The territory is an Important Bird and Biodiversity Area (LV039), and in the future it can be included in a list of Ramsar territories as an internationally important wetland which is particularly suitable for waterbirds.

Six EU protected habitat types have been found in the nature reserve. The most important ones are alluvial grasslands, bog woodlands, western Taïga. About 25 % of the territory is covered with water. Many of the flooded areas are overgrown. Ponds which are the most valuable for birds are located in the northwestern part where finished peat extraction fields initially were transformed to the agricultural land but later flooded, and now provide abundant underwater vegetation and good foraging resources. Grasslands in the northern part of nature reserve, at Seda river are important for birds as it is a breeding and foraging site for *Gallinago media* and *Crex crex*, and foraging site for *Aquila pomarina*. At a national scale, this is a priority territory for *Gallinago media*. In total, more than 100 bird species are breeding in the nature reserve, for example, *Cygnus columbianus, Cygnus cygnus, Mergellus albellus, Pandion haliaetus, Haliaetus albicilla, Philomachus pugnax, Porzana parva, Pernis apivorus, Tetrao tetrix, Circus cyaneus, Porzana porzana, Gallinago gallinago, Limosa limosa, Numenius arquata, Tringa totanus,* and others.

Seventeen protected plant species have been found in the nature reserve, for example, *Carex heleonastes, Carex paupercula, Salix myrtilloides*. The most important moss species are *Hamatocaulis vernicosus* and *Lophozia rutheana*. There are 13 protected invertebrate species, including *Nehalennia speciosa, Leucorrhinia pectoralis, Lestes virens,* and *Aeshna viridis*. It is mentioned in the literature that very rare protected amphibian species Pelobates fuscus can be found here.

2. Threats to habitat and species conservation

- The spring flooding of semi-natural alluvial grasslands is decreased due to straightening and deepening of Seda river, as well as a system of drainage ditches. In result, grasslands are degrading and overgrowing with shrubs, the diversity of plant communities and species is decreased. The influence still continues. The greatest threat is soil eutrophication due to several factors – peat mineralization after drainage, abandonment of grasslands at the turn of 20th and 21st centuries, and grass mowing with shredding which was widespread from early 2000s to 2015.
- The most significant threat to the great snipe *Gallinago media* is the drainage. Due to drainage, grasslands are fragmented by dense network of ditches, and the length of spring floods is reduced. The natural flooding regime is important for earthworms which are the main food for *Gallinago media*. The foraging conditions for *Gallinago media* are adversely affected by grass shredding.
- There is a functioning drainage system and shallow water level created by the dense network of drainage ditches. Shallow water areas in finished peat extraction

fields overgrow with dense cover of emergent macrophytes (*Phragmites australis* and *Typha* spp.) which promote water transpiration and the drying out of flooded territories. In result, places suitable for fish and other aquatic organisms disappear, as well as foraging and breeding sites for birds.
- Woodlands in the nature reserve and in its vicinity are threatened by water level fluctuations. Activities of beavers (*Castor fiber*) are the most common reason of water level rise.
- Bird staging and foraging during the migration is disturbed by hunting.

3. Existing management of the protected habitats and its assessment

- The most part of the former peat extraction area is flooded and transformed into ponds. Part of the territory is too dry for a self-restoration of mire and wetlands. Parts of the former peat extraction fields are afforested. There are also areas where peat extraction is finished but which are not recultivated.
- In the framework of the LIFE program "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), alluvial grasslands in Seda river floodplain were restored – shrubs were felled and mowing of grasslands was restarted. According to Rural Support Service, in 2014 94 % of alluvial grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". This means that the LIFE-Nature project has played a major role in the restoration and further maintenance of grasslands. Vegetation monitoring has not been carried out, therefore the management influence on grassland habitats is unknown.

4. Priorities of management and conservation

- Conservation of the diversity of bird species and the restoration of wetlands as well as the optimal maintenance of breeding and foraging conditions for birds is a priority for the territory. Rewetting is related to non-maintenance of the drainage system – the flooding of the former peat extraction sites.
- In floodplain of Seda river: maintenance and restoration of hydrological regime (especially the spring flooding regime) which is optimal for the provision of a favorable conservation status for *Gallinago media* and grassland waders, and for grassland habitats.
- Maintenance of the open landscape, preventing fragmentation of the area with shrubs and rows of trees on dikes. Reduction and fragmentation of continuous reedbeds in order to maintain and restore optimal conditions for water birds.
- Management and restoration of semi-natural alluvial grassland habitats up to maximum possible area; maintenance in a favourable conservation status (including the restoration of grasslands in their previous areas which are now covered with shrubs and forest).
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological regime research; rewetting (in accordance to regulatory enactments) in order to maintain water level which is optimal for breeding and migratory birds. Hydrological regime research in Seda river floodplain (assessing both the possibilities of biodiversity restoration and improvement, and the possibilities of management). After the rewetting – continuous hydrological regime monitoring for at least three years.
- Regular mowing or burning of reeds in the shallow water bodies, in order to prevent the development of monodominant reedbeds.
- Creation of a mosaic of new open water bodies (after the hydrological regime research). Where it is possible – grubbing up of former peat extraction fields and the uncovering of mineral ground before the flooding, in order to promote peat mineralization.
- Maintenance of as large as possible open areas, and prevention of landscape fragmentation, in order to ensure the optimal conditions for waterbirds during migration. Felling of trees and shrubs on ditch berms and on their shores.
- Evaluation of a possible restoration of semi-natural grassland biodiversity in drained and highly modified alluvial grasslands on peaty substrates with strong eutrophication. In Seda river floodplain, priorities are both the increase in areas suitable for *Gallinago media* and the improvement of semi-natural grassland biodiversity.

5.2. Specific measures

5.2.1. Species

- The population of the black tern *Chlidonias niger* decreases due to overgrowing. Therefore, trees and shrubs on ditch berms and shores must be felled once per 10-15 years. Mowing of reeds and fragmentation of reedbeds is necessary. In water bodies, areas with float-leaved vegetation must be maintained (necessary for *Chlidonias niger* nesting).

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	166.3	2.3	Poor.	Rewetting.	According to research results.	
9010*	Western Taïga	15.4	<1	Poor.	Non-intervention.		15.4
7140	Transition mires and quaking bogs	169.4	2.3	Poor.	Rewetting.	According to research results.	
7110*	Active raised bogs	39.8	<1	Poor.	Non-intervention.		39.8
6450	Northern boreal alluvial meadows	145.8	2.0	Favourable.	Restoration. Maintenance.	42.0	145.8
3260	Natural river reaches and river riffles	4.00	<1	Poor.	Removal of fallen logs and beaver dams in Seda river.	On necessity.	
3150	Natural eutrophic lakes	500.0	6.8	Poor.	Potential protected habitat. Creation of a mosaic of emergent vegetation by mowing, reed burning, or reduction of its occupied area.	100.0	

One-time grassland restoration measures are necessary in an area of at least 40 ha in Seda river floodplain. For the restoration of Gallinago media habitat, non-maintenance of drainage ditches and the blocking of ditches is planned. Also paludification must be avoided, therefore the potential influence of ditch blocking must be evaluated after groundwater monitoring for at least three years. *Gallinago media* habitat will also be enlarged and improved by habitat restoration.
Annual grassland management measures are necessary in the entire area grassland habitats, with regard to requirements of Gallinago media. In places where expansive plant species should be restricted, early mowing is recommended, using animal scaring devices (for protection of birds) and gradual mowing. Mowing with grass shredding and leaving on site is undesirable for *Gallinago media*. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Seržu tīrelis | *Nature Reserve (LV0500600)*

1. Brief description

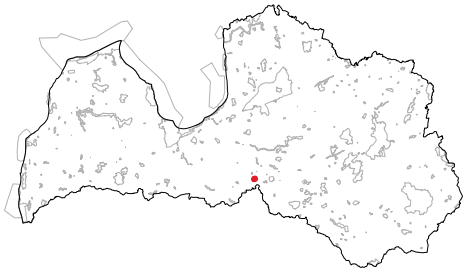
YEAR OF FOUNDATION: 1977.

LOCATION: Vecumnieki municipality Valle rural territory.

AREA: 151 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Seržu Tīrelis Nature Reserve includes mainly bog woodlands, as well as *Alnus glutinosa* swamp woods near Rudupīte river at the north-eastern border of the nature reserve. Bog woodlands are an important habitat for several rare and protected bird species, such as *Bonasa bonasia, Ciconia nigra, Aegolius funereus, Dryocopus martius, Pandion haliaetus*. There is also capercaillie *Tetrao urogallus* lek.

Examples of protected plant species in the territory are *Dactylorhiza incarnata, Dactylorhiza maculata, Schistostega pennata*. Invertebrates – *Semblis phalaenoides, Limenitis populi, Laphria flava*.

2. Threats to habitat and species conservation

- Capercaillie leks are potentially threatened by dense spruce (*Picea abies*) advance growth and understory. Currently, the conditions in the lek site are optimal for displaying.
- Nature values of the territory are threatened by hydrological regime changes. There are indications of drainage in the bog woodlands.
- Habitat type 3260 *Water courses of plain to montane levels with the* Ranunculion fluitantis *and* Callitricho-Batrachion *vegetation* is affected negatively by beaver dams and large woody debris.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of optimal conditions in capercaillie leks by felling advance growth and understorey on necessity, in accordance to the general guidelines on the capercaillie lek care or expert opinion.

5. Necessary management and conservation measures

5.1. General measures

Research on the influence of existing drainage system on mire habitats.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	95.5	63.2	Favourable, poor.	Non-intervention. Maintenance of capercaillie leks by felling part of advance growth and understory.		95.5
9080*	Fennoscandian deciduous swamp woods	4.1	2.7	Poor.	Non-intervention.		4.1
3260	Natural river reaches and river riffles	0.5	⟨1	Poor.	Elimination of beaver dams and impoundments; removal of large woody debris.		

Silabebru ezers | *Nature Reserve (LV0527500)*

1. Brief description

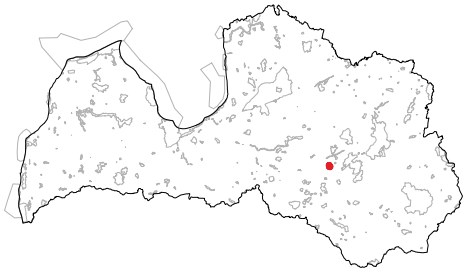
YEAR OF FOUNDATION: 2004.

LOCATION: Krustpils municipality Varieši rural territory.

AREA: 114 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Silabebru ezers Nature Reserve lays in the middle of drained woodlands. It includes Lake Silabebri and the adjacent transition mires and quaking bogs. Lake Silabebri is a mesotrophic lake with benthic vegetation of *Chara* spp. which is a very rare habitat in eastern part of Latvia.

The lake is a foraging site for insect species, such as *Leucorrhinia caudalis, Dytiscus latissimus*, and others. In transition mire, an abundant locality of rare orchid species *Liparis loeselii* can be found. Locality of *Najas marina*, species, which is very rare in eastern Latvia, is found in the lake.

2. Threats to habitat and species conservation

- The rapid overgrowth of the open surface of the lake with the decrease in the area occupied by charophytes.
- Activities of beavers. Dams on the tributary disturb the water discharge in the lake and decrease the water level in transition mire.
- Pollution of lake with organic substances may be increased due to farming in the neighbouring farm.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in transitional mire and lake habitats which are only slightly affected by humans as well as in habitats of species that need undisturbed natural environment.
- Provision of conditions optimal for *Liparis loeselii*.
- Prevention of the reduction of area occupied by charophytes by limiting the overgrowth of open lake surface with monodominant reedbeds.

5. Necessary management and conservation measures

5.1. General measures

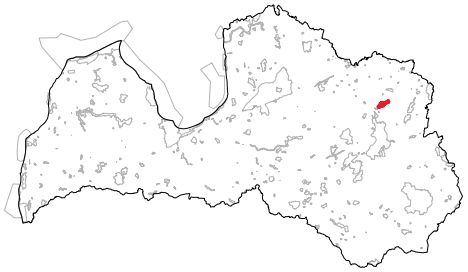
- Prescribed burning of reedbeds in winter, in small areas, in reedbeds contact area with open water. Evaluation of the efficiency of measure. If the measure is assessed as successful, the burning in small areas may be repeated, in order to decrease the expansion of emergent vegetation and associated reduction of areas occupied by charophytes.
- Evaluation on the necessity and methods of management of *Liparis loeselii* localities.
- Restoration of water circulation between the main part of the lake and open water areas in its southern and south-western parts by mowing the emergent vegetation and by deepening visible waterways. It will ensure conditions suitable for water birds, especially *Botaurus stellaris*.
- Cleaning and widening of two anglers' accesses to the lake on the northern and western coast.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7140	Transition mires and quaking bogs	20.3	17,8	Favourable.	Non-intervention. Demolition of beaver dams in the length of the entire tributary.	On necessity	20.3
3140	Charophyte lakes	66.1	58,0	Poor.	Prescribed burning or mowing of reedbeds, in order to reduce the overgrowth of open lake surface with monodominant reedbeds.		1.0 in a new area each year.

Sitas un Pededzes paliene | *Nature Reserve (LV0532000)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Gulbene municipality Litene rural territory, Balvi municipality Kubuļi rural territory.

AREA: 870 ha.

NATURE MANAGEMENT PLAN: 2005 (2005 – 2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 168 of 06 March 2007, Regulation on Individual Protection and Use of the Sitas un Pededzes Paliene Nature Reserve.

Sitas un Pededzes paliene Nature Reserve includes a very meandering part of Pededze river, the reach with confluence of Sita and Pededze rivers, and extensive semi-natural alluvial grasslands with groups of oaks and with oxbow lakes. Together with Mugurves pļavas and Pededzes lejtece Nature Reserves, the territory forms a joint hydrological system, in which the processes taking place are to a large extent dependent on the functioning of Pededze river and its tributaries.

Agricultural lands occupy 61% of the nature reserve. Grasslands have developed due to natural spring floods, as well as activities of humans for a prolonged period of time – grazing and limiting the growth of shrubs. There are seven grassland habitat types of EU importance, including xeric sand calcareous grasslands and species-rich *Nardus* grasslands which are very rare in Latvia. Wooded meadows with old oaks (*Quercus robur*) are very valuable.

The area is the seventh most important for the protection of habitat type 6530* *Fennoscandian wooded meadows* and fifth most important for protection of 6450 *Northern boreal alluvial meadows* in Latvia (1.2% and 4.3% of the total habitat area in the Natura 2000 network respectively). Currently, the grassland connectivity is high, and this is a prerequisite for the future sustainability of the site. The territory is important as a species dispersal corridor and core area for the provision of landscape-ecological integrity in North-eastern Geobotanical District, together with Natura 2000 sites "Lubāna mitrājs" and "Jaunanna".

There are naturally-developed oxbow lakes at all stages of their development, from initial formation to overgrowth. Oxbow lakes are very important for aquatic invertebrates. Other valuable habitats are river riffles and natural river reaches, as well as riparian mixed forests with *Quercus robur, Ulmus glabra, Fraxinus excelsior*; in some areas also western Taïga.

There are at least 42 protected species in the nature reserve: seven species of herbaceous plants, eight invertebrate, 23 bird and one mammal species. Grasslands are a habitat for rare and protected bird species such as *Haliaeetus albicilla, Circus pygargus, Pernis apivorus, Tetrao tetrix* and *Crex crex*. During the spring and autumn floods, meadows serve as a stopover site for several hundred migratory birds. For the great snipe *Gallinago media*, this is one of the five best breeding sites in Latvia, and the second most important territory for *Gallinago media* protection.

Examples of rare and protected species in floodplain grasslands are *Cnidium dubium, Iris sibirica, Viola stagnina, Orchis mascula*, and *Dactylorhiza incarnata*.

Old oaks serve as a habitat for *Osmoderma barnabita,* as well as for several other invertebrate species. In oxbow lakes which vegetation is more diverse, biodiverse communities of invertebrates develop. *Leucorrhinia albifrons* and *Leucorrhinia pectoralis* can be found here. The habitats of river valley are particularly valuable also for *Unio crassus*, *Lutra lutra,* and *Ophiogomphus cecilia*.

2. Threats to habitat and species conservation

- Grasslands and their species were affected negatively by management cessation at the end of the 20th century. It has contributed to fragmentation and to reduction of area and quality of species habitats.
- Many of the solitary oaks in alluvial grasslands have grown into shrubs, their stems are shaded by *Padus avium* and other shrubs and trees, and are not suitable for species which need well-insolated oaks.
- In broadleaf woodlands, *Picea abies* has appeared due to the succession. This can increase the shade in ground vegetation and understory, and change the conditions and species composition of ground cover.
- Hydrological regime and conservation of nature values are negatively affected by modification of Sita river bed and by drainage in the middle of the 20th century that reduced floods and promoted the overgrowth of grasslands with trees and shrubs, simplification of species composition, and grassland fragmentation with belts of shrubs along the ditches.

- Due to the operation of hydroelectric power plant (HPP) on Pededze river in Jaunanna village since 2001, spring floods are significantly decreased.
- Removal of shrubs in grasslands is interfered by beaver dams and burrows. Beavers can also create impoundments in areas where they destroy biological and economic values, and prevent runoff of flood waters from grasslands in summer. Activities of beavers can interfere with habitat management. Most beaver dams are on the river Sita. In many places along Sita, water level is increased, and mowing of meadows is difficult.
- Overgrowing of oxbow lakes, increase of their shading. Diversity of aquatic organisms is reduced due to clogging of oxbow lakes with oxygen-consuming leaf and twig litter.

3. Existing management of the protected habitats and its assessment

- In 2006, in the framework of the LIFE program "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), grassland restoration was carried out: shrub cutting in an area of 117 ha, first-time mowing in 264 ha, and restoration of wooded meadows in 11 ha. Restoration efficiency has not been studied.
- In 2011 - 2016, wooded grasslands were restored in an area of 16.4 ha in the framework of the LIFE project "Management of Fennoscandian wooded meadows (6530*) and two priority beetle species: planning, public participation, innovation" (LIFE09NAT/LV/000240).
- According to Rural Support Service, in 2014 80-90% of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only habitat type 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* was managed in a smaller area - 58% of its total area in the nature reserve.

4. Priorities of management and conservation

- The diversity of habitats and the number of species is very high in nature reserve, therefore the priority is the maintenance of both habitats and plant and bird habitats in a favourable conservation status.
- Restoration of grassland habitats in their maximum possible area and maintenance in favourable conservation status. Restoration of wooded meadows is the priority.
- Restoration of *Gallinago media* population. Maintenance of populations of grassland-breeding waders in favourable conservation status.
- Preservation of *Osmoderma barnabita* populations in at least six oaks; promotion of species distribution in the nature reserve.
- Promotion of continuity of broadleaf forests.
- Maintenance of oxbow lakes, preventing their overgrowth and filling with organic sediments.
- Restriction of beavers in Sita river, in order to prevent prolonged flooding of grasslands and to ensure their mowing.
- Provision of water flow in sites with shore erosion, as well as in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality (habitat of *Unio crassus*; suitable for spawning of *Lampetra planeri*).
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Update of the Nature management plan, in particular regarding the areas of habitat type 6530* *Fennoscandian wooded meadows* (existing and where restoration is necessary), their restoration and management.
- Evaluation of the possible merging of Mugurves pļavas and Sitas un Pededzes paliene Nature Reserves as they form a unified hydrological and landscape-ecological system in which the processes depend on the functioning of Pededze river and its tributaries.
- Evaluation of the hydrological regime in grasslands, in order to create an adequate management plan.
- Habitat mapping in accordance with the latest approaches.
- Provision of age-continuity of oaks is important for the long-term existence of *Osmoderma barnabita* in nature reserve. This can be achieved by preserving oak trees of all ages, both in forest and outside the forest.
- Felling of shrubs and low-value trees is necessary in and around oxbow lakes, especially in oxbow lakes which dry out, with the aim of reducing the accumulation of organic (leaf, twig) litter and filling up with organic matter.
- Creation of open littoral zone is necessary for aquatic invertebrates (dragonflies, caddisflies, mayflies etc) emerging to adults.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	7.8	<1	Favourable.	Non-intervention.		7.8
91F0	Riparian mixed forests	18.8	2.1	Favourable.	Non-intervention.		18.8
6530*	Fennoscandian wooded meadows	Not known		Poor.	Restoration. Maintenance.	Unknown	24.6
6510	Lowland hay meadows	186.1	21.4	Favourable.	Restoration. Maintenance.	At least 30	186.1
6450	Northern boreal alluvial meadows	433.7	50.0	Favourable.	Restoration. Maintenance.	At least 90	433.7
6430	Hydrophilous tall herb fringe communities	1	<1	Poor.	Restoration. Maintenance.	Unknown	Unknown
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	25.4	2.9	Favourable.	Restoration. Maintenance.	At least 2.5	25.4
6230*	Species-rich *Nardus* grasslands	1.4	<1	Poor.	Restoration. Maintenance.	Unknown	1.4
6120*	Xeric sand calcareous grasslands	5.7	<1	Favourable.	Restoration. Maintenance.	Unknown	5.7
3260	Natural river reaches and river riffles	10.0	1.1	Poor.	Removal of beaver dams; maintenance of water discharge. Removal or reduction of large woody debris in sites where they promote shore erosion, as well as in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality (habitat of *Unio crassus*; suitable for spawning of *Lampetra planeri*).		
3150	Natural eutrophic lakes	3.8	<1	Poor.	Felling of shrubs and low-quality trees in oxbow lakes and their surroundings. Creation of open littoral zones suitable for aquatic invertebrates (dragonflies, caddisflies, mayflies etc) emerging to adults.	3.8 On necessity	

Information of the Nature management plan from year 2005 is outdated, and grassland restoration sites must be specified during the new inventory of grasslands.

Skrundas zivju dīķi | *Nature Reserve (LV0535600)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Skrunda municipality, Skrunda town with rural territory.

AREA: 496 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Skrundas zivju dīķi Nature Reserve includes an actively managed, extensive fish pond complex (fish farm) near the town of Skrunda, as well as floodplain grasslands between the ponds, and small fragments of surrounding forests. Fisheries have been operating since 1947, currently specializing in full-cycle carp growing. One of the main threats to fish resources is cormorants *Phalacrocorax carbo*.

The area is located in a region where semi-natural grasslands are highly fragmented. Therefore, although the territory is not among the most important areas for grassland conservation at a national scale, their conservation is important for the biodiversity of region and for the nature park.

Fish ponds are important foraging and staging places for birds during the spring and autumn migration. The territory is particularly important for *Cygnus cygnus* during the moulting and for *Haliaeetus albicilla* as a foraging site. Several species of waders can be found here, including *Philomachus pugnax, Tringa glareola*, as well as large numbers of *Anser albifrons* and *Anser fabalis*.

Several bat species use the ponds for foraging, for example, *Myotis dasycneme, Nyctalus noctula, Eptesicus nilssonii, Myotis daubentoni,* and *Pipistrellus nathusii*.

2. Threats to habitat and species conservation

Lack of grassland management; abandonment.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage habitats, except management of grasslands.
- According to Rural Support Service, in 2014 78 % of habitat type 6450 *Northern boreal alluvial meadows* and the whole area of 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". The influence of management of grasslands has not been evaluated.

4. Priorities of management and conservation

Grassland restoration and management in a favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

Grassland maps are outdated and do not show the current situation. A repeated inventory of grasslands is necessary, and it must include the evaluation of necessity of grassland restoration measures, and a plan (including the suitability of hydrological regime for grassland-feeding waders and for the conservation of semi-natural grasslands).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	53.9	10.9	Poor.	Maintenance. Restoration.	11.8	53.9
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.4	›1	Poor.	Maintenance. Restoration.	0.0	0.4

Skujaines un Svētaines ieleja | *Nature Reserve (LV0530000)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Tērvete municipality Tērvete and Bukaiši rural territories; Dobele municipality Penkule rural territory.

AREA: 130 ha.

NATURE MANAGEMENT PLAN: 2011 (2010–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE AREAS: Klūnu atsegums Geological and Geomorphological Nature Monument.

Skujaines un Svētaines ieleja Nature Reserve includes unmodified part of Skujaine and Svētaine rivers, and their slopes with spring discharges and rock outcrops. The territory is an aggregation site for natural habitats and native species in a region where land use for intensive agriculture is characteristic. In total, 10 EU protected habitat types have been found in the territory. The most part of the nature reserve is occupied by forests, and large part of them is protected habitats – western Taïga, alluvial forests, forests of slopes. However, forests are fragmented, and clear-felling has been carried out in part of old woodlands in late 1990s and early 2000s. Valleys of Skujaine and Svētaine rivers with unmodified reaches and riffles are the main value and attraction of the territory. In smaller areas, also grasslands and alkaline fens can be found. Spring discharges are located both in the nature reserve and outside of it. A particularly valuable alkaline fen (2.2 hectares) is located outside the nature reserve (at its northern border). It lays on a gentle slope, and overgrows with shrubs and reeds (*Phragmites australis*) due to lack of management. The area of semi-natural grasslands in the nature reserve is small. However, they may function as stepping stones facilitating dispersal of grassland species, particularly because semi-natural grasslands in Zemgale Region are few and fragmented.

On the right bank of Skujaine river, there are outcrops of three types of bedrocks (sandstone, dolomitic marlstone, dolomite). The largest one is the Klūnu outcrop, its height reaches 4 m, width - 5 m. The development of outcrops is a dynamic process, determined by the influence of river. There are also outcrops in a slope of a quarry, on the border of the nature reserve. Several outcrops are located downstream of Skujaine river, outside the nature reserve.

In total, 29 rare and protected species have been found in the nature reserve, for example, plant species *Astrantia major* (can be found only in Zemgale Region), *Ranunculus lanuginosus, Dactylorhiza incarnata, Primula farinosa*. Rare and protected invertebrate species include *Unio crassus, Osmoderma barnabita*. The nature reserve is a foraging site for *Ciconia nigra, Bubo bubo, Mergus merganser. Botaurus stellaris* and *Alcedo atthis* are breeding in the nature reserve. Otter *Lutra lutra* lives in rivers.

2. Threats to habitat and species conservation

- There are artificial inundations in the Skujaine upstream, regulated by sluices. In low-water period, even short-time water deficiency can destroy *Unio crassus* habitats.
- The fast flow of Skujaine river stream is encumbered by numerous beaver dams and clogs of large woody debris which promote slowdown of the water flow, rise of the water temperature, decrease of dissolved oxygen, shore erosion or paludification (depending of the longitudinal profile of river reach), cover of boulders and gravel with sediments, and disappearance of habitats suitable for oxygen-sensitive invertebrates, including *Unio crassus*.
- There is a manufacturing site upstream of the nature reserve, next to the rock outcrop. Garbage from the manufacturing site can sometimes be detected next to the cliff outcrop as well in the river.
- Large colonies of invasive plant species *Heracleum sosnowskyi* are located on the northern border of nature reserve. The spread of this species in the territory of nature reserve is possible as individual plants have already been found in the territory.
- Forest habitat fragmentation is increased due to plantations of pines and spruces (*Picea abies*).

3. Existing management of the protected habitats and its assessment

In 2010, wet grasslands in the nature reserve were mown, and grass was removed. So far no other measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation. Increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat, or by promotion of development of mixed coniferous-broadleaf woodlands by selective felling.
- Provision of water discharge by removal of large woody debris, beaver dams and garbage from Skujaine and Svētaine rivers in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality (habitat of *Unio crassus*); limitation of the amount of beavers.
- Elimination of *Heracleum sosnowskyi* in nature reserve and in vicinity of its borders.
- Conservation of *Osmoderma barnabita* population by targeted management.
- Maintenance of semi-natural grasslands in their whole current area; restoration of abandoned grassland areas.
- Evaluation of the current borders of nature reserve and possible inclusion of an alkaline fen located outside the nature reserve (7230) (according to recommendations included in nature management plan).

5. Necessary management and conservation measures

5.1. General measures

- Elimination of *Heracleum sosnowskyi* in nature reserve and adjoining territories – in area of at least 3.6 ha (according to the situation on site). Plants must be destroyed mechanically – by repeated root cutting ~ 20 cm deep.
- Modification of borders of the nature reserve by inclusion of EU protected habitat type 7230 *Alkaline fens* in area of 2.3 hectares (at the northern border of nature reserve). Here, five protected plant species and two protected invertebrate species (species of the Habitats Directive Annex II – *Vertigo genesii* and *Vertigo angustior*) have been found. This way, the importance of nature reserve for the conservation of alkaline habitats characteristic for Skujaine river valley will be increased.
- To protect the most valuable trees from beavers, their trunks must be wrapped with wire mesh. Later, trees must be monitored, to avoid interfering with tree growth.

5.2. Specific measures

5.2.1. Species

- There is a vital *Osmoderma barnabita* population (25 – 30 specimens). The liberation (insolation improvement) of *Tilia cordata* trees inhabited by *Osmoderma barnabita* is necessary, as well as liberation of potential trees in the vicinity (in radius of 200 meters). Trees and shrubs below the larger trees must be removed in an area of their double crown radius. Measure must be repeated on necessity (when trunks of wide-crowned trees are shaded by young trees and shrubs, or when new trees reach the crown of large tree).
- One *Alcedo atthis* pair is breeding in the territory. For the conservation of this species habitat, the inundation of river riffles must be avoided – the number of beavers must be reduced and beaver dams in river riffle areas must be removed. For timely removal of beaver dams, riffle areas must be monitored.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	31.2	24.0	Favourable.	Non-intervention.		31.2
9180*	Slope forests	8.1	6.2	Favourable.	Non-intervention.		8.1
91E0*	Alluvial forests	32.1	24.7	Poor.	Non-intervention.		32.1
9000	Potential Protected woodland habitat	21.8	16.7	-	Non-intervention. Selective felling in new forests, in order to promote the admixture of deciduous and broadleaved trees.	21.8	7.0
8220	Siliceous rocky slopes	0.02	<1	Poor.	Regular collection of waste; prevention of unauthorized disposal of waste.	0.02	
7160	Fennoscandian mineral-rich springs and springfens	0.3	<1	Favourable.	Non-intervention.		0.3
7220*	Petrifying springs	0.8	<1	Favourable.	Non-intervention.		0.8
7230	Alkaline fens	0.33	<1	Favourable.	Non-intervention. Felling of shrubs, mowing (with grass removal).		0.33 2.2
6210	Semi-natural dry calcareous grasslands	0.1	<1	Bad.	Restoration. Maintenance.	0.1	0.1
6410	*Molinia* meadows	0.2	<1	Bad.	Restoration. Maintenance.	0.2	0.2
3260	Natural river reaches and river riffles	3.0	2.3	Poor.	Provision of water discharge: removal of clogs of fallen logs and sediments; demolition of beaver dams in Skujaine river; further monitoring of riffle areas and maintenance on necessity. Movement of tractors in riverbeds in order to collect logs is permissible. Removal of large-size garbage from riverbeds.	3.0	

Slapjo salu purvs | *Nature Reserve (LV0506200)*

1. Brief description

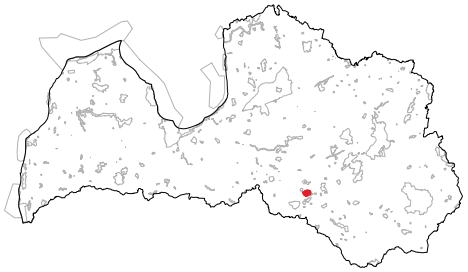
YEAR OF FOUNDATION: 1977.

LOCATION: Sala municipality Sala rural territory; Viesīte municipality Viesīte rural territory.

AREA: 1052 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Slapjo salu purvs Nature Reserve includes two eastern-type raised bogs with *Chamaedaphne calyculata*. Bogs are separated by a narrow belt of bog woodlands. Bog woodlands, small areas of swamp woods and western Taïga are located along the edges of bogs. There are no signs of significant degradation in the raised bog. On bog edges, as well as around the bog lake, there are small areas with transition mires and quaking bogs. In the periphery, expansion of fast-growing pines can be observed.

Examples of protected plant species are *Lathyrus niger, Cypripedium calceolus*, moss *Bazzania trilobata*. The territory is important for several protected bird species such as *Bonasa bonasia*, *Pernis apivorus, Tetrao tetrix*, and *Tetrao urogallus*. Near water, protected butterfly *Lycaena dispar* can be found; *Clausilia pumila* – in swamp woods.

2. Threats to habitat and species conservation

Influence of drainage caused by ditches on the southern and eastern borders of the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural mire and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Research of raised bog vegetation and hydrological regime; rewetting in raised bog habitats, if possible.

5. Necessary management and conservation measures

5.1. General measures

Investigation of the hydrological regime; development of building project if it is concluded that rewetting is possible. This also includes the preparation of a monitoring program and methodology for evaluation of the restoration success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	118.8	11.3	Poor.	Non-intervention except rewetting (ditch filling up or blocking).	According to research results	118.8
9080*	Tilio-Acerion forests of slopes, screes and ravines	8.1	<1	Poor.	Non-intervention.		8.1
9010*	Western Taïga	2.4	<1	Favourable.	Non-intervention.		2.4
7140	Transition mires and quaking bogs	11.2	1.1	Favourable.	Non-intervention.		11.2
7120	Degraded raised bogs	18.5	1.8	Poor.	Rewetting (ditch filling up or blocking, if possible).	18.5	
7110*	Active raised bogs	681.8	64.8	Favourable.	Non-intervention.		681.8
3160	Natural dystrophic lakes and ponds	0.5	<1	Favourable.	Non-intervention.		0.5

Sloku purvs | *Nature Reserve (LV0501200)*

1. Brief description

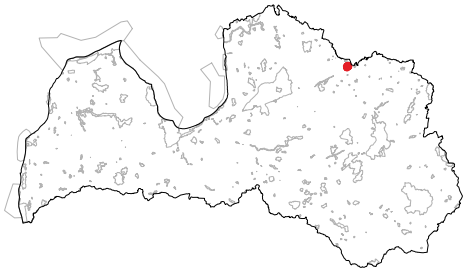
YEAR OF FOUNDATION: 1977.

LOCATION: Ape municipality Gaujiena rural territory.

AREA: 528 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Four EU habitat types are found in the Sloku purvs Nature Reserve – raised bog, bog woodlands, western Taïga (on mineral-ground islets in mire), as well as transition mire in the eastern part of the territory. Vegetation of raised bog is of eastern-type with *Chamaedaphne calyculata*. Examples of rare species in the territory include *Carex montana* and moss *Calypogeia sphagnicola*. Butterfly *Coenonympha hero* can be found in woodlands surrounding the mire.

The territory is important for protected bird species such as *Tetrao tetrix* and *Picus canus*. Also large mammals such as *Canis lupus* and *Lynx lynx* can be found here.

2. Threats to habitat and species conservation

- Influence of previous drainage on mire and bog woodland habitats.
- There are dolomite quarries in the surrounding territory, and it is also planned to establish a new quarry near the nature reserve. The lowering of water table and negative influence on mire hydrological regime is expected.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Restoration of optimal hydrological regime in mire habitats.
- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological research and development of a construction project if it is concluded that rewetting is necessary. This measure includes also development of a monitoring programme and methods for the evaluation of restoration success.
- Continuation to monitor potential influence of dolomite extraction on mire habitats.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	85.6	16.2	Poor.	Non-intervention.		85.6
9010*	Western Taïga	2.2	<1	Poor.	Non-intervention.		2.2
7140	Transition mires and quaking bogs	11.3	2.1	Favourable.	Complex rewetting in mire and bog woodlands: ditch blocking or filling up.	11.3	
7110*	Active raised bogs	387.6	73.4	Poor.	Rewetting (ditch damming or filling up) in northern, southern and south-eastern part of the territory. Logging or thinning (on necessity).	387.6	

Sofikalna meži | *Nature Reserve (LV0535700)*

1. Brief description

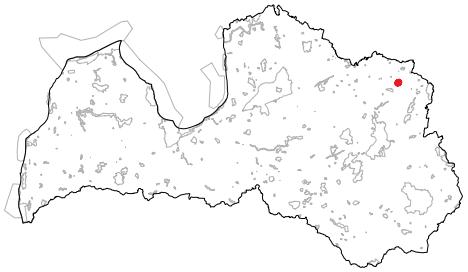
YEAR OF FOUNDATION: 2004.

LOCATION: Alūksne municipality Mālupe rural territory.

AREA: 52 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Sofikalna meži Nature Reserve is located in a large forest massif which is rich in biologically valuable, old woodlands. The nature reserve is an aggregation site of outstanding natural woodland habitats – old western Taïga with *Populus tremula* and *Picea abies*. In longitudinal direction, territory is crossed by the regulated watercourse. On its banks, periodically flooded alluvial forests with Alnus glutinosa, *Alnus incana, P. tremula* and *Fraxinus excelsior* are located. Protected plant species found in forests are *Carex disperma* and *Poa remota*. Rare moss species *Lejeunea cavifolia* can be found on stems of deciduous trees, and *Anastrophyllum hellerianum* on logs of coniferous trees.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	34.5	66.4	Poor.	Non-intervention.		34.5
91E0*	Alluvial forests	14.5	27.9	Poor.	Non-intervention.		14.5

Spinduļu meži | *Nature Reserve (LV0529500)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Amata municipality Zaube rural territory.

AREA: 132 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2014).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Spinduļu meži Nature Reserve is located in a large, hilly forest massif south of the Amata River, and it includes valuable forest habitats. Nearby is located Amatas paleja Nature Reserve – protected nature territory of local significance. There are five EU protected habitat types which together occupy more than 60 % of the territory. Transition mires and quaking bogs are located in the terrain depression in the central part of the nature reserve. Small natural dystrophic lake is located in the western part.

Old woodlands are important habitat for rare and protected bird species, such as *Bonasa bonasia, Pernis apivorus, Picoides tridactylus,* and *Dendrocopus leucotos*. The breeding of *Ciconia nigra* has been observed previously in the territory, and the woodland is still suitable for the breeding of this species. In several places in woodlands, very rare vascular plant species can be found - *Carex disperma* and *Carex paupercula*. Also *Listera cordata, Corallorhiza trifida, Glyceria lithuanica* grow in wet forests. A sedge species very rare in Latvia, *Carex rhynchophysa* is found here. *Hammarbya paludosa* and *Salix myrtilloides* grow in the small transitional mires. Old, large spruce logs are habitats for a very rare mushroom species *Astorodon ferruginosus*. This species is characteristic only to old and very wet spruce forests which have not been clear-felled for a long time.

2. Threats to habitat and species conservation

The high proportion of spruces (*Picea abies*) is adversely affecting those rare species whose existence depends on the presence of deciduous trees.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Non-intervention in the development of middle-aged woodlands which have not yet reached the biodiversity of protected woodland habitats, in order to stimulate the increase of the area of protected habitats and to decrease fragmentation. Development towards habitat type "Western Taïga" is expected.
- Creation of future habitats of deciduous trees by specialised management of new spruce plantations, in order to promote the development of habitat and to decrease fragmentation. The development towards habitat type *"Fennoscandian herb-rich forests with* Picea abies" is expected.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	24.3	18.4	Favourable.	Non-intervention.		24.3
9080*	Fennoscandian deciduous swamp woods	4.9	3.7	Poor.	Non-intervention.		5
9010	Western Taïga	34.6	26.2	Favourable.	Non-intervention.		34.6
9000	Potential Protected woodland habitat	48.0	36.4	-	Selective thinning in new spruce plantations, in order to increase proportion of broadleaved trees to at least 30%. Detailed measures in forest compartments are described in Nature management plan.	48.0	2.0
7140	Transition mires and quaking bogs	9.5	7.2	Favourable.	Non-intervention.		9.5
3160	Natural dystrophic lakes and ponds	0.3	<1	Favourable.	Non-intervention.		0.3

Spuļģu purvs | *Nature Reserve (LV0505800)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Jēkabpils municipality Kalna rural territory.

AREA: 307 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Spuļģu purvs Nature Reserve is located in area rich in mires and forests, in Sēlija Region, between Biržai town (Lithuania) and Daugava River. It includes the southern part of the Spuldzenieku mire and the surrounding woodlands. In total, six EU protected mire and forest habitats have been found. The most important bird species in the area are *Bonasa bonasia, Tetrao tetrix, Dendrocopos leucotos*, and *Dryocopus martius*. Moss species *Anastrophyllum hellerianum, Odontoschisma denudatum* grow in forests, as well as other rare and protected plant species.

2. Threats to habitat and species conservation

Habitats are threatened due to changes in hydrological regime. Drainage carried out in the bog adjacent to the nature reserve and in nearby areas has adversely affected the entire mire complex. The negative impact is ongoing, and bog overgrows with trees.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting and water table stabilization in wet forests and parts of mire which are influenced by drainage.
- Improvement of the quality of raised bog by removing trees and thereby ensuring favourable conditions for the protected bird species and other species.
- Undisturbed course of natural processes in natural mire and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Only the southern part of the mire is included in the nature reserve, and therefore the restoration and optimal protection of the entire mire ecosystem can not be ensured. The borders should be reviewed and expanded. The inclusion of entire cadastral unit in the nature reserve would be optimal.
- It is necessary to investigate the hydrological regime and, if necessary, prepare a building project for rewetting and for water level stabilization in the affected parts of mire and bog woodlands.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	77.6	25	Poor.	Non-intervention, except rewetting in complex with mires.	77.6	
9080*	Fennoscandian deciduous swamp woods	6.2	2	Poor.	Non-intervention.		6.2
9010*	Western Taïga	4.2	1	Poor.	Non-intervention.		4.2
7110*	Active raised bogs	71.7	23	Poor.	Rewetting (ditch blocking or filling up). Tree removal (area will be specified after evaluation on site).	71.7	
7120	Degraded raised bogs	38.6	12.6	Bad.	Rewetting (ditch blocking or filling up). Tree removal (area will be specified after evaluation on site).	38.6	

Starinas mežs | *Nature Reserve (LV0530300)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Krāslava municipality Indra rural territory.

AREA: 157 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Starinas mežs Nature Reserve includes natural old broad-leaved deciduous forests and outstanding forests on slopes in the west side of Lake Ostrovna, where they form a compact, small forest area. Woodlands are dominated by deciduous trees – *Fraxinus excelsior, Populus tremula, Tilia cordata, Quercus robur.* There is an abundance of structures characteristic to natural forests – logs, old trees, mosses on woody debris, and other elements of biodiversity. Just before the establishment of nature reserve, the area was clear-felled; therefore part of the nature reserve is covered by new woodlands where it is necessary to create conditions for the development of biodiverse woodlands and habitats suitable for protected species.

The territory together with the nearby Lake Ostrovna forms a very scenic landscape. A particular value of the nature reserve is the west coast of Lake Ostrovna, with a relatively high terrain, divided by side-ravines. There are slope forests with rare species such as *Bromopsis benekenii*. Nature reserve includes also the lake island, which is covered by *Tilia cordata – Populus tremula* woodland. Mixed broadleaved forests are an important habitat for rare and protected moss species *Dicranum viride* which has several localities here. Also an abundant locality of *Galium schultesii* can be found in the area.

2. Threats to habitat and species conservation

Removal of dead wood, withered and withering trees, as well as felling of biologically old trees (including beavers cutting *Populus tremula* trees on the island) can impair the structural quality of forest habitats and negatively influence the habitats of associated species.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of fragmentation of woodland habitats by increasing the area and integrity of protected habitats, and by providing non-intervention in woodlands which have not yet reached the quality of protected habitats.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	8.1	5.2	Favourable.	Non-intervention.		8.1
9020*	Broad-leaved deciduous forests	97.4	62.0	Favourable.	Non-intervention.		97.4
9000	Potential Protected woodland habitat	6.9	4.4	-	Non-intervention.		6.9

Stiklu purvi | *Nature Reserve (LV0518900)*

1. Brief description

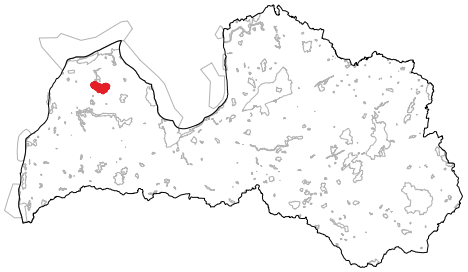
YEAR OF FOUNDATION: 1977.

LOCATION: Talsi municipality Valdgale rural territory; Ventspils municipality Usma and Puze rural territories.

AREA: 7245 ha.

NATURE MANAGEMENT PLAN: 2006 (2008–2018).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 81 of 25 January 2011, Regulation on Individual Protection and Use of the Stiklu Purvi Nature Reserve.



Stiklu Purvi Nature Reserve is the largest massif of raised bogs in Western Latvia. It consists of several separate raised bogs – Vasenieku, Vanagpurvs, Zvaguļu, Pumpuru Mires, and part of Sēme Mire which is not influenced by peat extraction. The surroundings of mires, and partly also the mires have been drained in the 20th century. Sala Mire (south-west from Sēme Mire) is located outside the nature reserve, it is drained and now used for peat extraction.

Nature reserve includes several lakes, fens, transition mires on the shores of the lakes and edges of bogs, as well as bog woodlands, western Taïga and swamp woods. In terms of biodiversity, raised bogs with hollows and pools with constant water are very important. Vasenieku Mire is particularly rich in hollows. There are plant communities which are typical to Coastal Lowland, with protected plant species *Trichophorum cespitosum*. Both mires and surrounding forests are particularly suitable for breeding and migratory birds. Stiklu Mire is an Internationally important bird site in Latvia (LV016).

In total, 12 EU protected habitat types have been found in the nature reserve; the most important ones are active raised bogs and bog woodlands. The currently known area of semi-natural grasslands is small, however, cartographic material suggests that the botanically diverse grasslands of habitat type 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) should be present in the nature reserve (drained with shallow ditch systems). The territory is located in a region where natural grasslands are heavily fragmented. Although the territory is not important for conservation of grasslands at a national scale, their conservation is important for biodiversity conservation of North-Kurzeme region, and locally, for conservation of biodiversity in nature reserve. The nature reserve is a habitat for several protected and rare species - there are 24 protected species of vascular plants, 24 moss, two snail, 17 invertebrate, 29 bird and eight protected mammal species. Several micro-reserves for bird species have been established in both the nature reserve and the adjoining forests. The most important bird species are *Bonasa bonasia, Ciconia nigra, Haliaeetus albicilla, Pernis apivorus, Tetrao tetrix, Tetrao urogallus, Botaurus stellaris, Crex crex, Pluvialis apricaria, Tringa glareola, Glaucidium passerinum, Aegolius funereus,* and others.

One of the few localities of *Cladium mariscus* located outside the Coastal Lowland is located in the nature reserve, as well as localities of *Sphagnum lindbergii* and *Eleocharis multicaulis*. Plant species which are rare for western Latvia are *Cardamine flexuosa, Juncus bulbosus, Juncus squarrosus, Viola uliginosa*. Also *Carex buxbaumii, Carex paupercula,* several species of orchids, such as *Dactylorhiza baltica, Hammarbya paludosa* and *Gymnadenia conopsea* grow here.

In some parts of the nature reserve, middle-aged and old oaks (*Quercus robur*) can be found. Probably, there used to be a wooded grassland with solitary wide-crowned oaks in the past, but now spruces and pines are planted in some places. *Clausilia bidentata* has been found on the trunks of oaks, and *Osmoderma barnabita* in the direct vicinity. Examples of other protected invertebrate species are *Necydalis major, Aromia moschata, Limenitis populi, Lopinga achine, Dolomedes plantarius*.

The particular value of the nature reserve is the eight lakes, which are habitats for Cottus gobio and Lutra lutra.

2. Threats to habitat and species conservation

- Drainage of mires and bog woodlands has had an impact on the quality of mires and forest habitats, and has contributed to the overgrowth of capercaillie Tetrao urogallus leks with spruces (*Picea abies*).
- Overgrowth of semi-natural grassland habitats due to lack of management.
- As a result of activities of beavers (*Castor fiber*), water levels are elevated in Velnezers and Seklene lakes which are the most important lakes of the nature reserve in terms of biodiversity. In the beginning of 21st century, several rare and protected plant species

of the *Lobelia-Isoëtes* complex and their abundant locality has disappeared completely.

3. Existing management of the protected habitats and its assessment

- In 2006, in scope of EC LIFE Project "Implementation of Mire Habitat Management Plan for Latvia" (LIFE04 NAT/LV/000196) water level was stabilized in Vasenieku Mire – dams were constructed and excess trees were removed in the vicinity of ditches, resulting in a successful restoration of the mire.
- In Forests, improvement of *Tetrao urogallus* leks and insolation improvement for oaks was carried out in 2011. The influence of these measures to the overall quality of habitats is assessed as neutral.
- According to Rural Support Service, in 2014 more than half of the currently known semi-natural grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Undisturbed course of natural processes in habitats, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by ensuring non-intervention in woodlands which have not reached the quality of protected habitats.
- Rewetting in Pumpuru mire (affected by drainage).
- Improvement and maintenance of *Tetrao urogallus* leks in favourable conservation status.
- Restoration and management of semi-natural grasslands in maximum possible area in their historical sites.
- Regular monitoring of functioning of ditch dams; their reparation if necessary – in Vasenieku Mire and also in Pumpuri Mire if rewetting is carried out.
- Restoration and maintenance of optimal hydrological regime in wet habitats.
- Optimal water level in lakes and watercourses.

5. Necessary management and conservation measures

5.1. General measures

- Amendments of the Individual regulations on protection and use, in order to include part of Sēme Mire which was incorporated in the nature reserve in year 2010, and for the planning of reduction of fragmentation by ensuring non-intervention in particular territories.
- Hydrological research in Pumpuru Mire; development of a construction project for the rewetting.
- Research and recommendations for the water level lowering in Seklenes and Velnezers lakes.
- Assessment of rewetting success by continuing the vegetation monitoring started in 2007.
- Inventory of grasslands; development of grassland restoration and management plan. The establishment of grassland habitats in the territories of the historic grasslands should be considered. Restoration of currently remained existing grasslands is the priority.

5.2. Specific measures

5.2.1. Species

There are five lek sites of *Tetrao urogallus* within the nature reserve. Necessary conservation measures include felling of *Picea abies* advance growth.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	939.4	13.0	Poor.	Non-intervention. Evaluation of the necessity of rewetting.		935.4
9080*	Fennoscandian deciduous swamp woods	4.0	<1	Poor.	Non-intervention.		4.0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	71.8	1.0	Favourable, Poor.	Non-intervention.		71.8
9000	Potential Protected woodland habitat	255.5	3.5	-	Non-intervention.		255.5
7140	Transition mires and quaking bogs	27.2	<1		Non-intervention.		27.2
7120	Degraded raised bogs	106.1	1.5	Poor.	Habitat mapping in order to specify habitat areas – in Pumpuru and Vasenieku Mires. Rewetting in Pumpuru Mire. Non-intervention and reparation of dams if necessary in Vasenieki and Pumpuru Mires.	According to research results.	
7110*	Active raised bogs	1712.4	23.6	Favourable, Poor.	Rewetting in Pumpuru Mire. Non-intervention and reparation of dams if necessary.	According to research results.	
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	9.0	<1	Bad.	Restoration. Maintenance.	5.0	9.0
6410	*Molinia* meadows	Unknown.		Bad.	Restoration. Maintenance.	Unknown.	Unknown.
6510	Lowland hay meadows	2.5	<1	Bad.	Restoration. Maintenance.	2.5	2.5
3260	Natural river reaches and river riffles	0.3	<1	Poor.	Control of beaver activities in Veciere river.		0.3
3160	Natural dystrophic lakes and ponds	12.0	<1	Poor.	Non-intervention (Stūriņezers, Līdakezers lakes).	12.0	
3150	Natural eutrophic lakes	58.0	<1	Poor to bad.	Maintenance of bathing site in Dižiere, Seklene. Reduction of population of beavers; lowering of water levels elevated by beavers.		0.2

One-time grassland restoration measures are necessary in an area of at least 65 hectares (including historical areas of overgrowing and overgrown grasslands). Measures and sites of grassland restoration include not only felling of trees and shrubs, root shredding, restorative grazing or mowing, but also regulation of hydrological regime (restoration of shallow ditch systems).

Stompaku purvi | *Nature Reserve (LV0502600)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Balvi municipality Lazduleja and Bērzkalne rural territories; Viļaka municipality Susāji and Medņeva rural territories.

AREA: 2978 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 1315 of 10 November 2009, Regulation on Individual Protection and Use of the Stompaku Purvi Nature Reserve.

Stompaku purvi Nature Reserve includes the large Stompaku and Mūrnieku Mires which are surrounded and connected with belts of woodlands. Woodlands are of various types and include bog woodlands as well as deciduous and mixed forests. A network of ditches has been established in Stompaku Mire and in some parts of Lielais Mire but surrounding forests have never been drained. The territory is affected by forestry activities – large-scale logging was carried out after the drainage. Well-preserved woodlands of *Pinus sylvestris* and *Populus tremula* can be found on mineral-ground islets in mire. Five EU protected habitat types are represented in the nature reserve and its surroundings. The nature reserve is especially important for the protection of raised bogs of eastern type.

Rare species which are protected in Latvia and in EU can be found in the nature reserve. There are 25 bird species which are protected in Latvia, 22 of them are protected also in EU. Nine micro-reserves are established for bird protection. Six of them are for protection of capercaillie *Tetrao urogallus* leks, others are for protection of *Aquila chrysaetos* and *Dendrocopus leucotos*. The territory is important also for birds *Bonasa bonasia, Ciconia nigra, Pernis apivorus, Tetrao tetrix, Falco columbarius,* and others.

Eight protected plant species have been found in the territory. An abundant locality of *Salix myrtilloides*, as well as several orchid species such as *Dactylorhiza maculata, D. baltica, D. incarnata* can be found in transition mires. Five protected invertebrate species have been found in the territory – *Apatura iris, Apatura ilia* and others. The nature reserve is important for large mammals. Migration of *Ursus arctos* has been observed in the territory.

2. Threats to habitat and species conservation

Mires and bog woodlands are affected negatively by previous drainage and changes in hydrological regime.

3. Existing management of the protected habitats and its assessment

In 2012, rewetting was carried out – 28 wooden dams were constructed in sites specified in the Nature management plan. Dams were manufactured by JSC "Latvijas Valsts Meži", in scope of the habitat management annual plan. Dams fulfil their function. Broader evaluation has not been carried out.

4. Priorities of management and conservation

- Optimal mire hydrological regime.
- Maintenance of capercaillie *Tetrao urogallus* leks; optimal conditions for the species.
- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Maintenance of *Tetrao urogallus* leks; hydrological regime regulation in lek areas according to recommendations of bird expert M. Strazds and guidelines of JSC "Latvijas Valsts Meži" ("Guidelines for forest management in different areas of management – in eco-forests for nature, recreation and capercaillie leks").
- Annual or seasonal (after spring floods or prolonged rain periods) monitoring of dams. Evaluation of how dams influence the hydrological regime in the territory. Assessment of the efficiency of existing dams; decision whether some of the dams have to be repaired or not because the restoration of mire is already ongoing.

- Hydrological regime monitoring to evaluate water table changes after the damming of drainage ditches.
- Monitoring of the habitat restoration efficiency in the nature reserve.

5.2. Specific measures

5.2.1. Species

There are 15 – 26 *Tetrao urogallus* males in the nature reserve. Continuous management (felling of understory) is necessary in six leks.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	335.6	11.3	Poor.	Non-intervention, except maintenance of existing dams.		335.6
9010*	Western Taïga	107.4	3.6	Poor.	Non-intervention.		107.4
7140	Transition mires and quaking bogs	170.8	5.7	Poor.	Non-intervention, except maintenance of existing dams.		170.8
7120	Degraded raised bogs	210.1	7.1	Poor.	Non-intervention, except maintenance of existing dams.		210.1
7110*	Active raised bogs	1465.3	49.2	Poor.	Non-intervention, except maintenance of existing dams. Blocking or filling up of drainage dams in 806th block, compartments 283 and 291.	200.0	1264.3

Supes purvs | *Nature Reserve (LV0505500)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Viesīte municipality Viesīte town with rural territory and Elkšņi rural territory.

AREA: 712 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Supes purvs Nature Reserve includes raised bog with *Depressions on peat substrates of the* Rhynchosporion, surrounded by bog woodland, and natural eutrophic lake (Lake Supe) in the middle of the mire. A deep, fast flowing ditch, also called Raktupīte, flows out of the Lake Supe. There are quite a lot of ditches in the territory of the reserve; some of them are old and overgrown with *Eriophorum* spp. and *Sphagnum*. The drainage carried out years ago has adversely affected the mire which is rather overgrown; there are many new, fast-growing trees among the old, slowly growing pines (*Pinus sylvestris*).

Western Taïga covers a small area. In the southeast the nature reserve borders with a micro-reserve for the protection of *Pandion haliaetus*. The most important bird species are *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus* and *Pluvialis apricaria*. Wet habitats are rich in rare and protected moss species, such as *Odontoschisma denudatum* un *Calypogeia sphagnicola*.

2. Threats to habitat and species conservation

Wet habitats are still being degraded by past drainage. Drainage ditches in mire and its edges are still functioning.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Establishment of adjustable dams in Raktupīte river in a way which prevents wetting of the mineralised banks, and following nutrient leaching and lake eutrophication. The dam must maintain the water level in lake during the low water level period. At high water level period, significant water level rise in the lake must be prevented.
- Rewetting and water level stabilization in wet forests and in parts of mire which are influenced by drainage (priority: rewetting in degraded part of raised bog).
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Extension of the nature reserve area in order to include the whole mire, its adjoining wet forests and also micro-reserves located east from the nature reserve.
- Hydrological regime research, including hydrological measurements throughout the year in order to determine the lake's water supply type and water level fluctuations. Development of a construction project for rewetting and stabilization of water level in bog woodlands and in parts of mire which are influenced by drainage.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	184.3	25.9	Poor.	Non-intervention, except rewetting in complex with mire.	According to research results.	184.3
9010*	Western Taïga	1.7	<1	Favourable.	Non-intervention.		1.7
7120	Degraded raised bogs	58.8	8.2	Poor.	Rewetting (ditch blocking or filling).	According to research results.	
7110*	Active raised bogs	259.4	36.4	Favourable.	Rewetting (ditch blocking or filling).	According to research results.	
3260	Natural river reaches and river riffles	1.0	<1	Poor.	Non-intervention.		1.0
3150	Natural eutrophic lakes	36.9	5.2	Favourable.	Non-intervention.		36.9

Sventājas upes ieleja | *Nature Reserve (LV0526400)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Rucava municipality Rucava rural territory.

AREA: 413.4 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Sventājas upes ieleja Nature Reserve includes a sector of Sventāja river valley, and it is one of the few places in Latvia where the habitat type protected in Latvia and EU *Inland dunes with open* Corynephorus *and* Agrostis *grasslands* can be found, as well as habitat which can be found only in the western part of Latvia - broadleaf forests with *Carpinus betulus*. Large areas in the territory are occupied by overgrown alluvial grasslands, lowland hay meadows, species-rich dry to mesic grasslands; smaller areas are occupied by xeric sand calcareous grasslands and species-rich *Nardus* grasslands. Also dry heaths can be found in small areas. Wooded meadows with groups of *Carpinus betulus* and other tree species are a particular value of the territory. Based on the currently known size of this habitat type, the territory is the third most important in the country (4% of the total habitat area in Natura 2000 areas). In general, the territory is very important for ensuring the landscape-ecological connectivity of grasslands and as a species dispersal corridor in the southern part of Kurzeme Geobotanical District. Along the river, oak (*Quercus robur*) forests with *Carpinus betulus* can be found, as well as remnant oxbow lakes in the floodplain part of the river.

There are 15 EU protected habitat types in the territory, and many plant and animal species which are rare and protected in Latvia. Distribution of these species is associated to the southern and south-western part of the country. Sventāja river valley is one of the few localities of plant *Scutellaria hastifolia*. In dry inland dunes, *Corynephorus canescens* and *Filago minima* can be found, in xeric grasslands and pine (*Pinus sylvestris*) woodlands - *Peucedanum oreoselinum, Trifolium campestre*. In mesic grasslands - *Serratula tinctoria*. In slope forests - *Polygonatum verticillatum* and other species.

Grasslands of the nature reserve are important for several protected bird species; *Lanius collurio* and *Crex crex* are breeding here. Examples of rare and protected invertebrate species are *Vertigo angustior, Apatura iris* and *Emus hirtus*. Protected reptile – *Lacerta agilis*. The territory is important for *Lutra lutra* and for fish species, for example, *Cobitis taenia*. Salmonid migration and spawning is possible. Oxbow lakes have remained in the Sventāja river valley, where conditions are suitable for diversity of dragonfly species.

2. Threats to habitat and species conservation

- Due to lack of management, grasslands, inland dunes and dry heaths overgrow rapidly with trees and shrubs. Wildfire occurred in dry heaths in 2005, but the rapid overgrowth with pines continues.
- Riffle areas in Sventāja river are affected by fallen tree obstructions and beaver impoundments/dams facilitating (further) erosion processes of river banks.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 most of the grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 1 – 7 % of habitat types 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis), 6450 *Northern boreal alluvial meadows*, 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe),* 6120* *Xeric sand calcareous grasslands* received the support. Only habitat type 6270* Fennoscandian lowland species-rich dry to mesic grasslands was managed in larger area – 40 % of the total area in nature reserve. The influence of this measure on grassland quality is not evaluated.

4. Priorities of management and conservation

- Preserving the *Carpinus betuli*, in all cases saving it by selective thinning. Special attention should be paid to the *Alnus incana* woodlands on the shore of the river Sventāja.
- The diversity of semi-natural grasslands and their species numbers are very high, therefore the priority in the nature reserve is both the conservation of habitats, and conservation of habitats of plants and birds in favourable conservation status. The restoration and management of habitat types 6120* *Xeric sand calcareous grasslands*, 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe*) and 4030 *European dry heaths* is the priority at a national level.
- Appropriate management in grasslands which are concentration sites of *Crex crex*.
- Maintenance of Sventāja river riffles. Improvement of insolation in some oxbow lakes and connecting them to Sventāja river. Creation of conditions suitable for protected dragonfly species and for the overall increase of diversity of aquatic species.
- Undisturbed course of natural processes in habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Development of Nature management plan. It must include grassland restoration and management plan, as well as detailed mapping and evaluation of wooded meadows. Creating a valid assessment on the minimal necessary areas of grasslands for their sustainable conservation (the high level of fragmentation indicates that the current area can not ensure favourable protection status of grasslands in the long term).
- In order to increase the landscape-ecological connectivity of grasslands, the establishment of grasslands in their historical areas must be evaluated. The restoration of grasslands which were assessed as EU protected grassland habitat types at the beginning of 21th century but later were assessed as ineligible for the criteria of EU habitat types.
- Development and approval of Individual regulations on protection and use.
- The activities in the adjacent areas should be evaluated, for example, the risks that may arise from the arboretum with non-native species.
- Limitation of activities of beavers, in order to prevent the paludification of alluvial grasslands.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	3.1	<1	Poor.	Non-intervention.		3.1
9160	Oak forests	20.6	5.0	Poor.	Non-intervention.		20.6
9080*	Fennoscandian deciduous swamp woods	0.8	<1	Poor.	Non-intervention.		0.8
91E0*	Alluvial forests	1.8	<1	Poor.	Non-intervention. Saving of *Carpinus betulus* in selective thinning.		1.8
7160	Fennoscandian mineral-rich springs and springfens	0.2	<1	Favourable.	Non-intervention.		0.2

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6530*	Fennoscandian wooded meadows	19.8	4.8	Bad.	Restoration. Maintenance.	19.8	19.8
6510	Lowland hay meadows	26.7	6.5	Bad.	Restoration. Maintenance.	24.8	26.7
6450	Northern boreal alluvial meadows	137.7	33.3	Bad.	Restoration. Maintenance.	122.5	137.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	6.2	1.5	Bad.	Restoration. Maintenance.	3.9	6.2
6230*	Species-rich Nardus grasslands	1.7	<1	Bad.	Restoration. Maintenance.	1.7	1.7
6120*	Xeric sand calcareous grasslands	8.8	2.1	Bad.	Restoration. Maintenance.	8.8	8.8
6000	Grasslands to be restored	70.0	17.0	-	Restoration. Maintenance.	70.0	70.0
4030	European dry heaths	0.8	<1	Bad.	Restoration. Maintenance.	0.8	0.8
3260	Natural river reaches and river riffles	40.0	9.7	Nepietie-kams.	Ensuring the water flow rate. Removal or decrease of large woody debris in sites with erosion or where riverbed with boulders or pebbles indicate on river rapids of high quality (suitable for *Lampetra planeri* spawning, habitat of *Unio crassus*). Mowing of aquatic macrophytes in sites where their cover is higher than 60 % and where it has promoted the water level rise, bank erosion or paludification. Once per 5 years.	1.0 1.0	
3150	Natural eutrophic lakes	20.0	4.8	Poor.	Restoration of connections between oxbow lakes and Sventāja river; mowing of the connecting water courses and removal of sediments – to ensure the migration of aquatic organisms. Once per 5 years. Creation of openings on the shores of completely shaded oxbow lakes in order to improve the oxygen conditions and increase biodiversity.	1.0 1.0	
2330	Inland dunes with open grasslands	4.1	1.0	Bad.	Grazing or mowing. In some places – felling of pines, removal of litter, topsoil removal.		4.1

Svētes ieleja | *Nature Reserve (LV0529900)*

1. Brief description

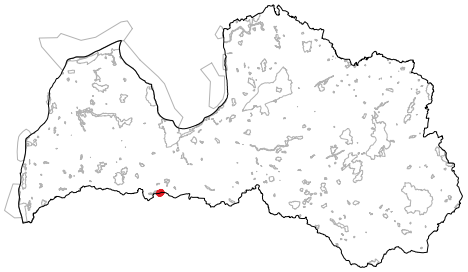
YEAR OF FOUNDATION: 2004.

LOCATION: Tērvete municipality Augstkalne rural territory.

AREA: 46 ha.

NATURE MANAGEMENT PLAN: 2008 (2008–2018).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Svētes ieleja Nature Reserve includes the periodically flooded reach of Svēte river, which forms a single complex with grasslands in the valley, as well as coniferous forests on the slope of valley and outside the valley. Taking into account that historically Zemgale Plain has been the most deforested region in Latvia, the territory is particularly important for species whose habitat is forest.

The nature reserve is visually and biologically valuable, because it includes a natural reach of Svēte river. The distinctive terrain of river valley differs from the agricultural lands which are typical for Zemgale Region. As a result of past forestry activities (logging), the number of old forest compartments is not high, and there is a large proportion of young forests. In mature pine (*Pinus sylvestris*) woodlands, there is a rather high admixture of oaks (*Quercus robur*), which suggests that in the future development towards broadleaved forests is expected.

There are five EU protected habitat types in the territory, and the largest areas are covered by grasslands, especially lowland hay meadows. The nature reserve is located in a region where semi-natural grasslands are highly fragmented; therefore, although the territory is not among the most important territories for grassland conservation, it is important for maintaining the biodiversity in nature reserve and in the entire Zemgale region. *Sesleria caerulea* is very rare in Zemgale Geobotanical District, therefore nature reserve is important for the conservation of this species.

Of forest habitats, natural old broad-leaved forests cover larger areas. In woodlands, there are rare plant species which can be found only in Zemgale, such as *Astrantia major* and *Ranunculus lanuginosus*. There are also rare lichen species which are indicator species of woodland key habitats. Rare and protected species that are breeding in the area include *Bonasa bonasia*, *Dendrocopos leucotos, Dendrocopos medius*. *Lutra lutra* lives in Svēte river. *Ciconia nigra* uses river for foraging.

2. Threats to habitat and species conservation

- Overgrowth of grasslands due to management cessation; grubbing up of grasslands.
- Forest habitat fragmentation. Due to previous logging, there are few old forest compartments, and the proportion of new forests is rather high.
- Volumes of dead wood can decrease due to selective felling (sanitary and tending felling). This will adversely affect the breeding birds.
- Beavers (*Castor fiber*) can cause paludification of grasslands, and the following reduction of their quality.
- Beaver dams and coarse woody debris cause sediment accumulation and clogging of river riffles, and reduction of their quality and functionality.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in 2014 none of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".
- In 2012, JSC "Latvijas Valsts Meži" mowed (with grass removal) grasslands in its possession.
- Natura 2000 monitoring data are available for only one grassland – it was not managed, and its quality was assessed as poor.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Particularly for woodpeckers – it is necessary to conserve old woodlands, as well as various structural elements in middle-aged and young woodlands (fallen logs, standing dead trees, etc.), therefore it is necessary to exclude any kind of traditional forestry activity in such compartments, in order to ensure the conservation of such structures in the long term.
- Restoration of grassland habitats in the maximum possible area; their maintenance in favorable conservation status.

- Reducing the impact of beaver-caused large woody debris, for the improvement of shore grasslands and river habitats.

5. Necessary management and conservation measures

5.1. General measures

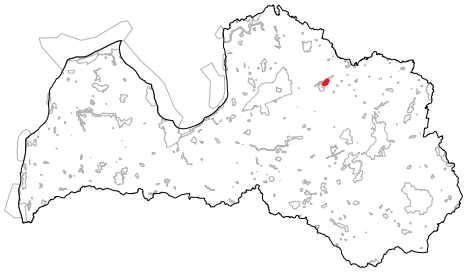
- Expansion of the nature reserve in order to conserve a unified landscape along the edges of the old forest road, which currently partially forms the northern border of the nature reserve, as well as to provide sufficient areas for breeding and foraging of woodpeckers and other forest bird species.
- Development and approval of Individual regulations on protection and use, which would ensure non-intervention in mature and younger woodlands, for the protection of bird species.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	1.9	4.1	Poor.	Non-intervention.		1.9
9010*	Western Taïga	0.34	<1	Poor.	Non-intervention.		0.34
6510	Lowland hay meadows	4.2	9.1	Bad.	Restoration. Maintenance.	4.2	 4.2
6430	Hydrophilous tall herb fringe communities	0.7	1.5	Bad.	Restoration. Maintenance.	0.7	 0.7
6410	*Molinia* meadows	1.1	2.4	Bad.	Restoration. Maintenance.	1.1	 1.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.3	<1	Bad.	Restoration. Maintenance.	0.3	 0.3
3260	Natural river reaches and river riffles	4.0	8.7	Poor.	Removal of large woody debris in sites where they promote shore erosion, inundation or paludification of grasslands, as well in sites where riverbed with boulders or pebbles indicate on river riffles of high quality. Non-intervention.	0.5	 3.5

Šepka | *Nature Reserve (LV0528100)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Smiltene municipality Palsmane, Variņi and Launkalne rural territories.

AREA: 375 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2013).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Šepka Nature Reserve includes an unmodified section of Šepka river, with alluvial grasslands and surrounding forest. Natural reaches and riffle areas of the river are particularly important for two rare mussel species – freshwater pearl mussel *Margaritifera margaritifera* and thick shelled river mussel *Unio crassus*.

There are dry pine (*Pinus sylvestris*) and birch (*Betula* spp.) woodlands, mixed spruce (*Picea abies*) and pine woodlands. Birch and *Alnus incana* woodlands are more characteristic to eastern part of the nature reserve, and *Alnus glutinosa* and *Picea abies* – for central part. Part of the agricultural lands is intensively managed. Five protected habitat types of EU importance have been found in the territory. The most important of them are unmodified water courses with riffles (3260), alluvial grasslands, western Taïga.

From landscape-ecological point of view, the territory is important for the conservation of semi-natural grasslands of North-Vidzeme Geobotanical District. The currently known area of semi-natural grasslands is small, but potentially it is larger and not identified yet due to insufficient inventory and mapping. Grasslands are an important habitat for invertebrates (they greatly enrich the insect fauna of the reserve) and for *Crex crex*. Also the breeding of a very rare bird *Asio flammeus* is possible here.

The nature reserve is an important habitat for other rare and protected species - five species of plants, nine bird, 14 invertebrate, four fish, and five mammalian species. Protected plant species include *Dactylorhiza maculata, Poa remota,* moss *Trichocolea tomentella*. Birds *Lanius collurio, Caprimulgus europaeus, Picoides leucotos, Glaucidium passerinum* are breeding here. Important invertebrate species are *Parnassius mnemosyne, Cochlicopa nitens, Clausilia cruciata*. Fish *Salmo trutta f .trutta, Thymallus thymallus, cyclostomes Lampetra planeri* and *Lampetra fluviatilis,* mammal *Lutra lutra* can be found in Šepka river.

2. Threats to habitat and species conservation

- Beaver dams and large woody debris in river promote slowdown of the stream, covering of pebble and boulder bed with sediments, and the disappearance of habitats suitable for *Margaritifera margaritifera* and *Unio crassus*. The vitality of *Margaritifera margaritifera* is reduced due to warmed up water in beaver inundations and the decrease of dissolved oxygen. Beaver dams and large woody debris in the river act as barriers to migration of fish, including *Salmo trutta* which are hosts for glochidias and ensure the dispersal of *M. margaritifera*.
- The amount of *Salmo trutta* in river is insufficient for the development of sustainable population of *M. margaritifera* in the river. Rauza Mill reservoir (dam) is located downstream of the nature reserve, and it is a reason why natural migration of salmonids does not occur in Šepka river. The natural reproduction of *Salmo trutta* is low. The current population consists of artificially released *Salmo trutta*.
- The existence of *M. margaritifera* and *Unio crassus* is threatened by biogene input via drainage ditches from agricultural lands located next to nature reserve.
- Water level fluctuations downstream of hydroelectric power plants outside the nature reserve.
- A river crossing spot for vehicles is established at Dišleri farmstead. A stack of boulders hinders fish movement, holds the water flow, promotes its warming up and eutrophication.
- Overgrowth of semi-natural grasslands with shrubs; fragmentation.
- The fragmentation of old forests.

3. Existing management of the protected habitats and its assessment

- In 2005 and 2006, Salmo trutta juveniles were released in Šepka river. Control catches in September 2009 indicated that the number of juvenile salmonids correspond to an optimal amount in small rivers of this type.
- Management of river riffle areas has been episodic and based on individual projects; habitat quality and condition of rare species populations deteriorate again after the end of project.

- In 2007-2009, a regular demolition of beaver dams and the reduction of the amount of beavers was organised in cooperation between Nature Conservation Agency and hunters' associations.
- In 2016, a voluntary work event (*talka*) was organized and a large clog of large woody debris in Šepka river was removed in cooperation with the association "Balta daba".
- According to Rural Support Service, in 2014 semi-natural grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Implementation of management and protection measures in complex with measures in Rauza and Launkalne Nature Reserves.
- Maintenance of river riffles suitable for *Margaritifera margaritifera* and *Unio crassus*, and their juveniles.
- Creation and maintenance of sustainable *Margaritifera margaritifera* population in river.
- Restoration and maintenance of semi-natural grasslands in a favourable conservation status in an area of at least 150 hectares.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of merging three Nature Reserves – Rauza, Šepka and Launkalne – in one Natura 2000 territory because Rauza river valley (where two nature reserves are located) and Ludze (tributary of Rauza) river valley form a single physical and geographical territory.
- Development of a new nature management plan.
- Inventory of semi-natural grasslands. Development of grassland restoration and management plan. The currently available maps of grasslands are outdated and do not show the real situation. Part of the grasslands has not been inventoried. It is stressed in nature management plan of 2007 that semi-natural grasslands must be conserved in maximum possible area.
- To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered. The restoration of currently preserved grasslands is the priority. Only a belt of grasslands along the river must be left without restoration, in order to maintain shading conditions suitable to pearl mussel *Margaritifera margaritifera* which is the main nature value of nature reserve.
- Evaluation of drainage systems which are located in the catchment area of rivers of nature reserve, and evaluation of pollution created by these drainage systems. Development of an action plan for reduction or prevention of pollution.
- In river reaches flowing through agricultural land – improvement of the efficiency of river protective belts by creation of shore vegetation mosaic of grasslands, trees and shrubs, thus ensuring continuous interception of nutrients throughout the year.
- Development and implementation of a project for river riffle restoration: creation of boulder bars and artificial river rapids.
- Construction of bridges instead of existing river crossings.
- Elimination of the influence of ditch which is located parallel to Šepka river, at its right bank: strengthening of river bank interruption, and restoration of the natural river bank.

5.2. Specific measures

5.2.1. Species

- Population of *Margaritifera margaritifera* consists of 1120-3000 specimens. Population condition is bad.
- Artificial infestation of *Salmo trutta* with glochidia once per two years; evaluation of artificial breeding of pearl mussel juveniles.
- Prevention of beaver activities in river reaches where pearl mussels can be found or where suitable conditions can be created.
- Maintenance of a multi-aged population of *Salmo trutta* in a river by regular (annual) release of juvenile fish. In the open river reaches, creation of a mosaic of near-shore trees which create scattered shade on river water, in order to decrease water temperature in river reaches suitable for pearl mussels.
- Development and implementation of the project for creation of boulder bars and artificial riffles, in order to restore the modified areas and, as soon as possible, create preconditions for the self-restoration of river riffle habitats. It is recommended to create stone stacks and artificial riffles upstream of pearl mussel populations and in tributaries. It is also necessary to create micro-habitats necessary for juvenile pearl mussels where riverbed substrate is course sand. Establishment of small dams in lower reaches and straightened tributaries in order to avoid rapid seasonal water level fluctuations and to reduce the negative impact of drainage.
- Monitoring and result control of all the activities.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	1.0	<1	Favourable.	Non-intervention.		25
9080*	Fennoscandian deciduous swamp woods	2.6	<1	Bad.	Non-intervention.		12
9010*	Western Taïga	8.9	2.4	Bad.	Non-intervention.		120
91E0	Alluvial forests	0.9	<1	Poor.	Non-intervention, except parts of the river suitable for pearl mussels (here pearl mussels and their relevant management and conservation measures are priority).	On necessity.	
6450	Northern boreal alluvial meadows	29.9	8.0	Bad.	Restoration. Maintenance.	29.9	29.9
6000	Grasslands to be restored	120.0	32.0	-	Restoration. Maintenance.	120.0	120.0
3260	Natural river reaches and river riffles	17.5	4.7	Bad.	Removal of large woody debris, beaver dams and inundations. At least once a year.		17.5

One-time grassland restoration measures are necessary in an area of 150 hectares (including overgrowing grasslands and historical territories of grasslands which are overgrown with shrubs and secondary forest, as well as old cultivated grasslands and fallow-lands). In must be taken into account that as far as possible, the indirect influence of grassland restoration of pearl mussels must be prevented (felling of shrubs along the river bank is not recommended, as well as grazing, which can create water eutrophication.

Šķibu purvs | *Nature Reserve (LV0500100)*

1. Brief description

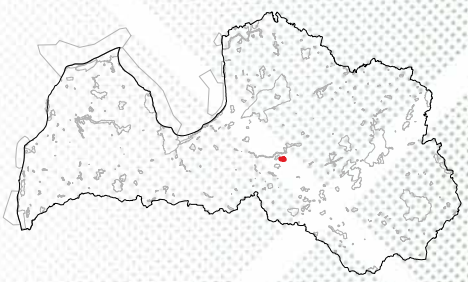
YEAR OF FOUNDATION: 1977.

LOCATION: Koknese municipality Bebri rural territory.

AREA: 536 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Šķibu purvs Nature Reserve includes open raised bog. In its central part, there are swamps with elements of transition mire, and a few small mineral-ground islets with pine forest. Mire is surrounded by bog woodlands. Nature reserve includes part of the micro-reserve which is established for the conservation of *Tetrao urogallus* lek. A rare plant species of eastern-type raised bogs is found here – *Betula nana*. The territory is important for several protected bird species - *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Pandion haliaetus, Pluvialis apricaria,* and others. Examples of protected plant species found in woodlands are *Dactylorhiza maculata* and *Lycopodium annotinum*.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Management measures in *Tetrao urogallus* lek, according to expert recommendations.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	127.4	23.7	Favourable.	Non-intervention.		127.4
9010*	Western Taïga	1.1	<1	Favourable.	Non-intervention.		1.1
7140	Transition mires and quaking bogs	43. 4	8.1	Favourable.	Non-intervention.		43. 4
7110*	Active raised bogs	372.4	69.5	Favourable.	Non-intervention.		372.4

Švēriņu purvs | *Nature Reserve (LV0506300)*

1. Brief description

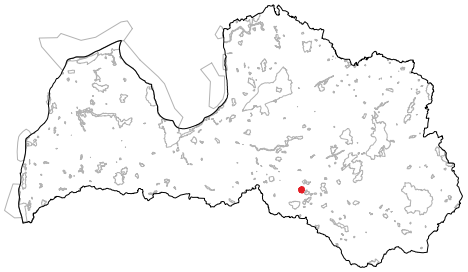
YEAR OF FOUNDATION: 1977.

LOCATION: Viesīte municipality, Viesīte town with its rural territory,

AREA: 643 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Švēriņu purvs Nature Reserve is located in an area rich in forests and mires, where several protected nature territories are established. It includes a raised bog with a small complex of depressions on peat substrates of the *Rhynchosporion*, as well as transition mire and bog woodlands and deciduous swamp woods. Old drainage ditches can be found on the edges of the nature reserve, and surrounding forests are drained, especially in the northern part.

The territory is important for several protected bird species – *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Pluvialis apricaria, Tringa glareola*, and others. In bog woodlands, protected moss species A*nastrophyllum hellerianum* can be found. Deciduous woodlands on the edge of mire is a habitat for moss *Lejeunea cavifolia,* invertebrates *Clausilia cruciata, Laphria gibbosa*. Protected species dwarf birch *Betula nana* can be found as well.

2. Threats to habitat and species conservation

Habitats are threatened by hydrological regime changes caused by previous drainage as well as by restoration and improvement of drainage system in the surrounding territory, especially in the western side.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting in mire habitats.
- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological regime research and development of building project for rewetting. It includes a development of a monitoring program and methods for the evaluation of habitat restoration success.
- Evaluate the necessity of including protected habitats (that are outside the territory) into the nature reserve, considering their ecological borders.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	114.3	17.7	Poor.	Non-intervention, except rewetting, in complex with mires.		114.3
9080*	Fennoscandian deciduous swamp woods	4.4	<1	Poor.	Non-intervention.		4.4
7150	Depressions on peat substrates	70.4	10.9	Favourable.	Rewetting (ditch damming or filling up).	70.4	
7110*	Active raised bogs	346.1	53.8	Favourable.	Rewetting (ditch damming or filling up).	346.1	

Taurīšu ezers | *Nature Reserve (LV0531600)*

1. Brief description

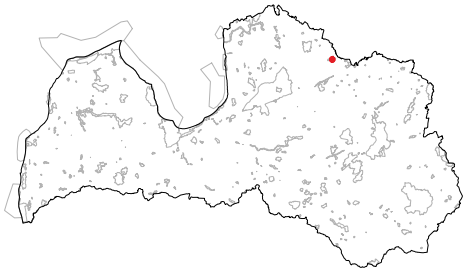
YEAR OF FOUNDATION: 2004.

LOCATION: Valka municipality Zvārtava rural territory.

AREA: 2 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Taurīšu ezers Nature Reserve includes a small Lake Taurīšu in a terrain depression, surrounded by wet and drained woodlands. One of the few localities of rare and protected moss species *Hamatocaulis lapponicus* and *Hamatocaulis vernicosus* in Latvia can be found in the nature reserve. There are also three EU protected habitat types – natural dystrophic lake and its surrounding transition mires and quaking bogs (habitat of the rare moss species), as well as bog woodlands.

2. Threats to habitat and species conservation

- A previously excavated ditch is outflowing of the lake. The surrounding area is also drained. However, hydrological regime is stable in the transition mire and the locality of rare mosses, and habitat degradation is not observed. Potentially the transition mire (and the habitat of rare species) can be threatened by beavers which can cause lake water level elevation.
- The narrow belt of woodlands around the lake is logged in some sites after the wind-throws in 2016. Potentially, this might promote the inflow of nutrients into the lake, which may lead to overgrowing of lake.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in lake and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Prevention of water level changes caused by beavers by regulating their activities on necessity, by demolition of dams and by hunting.

5. Necessary management and conservation measures

5.1. General measures

To ensure a buffer zone around the nature reserve where clear-felling is prohibited as it may change the circulation of chemical substances by increasing the runoff of organic matter into the lake, thus promoting its overgrowth. It may also adversely influence the transition mire around the lake, causing hydrological changes.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0	Bog woodland	0.9	45	Favourable.	Non-intervention.		1
7140	Transition mires and quaking bogs	0.8	40	Favourable.	Non-intervention, except regulation of activities of beavers (on necessity).		0.8
3160	Natural dystrophic lakes and ponds	0.3	15	Favourable.	Non-intervention, except regulation of activities of beavers (on necessity).		0.4

Tāšu ezers | *Nature Reserve (LV0527300)*

1. Brief description

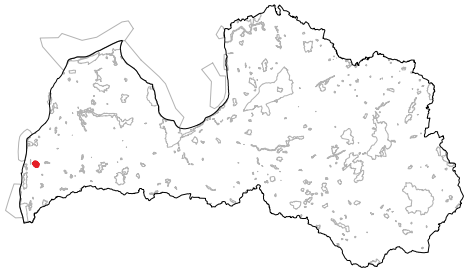
YEAR OF FOUNDATION: 2004.

LOCATION: Grobiņa municipality Medze rural territory.

AREA: 271 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Tāšu ezers Nature Reserve is located in an extensive agricultural landscape. It includes Lake Tāšu, with swamps of emergent vegetation, shore zone with grasslands and overgrowing wet territories. Extensive swamps and beaver inundations lay at inflow of Ālande river into the lake. The nature reserve is an Important Bird and Biodiversity Area.

During the last years, the shallow and highly overgrown lake with gently-sloping banks has lost its attractiveness for the breeding of waterbirds and as a stopover site for migratory birds. During the spring migration, *Cygnus cygnus* and *Anser anser* are gathering in the lake. Bird species breeding in the lake include C*hlidonias niger, Botaurus stellaris, Locustella luscinioides.* Also *Haliaeetus albicilla, Philomachus pugnax*, and others can be found.

The territory is located in an area where the conservation of grassland habitats is insufficient – a large part of grasslands which are important for birds and are of EU significance, are located outside the protected nature areas, such as the extensive grasslands in Ālande river floodplain between Lake Tāšu and Grobiņa village, grasslands in Vārtāja river valley between Vārtāja and Paplaki villages, and grasslands in Trumpe river floodplain between Durbe town and Vārve village. Therefore, grasslands at Tāšu Lake are important for the provision of grassland landscape-ecological connectivity between Kurzeme and Coastal Geobotanical Districts in southwestern part of Latvia.

The territory is important also for several protected invertebrate species – *Leucorrhinia pectoralis, Graphoderus bilineatus, Lycaena dispar*, and others. A bird observation tower has been built on the eastern coast of the lake.

2. Threats to habitat and species conservation

- Rapid overgrowth of lake; natural succession.
- Overgrowth of grasslands due to management discontinuation.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 only 30 % of the grasslands of habitat type 6450 Northern boreal alluvial meadows were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Other habitats are managed in almost all of their area. The influence of management on grassland habitats has not been evaluated.

4. Priorities of management and conservation

- Development of a plan for lake overgrowth prevention. The needs of bird diversity conservation and water resources conservation must be balanced.
- Restoration of functionality and discharge of Ālande river at its inflow into lake and outflow from it.
- Restoration of grassland habitats in the maximum possible area; their maintenance in a favourable conservation status, ensuring also the habitats suitable for grassland-breeding waders.

5. Necessary management and conservation measures

5.1. General measures

- Development of the plan for lake overgrowth prevention.
- Mowing of emergent vegetation (*Phragmites australis, Typha* spp., *Sparganium* spp., *Scirpus* spp.). Prescribed burning of emergent vegetation in winter, in order to reduce plant litter and the speed of its accumulation on lakebed.
- Maintenance of boat channels at boat dock; creation of open littoral zones (in order to attract ducks and waders and increase their breeding success).
- Inventory of grasslands, in order to clarify the measures and areas of restoration and management.

In addition to the currently managed grasslands, there is information on previously inventoried (mapped) biologically valuable grasslands whose current status is unknown.

- Evaluation of the possible extension of the territory by incorporation of grasslands adjoining the nature reserve in north, south and west.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	2.9	1.1	Bad.	Restoration. Maintenance.	2.0	2.9
6410	*Molinia* meadows	0.9	<1	Poor.	Restoration. Maintenance.	0.3	0.9
6270	Fennoscandian lowland species-rich dry to mesic grasslands	0.4	<1	Favourable.	Restoration. Maintenance.	0.0	0.4
6000	Overgrown grasslands	up to 15.0	5.5	-	Restoration. Maintenance.	15.0	15.0
3150	Natural eutrophic lakes	95	35.0	Bad.	Mowing of aquatic macrophytes, removal of sediments and withered willows. One-time measure. Excavation of channels in areas of Ālande river inflow and outflow, for the improvement of discharge. Mowing and maintenance of boat tracks. Annually.	3.0 3.0	0.5

Approximate estimation of the cartographic material shows that grassland restoration is necessary in an area of at least 15 hectares. Restoration territories must be specified during the grassland inventory which should include also the grasslands overgrown with shrubs (currently do not correspond to criteria of EU protected grassland habitats).
Annual management measures are necessary in the entire area of currently known EU protected grassland habitats (4.2 hectares), and will be necessary in restored areas. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Tebras ozolu meži | *Nature Reserve (LV0535800)*

1. Brief description

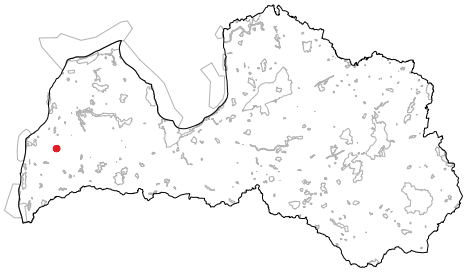
YEAR OF FOUNDATION: 2004.

LOCATION: Aizpute municipality Laža rural territory.

AREA: 51 ha.

NATURE MANAGEMENT PLAN: 2006 (2006– 2016).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Tebras ozolu meži Nature Reserve includes a compact oak forest massif typical for the western part of Latvia, surrounded by agricultural land.

There are high-quality old *Quercus robur, Tilia cordata* and mixed broadleaved woodlands with *Picea abies* admixture. Oak (*Quercus robur*) is a dominant tree species occupying more than 90% of the area. This area corresponds to the EU protected habitat type 9160 *Sub-Atlantic and medio-European oak or oakhornbeam forests of the* Carpinion betuli. It is also important for the conservation of genetic diversity and genotypes of tree species of the natural woodlands.

Seven protected and rare plant species, three species of animals and several rare lichen species have been found in the nature reserve. Scattered across the whole territory, there are large, biologically old oaks with wide crowns and dead and live branches which are potentially important for rare and protected invertebrate species. A rare lichen *Arthonia bysacea* can be found on oak stems. *Dendrocopos medius* is nesting in the oldest oak woodlands; also *Ficedula parva* is found. Rare invertebrate species associated to *Salix* spp. and old *Betula* spp. can be found, such as *Meloe proscarabeus, Apatura iris, Necydalis major.* Rare plant species in the area are *Serratula tinctoria, Dentaria bulbifera, Lathyrus niger,* and *Carex montana.*

2. Threats to habitat and species conservation

- Succession which can have a negative effect on long-term preservation of oak forests: the proportion of Norway spruce (*Picea abies*) can increase, suppressing the development of oaks. New oak trees in woodlands are very rare, due to shading and animals.
- Damage caused by animals to young oak trees. European roe deer *Capreolus capreolus* graze the treetops, thus reducing the amount and vitality of new oaks in the nature reserve.

3. Existing management of the protected habitats and its assessment

- In order to improve the quality of the habitat and maintain its typical characteristics, spruces of subcanopy layer and advance growth were felled around the large oaks in years 2009, 2012 and 2013.
- To preserve the oak habitat, the measure should be continued in order to decrease the admixture of spruces which appear during the course of succession.

4. Priorities of management and conservation

- Oak forest habitat cover more than 90 % of the nature reserve, and its quality is high. Therefore, the main habitat management measures are related to the preservation of oak woodlands and the promotion of their biodiversity.
- Promotion of the development of broadleaf forest by means of selective felling of spruces in the canopy and subcanopy layers.
- Conservation of the locality of protected plant species (*Serratula tinctoria*) in the forest gap.

5. Necessary management and conservation measures

5.1. General measures

- Protection of young oaks against wild animals using natural repellents (dried blood) or physical barriers. Twice a season, seedlings should be sprayed with a repellent. Measure should be continued for at least 5 consecutive years, until oaks reach the necessary height that roe deers can not graze them anymore.
- Forest development monitoring after the felling of spruces in canopy and subcanopy layers. The measure is necessary for the evaluation of forest development after the spruce removal. It is important to find out whether the felling of spruces contributes to an increase of the vitality of oak trees and the preservation of a typical broad-leaved forest.

5.2. Specific measures

5.2.1. Species

To preserve *Serratula tinctoria*, grassland must be mown at least once every three years. The recommended mowing time is the end of August, as the species blooms late in July-August. Also *Sorbus aucuparia* and *Padus avium* can be felled, but oaks of all ages and large trees must be preserved.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	43.8	85.9	Poor.	Non-intervention, except selective removal of *Picea abies* from canopy and subcanopy layers. *Picea abies* felling in advance growth.	On necessity.	43.8

Tetersalas purvs | *Nature Reserve (LV0501600)*

1. Brief description

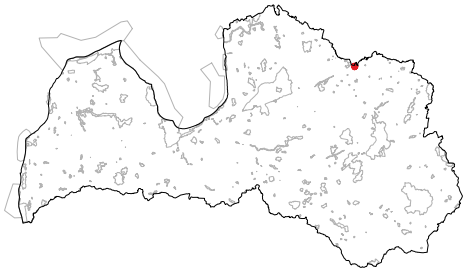
YEAR OF FOUNDATION: 1977.

LOCATION: Ape municipality, Trapene rural territory.

AREA: 348 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Tetersalas purvs Nature Reserve includes raised bog with pioneer communities of *Rhynchosporion albae* in the mire depressions, as well as small fragments of transitional mire and western Taïga. In total, there are five habitats of EU importance. The mineral-ground islet in the mire is occupied by old woodland with *Populus tremula* and *Picea abies*. The territory is important for several rare and protected bird species - *Tetrao tetrix, Tetrao urogallus, Circus aeruginosus, Pluvialis apricaria, Dryocopus martius*, and others. Grey wolf *Canis lupus* has been observed in the territory. Examples of rare insect species are *Pyrrhosoma nymphula, Laphria flava*. Several localities of the rare plant species *Carex montana* have been found in the nature reserve. *Salix myrtilloides* grows on the edges of the mire, and protected moss species *Calypogeia sphagnicola* is found in the bog.

2. Threats to habitat and species conservation

There is no negative influence observed on mire habitats; woodlands near ditches are affected negatively by drainage.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of hydrological regime optimal for wet habitats.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	68.8	19.7	Favourable.	Non-intervention. Blocking of ditches on the edges of mire (South-eastern side, parallel to the road).		68.8
9010*	Western Taïga	2.4	<1	Favourable.	Non-intervention.		2.4
7150	Depressions on peat substrates	0.3	<1	Favourable.	Non-intervention.		0.3
7140	Transition mires and quaking bogs	1.5	<1	Favourable.	Non-intervention.		1.5
7110*	Active raised bogs	216.4	62.2	Favourable.	Non-intervention.		216.4

Timsmales ezers | *Nature Reserve (LV0530200)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Krustpils municipality Variešu rural territory.

AREA: 101 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Timsmales ezers Nature Reserve includes one of the most outstanding clear-water lakes (oligo-humic lakes) with low-mineralised water in Latvia. There is an abundant locality of protected plant species *Sparganium angustifolium*. The lake corresponds to EU protected habitat type 3130 *Oligotrophic to mesotrophic standing waters with vegetation of the* Littorelletea uniflorae *and/or* Isoeto-Nanojuncetea. EU protected forest habitats are found in the rest of the area around the lake – western Taïga with *Pinus sylvestris, Picea abies* and deciduous trees, as well as small areas of bog woodlands and swamp woods. Previously, several localities of *Pulsatilla patens* have been identified in the area.

2. Threats to habitat and species conservation

- Visits to the territory and recreational activities threaten the natural structures of forests - dry trees and logs, because they are used as firewood.
- Development of dense monodominant belt of reeds, paludification of lower parts of the coast; development of swamps; disappearance of littoral parts with open mineral bottom.
- The development of shrubs (*Salix* sp., *Frangula alnus, Padus avium*) on the lake shore and input of their leaf and twig litter into the lake promotes the accumulation of organic substances and the intensification of eutrophication processes. The shade of the trees does not allow the development of littoral float-leaved and emergent vegetation, which, in turn, causes shading and suppressing of isoetids.
- Reduction of the size of *Sparganium angustifolium* localities in the last three years.

3. Existing management of the protected habitats and its assessment

Infrastructure to reduce the negative impact of recreation has been created - two well-equipped picnic sites, waste bins, a fireplace, a toilet.

4. Priorities of management and conservation

- Maintenance of visitor infrastructure to reduce the load on the lake habitat and its coast.
- Maintenance of lake ecosystems in a favourable conservation status by reducing the volumes of decayed plants and residues of tree and leaf litter entering the water.
- The prevention of paludification of lower coastal parts as well as the development of swamps. These processes are promoted by expansion of reedbeds and the disappearance of littoral with open mineral bottom.

5. Necessary management and conservation measures

5.1. General measures

- Maintenance of visitor infrastructure.
- Assessment of condition of *Sparganium angustifolium* localities in the lake, and factors that influence their condition.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	1.5	1.5	Poor.	Non-intervention.		1.5
9010*	Western Taïga	17	16.8	Bad.	Non-intervention.		17
91D0*	Bog woodland	3.7	3.7	Poor.	Non-intervention.		3.7
3130	*Lobelia-Isoetes* lakes	43.1	42.7	Favourable.	Removal of trees which are bent over the open lake surface, as well as shrubs growing on the shores of lake.	0.5	
					Mowing of emergent macrophytes; removal of plant parts in some areas of lake (if necessary), for example, in bottleneck area separating N and S parts of the lake.	0.5	
					Prevention of further development of sedge hummocks and swamps, paludification of lake littoral and input of organic substances into lake.	On necessity.	

Tīrās sūnas purvs | *Nature Reserve (LV0504000)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Daugavpils municipality, Maļinova rural territory.

AREA: 36 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Tīrās sūnas purvs Nature Reserve includes the less affected part of the Maļinovas Mire. It is an open transition mire with a peculiar micro-terrain structure and vegetation. A significant location of rare species *Salix myrtilloides* is found here. Bog woodlands and western Taïga are located on bog edges in small areas.

2. Threats to habitat and species conservation

Logging in the immediate vicinity of the mire.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed natural processes in mire and forest habitats which are only slightly affected by humans, as well as in habitats of bird species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

It is necessary to specify the borders of the nature reserve as part of the mire is located outside the nature reserve and Natura 2000 territory, therefore the necessary protection can not be provided.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	0.3	<1	Favourable.	Non-intervention.		0.3
9010*	Western Taïga	1.7	4.7	Favourable.	Non-intervention.		1.7
7140	Transition mires and quaking bogs	27.8	77.2	Favourable.	Non-intervention.		27.8

Tīreļu purvs | *Nature Reserve (LV0506100)*

1. Brief description

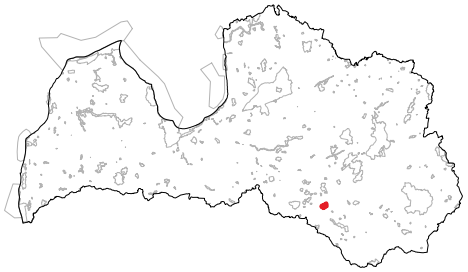
YEAR OF FOUNDATION: 1923.

LOCATION: Jēkabpils municipality, Zasa and Rubene rural territories.

AREA: 1203 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Tīreļu purvs nature reserve includes Tīreļi (Sīļi) Mire located in the terrain depression, and the surrounding bog woodlands and swamp woods. Beside the nature reserve there are two small, partially drained mires. Bērze river, which is modified and straightened, flows through the nature reserve.

The nature reserve is important for several protected bird species, such as *Bonasa bonasia, Tetrao tetrix, Tetrao urogallus, Grus grus, Pluvialis apricaria, Dendrocopos medius, Picoides tridactylus, Dryocopus martius*. Examples of protected invertebrate species are *Leucorrhinia pectoralis* and *Segmentina nitida*. Protected plant species - *Sphagnum pulchrum*. The territory is also a potential habitat of *Canis lupus*.

2. Threats to habitat and species conservation

Drainage. There are ditches in mire and woodlands, and a modified watercourse (Bērze river). The total length of ditches is 9.6 km.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting and maintenance of the hydrological regime in mires and bog woodlands.
- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Hydrological regime research, rewetting. It also includes development of a monitoring program and description of methods for the evaluation of habitat restoration efficiency.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	263.9	21.9	Bad.	Non-intervention. Complex rewetting in bog woodlands and mires (ditch blocking or filling up), removal of trees from ditch berms.	According to research results.	263.9
9080*	Fennoscandian deciduous swamp woods	110.6	9.2	Poor.	Non-intervention.		110.6
7110*	Active raised bogs	688.4	57.2	Bad.	Rewetting (ditch blocking or filling up). Removal of trees.	According to research results.	688.4
7120	Degraded raised bogs	37.9	3.2	Bad.	Rewetting (ditch blocking or filling up). Removal of trees.	According to research results.	37.9
7140	Transition mires and quaking bogs	29.8	2.5	Poor.	Non-intervention.		29.8
3260	Natural river reaches and river riffles	0.2	<1	Poor.	Non-intervention.		0.2

Tīšezers | *Nature Reserve (LV0517400)*

1. Brief description

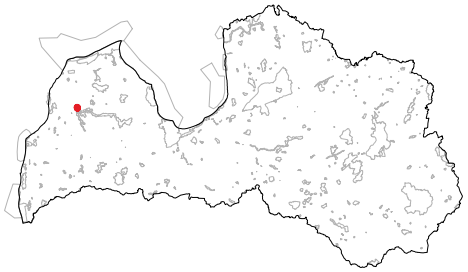
YEAR OF FOUNDATION: 1977.

LOCATION: Ventspils municipality Zlēkas rural territory.

AREA: 39 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Tīšezers Nature Reserve includes bog woodlands, transitional mires and quaking bogs, and active raised bog with *Rhynchosporion albae* communities in depressions. There are five EU protected habitat types in a small territory. The nature reserve is an important habitat for rare and protected plant species, such as *Corallorhiza trifida, Dactylorhiza incarnata, Hammarbya paludosa*, and *Dactylorhiza maculata*.

2. Threats to habitat and species conservation

There are a few ditches in the territory. They are overgrown and do not influence the condition of wet habitats.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	17.4	44.6	Poor.	Non-intervention.		17.4
7150	Depressions on peat substrates	1.2	3.1	Favourable.	Non-intervention.		1.2
7140	Transition mires and quaking bogs	11.5	29.5	Favourable.	Non-intervention.		11.5
7110*	Active raised bogs	3.2	8.2	Favourable.	Non-intervention.		3.2
3160	Natural dystrophic lakes and ponds	2.6	6.7	Favourable.	Non-intervention.		2.6

Tosmare | *Nature Reserve (LV0520900)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Grobiņa municipality Medze rural territory, Liepāja city.

AREA: 972 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Tosmare Nature Reserve is located in Liepāja city and Grobiņa municipality and it includes Lake Tosmare – naturally eutrophic lagoon-type coastal lake, as well as periodically or continuously wet grasslands in its vicinity, and calcareous fens. They are surrounded by swamp woods with *Betula* spp. and *Alnus glutinosa*, bog woodlands with *Pinus sylvestris* and *Betula* spp., in some areas also by western Taïga on dry substrate. There are also small fragments of raised bog. The hydrological regime of lake has been transformed – water level was regulated in 1950 - 1960. Currently, the lake is connected to the sea in the north. In south, it is connected to Ālande river via a ditch to Cietokšņa Channel. Water flow regulator is established on the ditch.

In some places in Lake Tosmare, charophytes can be found. As the lake has lost around 88% of the total area in the last 100 years, it is considered to be a significantly influenced charophyte lake at its last stage of development (almost completely overgrown).

There are 14 EU protected habitat types in the nature reserve. The most important ones are alkaline fens with localities of *Liparis loeselii* and *Molinia* meadows on calcareous, peaty or clayey-siltladen soils.

The territory is rich in mire and grassland plant communities. There is one of the few localities of *Laserpitium prutenicum* in Latvia and the only known locality of *Aira praecox*. Nature reserve is Important Bird and Biodiversity Area, especially for assemblages of birds breeding in reedbeds (*Larus ridibundus* and other), *Circus aeruginosus, Botaurus stellaris, Aythya fuligula, Aythya ferina* can be found. The lake is an important foraging place for bats, such as *Pipistrellus nathusii, Eptesicus nilssonii, Nyctalus noctula, Plecotus auritus*. Protected fish species *Rhodeus sericeus amarus* can be found in the lake.

2. Threats to habitat and species conservation

- Overgrowing of the lake. Currently, the open lake area is only 12 % of its former area, it consists of two separate open water areas.
- Modification of the water flow due to the operation of dolomite quarry "Ielejas luteri" (2.4 km east of Lake Tosmare). Due to its influence, lowering of water level is expected (2.5 cm according to estimation of hydrogeologists), and reduced inflow of groundwater into the lake from the east, reducing the lake water level further down by 0.3 cm. Water which will be pumped from quarry, could be directed via Grīzupīte river, and intercepted in monodominant reedbeds, promoting further overgrowth of lake.
- According to the estimation of ornithologist R. Lebuss, in 2016 lake overgrowth with monotonous reedbeds significantly impaired bird foraging and breeding conditions, and it makes Lake Tosmare insignificant for several waterbird species, including species breeding in reedbeds.
- Overgrowth of fens and raised mires, promoted by earlier drainage.
- Grassland habitats are threatened by management cessation and overgrowth.
- The existence of grassland habitats can be adversely affected by changes in the hydrological regime, especially in case if operation of network of shallow ditches is discontinued that has historically ensured the existence of grasslands and prevented their paludification.

3. Existing management of the protected habitats and its assessment

- Since 2009, reeds were mown in eastern part of lake in the area of several tens of hectares. Mown and compacted reeds were used for heating in the municipal heating system in Dubeņi village in Grobiņa. Activity is assessed as positive as it reduces evapotranspiration from reedbeds (water is preserved in the lake volume), reduces risk or reed wildfires, slows down further degradation of grasslands on lake coast, and creates open areas which attract birds.
- According to Rural Support Service in 2014, only a very small part of the natural grassland area is managed within the framework of Rural

Development Programme measure "Maintaining biodiversity in grasslands" (2% of the habitat type 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils*). Natura 2000 monitoring data show that grasslands of this habitat type are in very poor condition.

4. Priorities of management and conservation

- Mowing of reedbeds and increasing areas of open water while reducing evapotranspiration at the same time. Connecting the Grīzupīte river mouth in the lake with any of the open water areas. Development of integrated lake restoration plan using conclusions of hydrogeological research on groundwater feeding into lake.
- Restoration and maintenance of fens.
- Grassland restoration and maintenance in favourable conservation status in an area of at least 150 hectares.
- If possible, rewetting in wet forests and mires.
- Undisturbed course of natural processes in natural forest habitats which are only slightly affected by humans.

5. Necessary management and conservation measures

5.1. General measures

- Investigation of the hydrological regime and the preparation of a building project if it is concluded that rewetting is possible. It includes also the elaboration of monitoring program and methods for the assessment of habitat restoration success.
- Reed mowing and connection of groundwater discharge zones for the improvement of lake water balance.
- Including in nature reserve the semi-natural grasslands that adjoin its northern and north-eastern borders.
- Development of grassland restoration plan (including areas overgrown with reeds, shrubs and forest for a lengthy period of time) and management plan, involving all stakeholders and evaluating alternative territories in the context of socio-economic constraints, including the possibility of land repurchasing and transferring to the supervision of Nature Conservation Agency.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	32.0	3.3	Poor.	Non-intervention. Rewetting (if possible according to conclusions of hydrological research).	According to research results	32.0
9080*	Fennoscandian deciduous swamp woods	111.8	11.5	Poor to bad.	Non-intervention.		111.8
9010*	Western Taïga	8.7	<1	Bad.	Non-intervention.		8.7
7230	Alkaline fens	23.3	2.4	Bad.	Felling of trees and shrubs, mowing; extensive grazing is preferable.		30.0
7210*	*Cladium mariscus* fens	0.8	<1	Favourable.	Non-intervention.		0.8

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7140	Transition mires and quaking bogs	5.4	<1	Bad.	Rewetting (if possible according to conclusions of hydrological research).		5.4
7120	Degraded raised bogs	4.5	<1	Bad.	Rewetting (if possible according to conclusions of hydrological research).		4.5
7110*	Active raised bogs	8.0	<1	Bad.	Rewetting (if possible according to conclusions of hydrological research).		8.0
6530*	Fennoscandian wooded meadows	3.1	<1	Bad.	Restoration. Maintenance.	3.1	3.1
6510	Lowland hay meadows	3.2	<1	Bad.	Restoration. Maintenance.	3.2	3.2
6450	Northern boreal alluvial meadows	32.0	3.3	Bad.	Restoration. Maintenance.	32.0	32.0
6410	*Molinia* meadows	68.3	7.0	Bad.	Restoration. Maintenance.	68.3	68.3
6000	Grasslands to be restored	46.0	4.7	-	Restoration. Maintenance.	46.0	46.0
3140	Charophyte lakes	40.0	4.1	Bad.	Mowing of reedbeds, annually changing the managed sites in the lake periphery in order to promote water discharge to remnant lakes. Increase open water areas by reducing evapotranspiration in reedbeds.		40.0
2320	Dry heaths	0.5	<1	Poor.	Non-intervention.		0.5

One-time grassland restoration measures are necessary in area of at least 150 hectares (restoring grasslands in their maximum historical area). Grassland restoration measures include cutting of trees and shrubs, root shredding, restorative mowing or grazing, as well as hydrological regime investigation and rewetting by restoration of shallow ditch systems, and repair and establishment of access roads.

Tumes meži | *Nature Reserve (LV0535900)*

1. Brief description

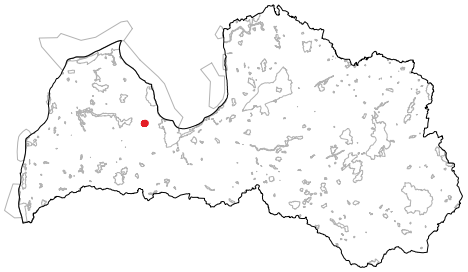
YEAR OF FOUNDATION: 2004.

LOCATION: Tukums municipality, Tume rural territory.

AREA: 68 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Tumes meži Nature Reserve includes coniferous forests, transition mires and quaking bogs at Lake Viksala. The territory is crossed by a relatively wide power line. Near ditches, beaver-inundated areas with standing dead trees can be found in some places. In the territory there are large stands of *Lycopodium annotinum*; protected moss *Scapania* sp. is found, as well as several indicator species of woodland key habitats, such as *Pycnoporellus fulgens*.

2. Threats to habitat and species conservation

Dry forests have developed after the previous drainage. Due to activities of beavers in ditches in some places, creation of beaver-inundated areas is promoted.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats, as well as in habitats of species that need undisturbed, natural environment.
- Limiting the activities of beavers.

5. Necessary management and conservation measures

5.1. General measures

It is necessary to limit the activities of beavers, to avoid the formation of too large beaver-inundated areas which threaten the persistence of western Taïga.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	60.0	88.2	Favourable.	Non-intervention.		60.0
7140	Transition mires and quaking bogs	0.4	<1	Favourable.	Non-intervention.		0.4
91D0*	Bog woodland	4.7	6.9	Poor.	Non-intervention.		4.7

Ukru gārša | *Nature Reserve (LV0523200)*

1. Brief description

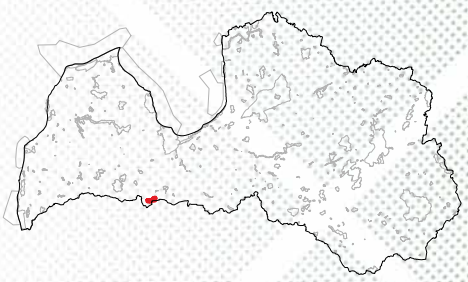
YEAR OF FOUNDATION: 1999.

LOCATION: Tērvete municipality Bukaiši rural territory; Auce municipality Ukri rural territory.

AREA: 1115 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 44 of 29 January 2002, Regulation on Individual Protection and Use of Ukru Gārša Nature Reserve.



Ukru Gārša Nature Reserve is one of the few preserved forest massifs in Zemgale Plain, in the historical distribution area of broadleaved forests in Latvia. Broadleaved forests, mainly woodlands of ash (*Fraxinus excelsior*) can still be found in Ukru Gārša. Woodlands cover 98 % of the nature reserve. Part of the territory is drained and planted with spruces (*Picea abies*). In the other part, natural tree species composition is still preserved – small fragments with oak (*Quercus robur*) woodlands, mixed woodlands with old oaks including noble trees (large trees whose size meet the criteria set in Regulation of the Cabinet of Ministers) and potential noble trees; there is a typical understory and rich vegetation. Seven EU protected habitat types have been found in the territory.

The most important habitats are *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (rare in Latvia), *Fennoscandian herb-rich forests with* Picea abies, in smaller areas also *Fennoscandian deciduous swamp woods, Alluvial forests*, as well as *Lowland hay meadows* and Molinia *meadows*.

As the cover of forests in Zemgale Region is low, this forest area serves as a refuge for many plants and animals (especially birds). Nature reserve is an important habitat for 48 protected and rare species, including 13 species of plants, one mushroom, 20 bird, seven invertebrate and seven mammal species. There are several plant species located close to the northern border of their distribution range, and are rare or absent on the rest of Latvia, such as *Ranunculus lanuginosus* and *Hypericum hirsutum*. Also *Bromopsis benekenii* is located close to its distribution border. Particularly valuable are *Fraxinus excelsior* forests with *Astrantia major* (can be found only in Zemgale Region).

The area of grasslands in nature reserve is small; however, they are important for ensuring gradual dispersal of grassland species, considering that semi-natural grasslands in Zemgale Region are rare and fragmented.

There is one of the highest lesser spotted eagle *Aquila pomarina* breeding densities in Latvia. Old oaks are suitable for nesting of *Ciconia nigra*, but woodlands of deciduous trees – for breeding of rare woodpecker species *Dendrocopos medius, Dendrocopos leucotos,* and *Picus canus*.

The territory is important for several rare and protected invertebrate species, for example, *Osmoderma barnabita*. In some reaches of the Tērvete river, *Unio crassus* is found, but in riparian forests - *Xylomoia strix* and *Lopinga achine*. Three bat species have been found in the territory, including *Nyctalus noctula*. Also *Muscardinus avellanarius* and *Lutra lutra* live here.

2. Threats to habitat and species conservation

- Wet forests are influenced by drainage. Drainage was started in 1920s, and habitats are still threatened by the deep cleaning of ditches.
- Cleaning of the riverbed of straightened Tērvete river in the direct vicinity of nature reserve.
- Fragmentation of broadleaved forests. Logging occurred even in the last decade of the 20th century thus fragmenting the most valuable continuous woodlands. Fragmentation is promoted by planting of spruces (*Picea abies*) in the cut areas.
- The vitality of oaks is decreased due to spruces which grow into their crowns.
- Overgrowth and fragmentation of grasslands on the banks of Tērvete river.
- The spread of invasive plant species meadow lupine *Lupinus polyphyllus* in nature reserve.

3. Existing management of the protected habitats and its assessment

In 2013, the removal of spruces which grow into crowns of oaks was carried out. For a permanent result, the insolation improvement (felling of shrubs and young trees around the large oaks) must be carried out.

4. Priorities of management and conservation

- Prevention of forest habitat fragmentation by promoting the growth of broadleaved trees and development of young mixed woodlands.
- Reduction of water runoff from EU protected habitats which have started to degrade.
- Maintenance of semi-natural grasslands in their whole current area; restoration of semi-natural habitats in abandoned or intensively managed grasslands.
- Establishment of conditions optimal for *Osmoderma barnabita* population.
- Limitation of the spread of invasive plant species *Lupinus polyphyllus*.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Clarification of the borders of nature reserve (compartments 25, 26, 37 of block 136, c. 3, 4 of bl. 135). According to the border description, these areas belong to the nature reserve, but they do not according to the official border of the territory. At the same time, these compartments are marked with a feature "nature protection" in State Forest Register, and it is considered that these compartments are located in the nature reserve.
- Meadow lupine *Lupinus polyphyllus* has massively spread in grasslands (marked as grasslands of wild animals by the forest inventory) at the former Mežvidi farmstead. They must be mown, twice per season in the beginning, to prevent the ripening and spread of lupine seeds. When lupine is destroyed, grassland must be maintained by mowing once per season.
- Periodical monitoring of the habitats of the territory in order to assess the efficiency of management measures and the dynamics of habitat development. Monitoring must be started in vegetation season before the management measures are taken. Further, it must be continued every 5 years.

5.2. Specific measures

5.2.1. Species

- The size of *Osmoderma barnabita* population in nature reserve is 60-120 individuals. For the conservation of species it is necessary to improve the insolation conditions around the old oaks, especially the hollow trees, by felling of excess trees and shrubs (the method is described in nature management plan). The measure should be taken in two steps.
- Also the restoration of open landscapes and grasslands along the Tērvete by felling of *Alnus incana* in area of 3 ha is necessary. Restoration must be continued by regular management.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	4.1	<1	Bad.	Non-intervention.		4.1
9160	Oak forests	4.4	<1	Poor.	Non-intervention. Improvement of insolation of oak crowns by felling of spruces.	1.5	2.9
9080*	Fennoscandian deciduous swamp woods	8.6	<1	Bad.	Non-intervention. Blocking of two drainage ditches (by construction of dams).	1.9	6.7
9050	Herb rich spruce forests	136.9	12.3	Poor.	Non-intervention. Improvement of insolation of oak crowns by felling of spruces. Felling of advance growth.	10.8	124
9020*	Broad-leaved deciduous forests	340.9	30.6	Poor.	Non-intervention. Felling of *Corylus avellana*. Promotion of the regeneration of broadleaved forest.		340.9
9000	Potential Protected woodland habitat		10.9	-	Creation of future habitats in mixed broadleaved forests by targeted management of spruce and birch plantations (selective felling, leaving all the broadleaved trees but decreasing spruces to 20%). Sites and methods are specified in Nature management plan.	122.0	
6510	Lowland hay meadows	7.5	<1	Bad.	Restoration. Maintenance.	7.5	7.5
6410	Molinia meadows	1.9	<1	Bad.	Restoration. Maintenance.	1.5	1.9

Ungurpils meži | *Nature Reserve (LV0522300)*

1. Brief description

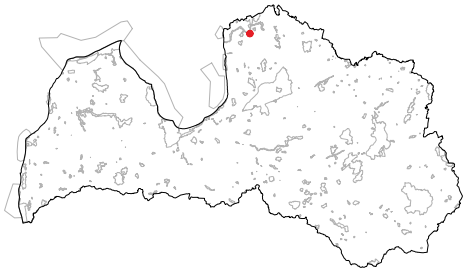
YEAR OF FOUNDATION: 1999.

LOCATION: Aloja municipality Staicele rural town.

AREA: 52.7 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ungurpils Meži Nature Reserve includes deciduous swamp woods mainly dominated by *Alnus glutinosa*, alluvial forests, as well as natural sections and riffles (habitat type 3260) of Karogupīte river. The territory borders with other EU and Latvian protected habitat types outside the nature reserve – sandstone outcrops (siliceous rocky slopes with chasmophytic vegetation), caves not open to the public (important habitats for bats), mineral-rich springs and springfens.

Protected plant species of the nature reserve includes *Glyceria lithuanica* and moss *Schistostega pennata*. The territory is an important habitat for bird *Bonasa bonasia,* there are several woodpecker species – *Dendrocopos leucotos, Picoides tridactylus, Dryocopus martius*.

2. Threats to habitat and species conservation

Significant nature values are not included in the nature reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Extension of the nature reserve: inclusion of ancient valley of Karogupīte river and its adjoining ravines with EU protected habitat types such as sandstone outcrops (siliceous rocky slopes with chasmophytic vegetation), caves not open to the public (important habitats for bats), mineral-rich springs and springfens.
- Demining of projectiles (remnants of the Second World War) in cooperation with the responsible organizations; if necessary.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	24.38	46.3	Poor.	Non-intervention.		24.38
91E0*	Alluvial forests	4.49	8.5	Poor.	Non-intervention.		4.49
3260	Natural river reaches and river riffles	0.05	<1	Poor.	Removal of beaver cut logs.		0.05

Užava | *Nature Reserve (LV0520300)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Ventspils municipality Užava rural territory.

AREA: 3012 ha, including terrestrial area 1236 ha.

NATURE MANAGEMENT PLAN: 2014 (2015–2025).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Užava Nature Reserve comprises a complex of coastal habitats – embryonic shifting dunes, white dunes (shifting dunes along the shoreline with *Ammophila arenaria*), grey dunes, wooded dunes. The very rare grey dune habitats which are rare in Latvia are particularly valuable: 2130* *Fixed coastal dunes with herbaceous vegetation (grey dunes)*, 2140* *Decalcified fixed dunes with* Empetrum nigrum, 2170 *Dunes with* Salix repens *ssp.* argentea (Salicion arenariea). The most part of the nature reserve is occupied by wooded dunes which have developed both naturally (by overgrowth of grey dunes with pines) and artificially (afforestation). There are 11 EU protected habitat types. Nature reserve plays an important role in the conservation of species associated with Coastal Lowland, as well as for conservation of open grey dune landscape.

In total, 13 rare and protected vascular plant species have been found in the nature reserve. Of them, the most important ones are *Linaria loeselii* and *Dianthus arenarius* subsp. *arenarius*, as well as *Eryngium maritimum* for which the nature reserve is one of the two localities in Latvia. There are several protected plant species characteristic to Coastal Lowland: *Lathyrus maritimus, Tragopogon heterospermus, Alyssum gmelinii*, also one rare moss species *Tortella inclinata*.

Grey dunes and coniferous forests of the nature reserve are important habitats for rare and protected lichens; this is the only locality in Latvia for 12 lichen species.

There are 19 protected bird species including *Anthus campestris, Bubo bubo, Sterna paradisaea, Lullula arborea, Columba oenas*. Also mammal *Lutra lutra* and reptile *Lacerta agilis* live here.

2. Threats to habitat and species conservation

- Grey dunes overgrow with pines (*Pinus sylvestris*) in course of succession. In result, habitats of rare and protected species decrease.
- Uncontrolled use of vehicles (quadricycles, cars) in grey dunes.
- Spread of invasive and alien plant species (*Rosa rugosa, Syringa vulgaris*, and others).
- Most part of Užava river channel is modified, straightened and deepened. The amount of suitable spawning and staying sites for fish outside the nature reserve is decreased.
- Illegal fishing of migratory fish.

3. Existing management of the protected habitats and its assessment

- For the management of anthropogenic pressure, visitor infrastructure was established in framework of LIFE project "Protection and management of coastal habitats in Latvia" (LIFE02NAT/LV/8498) and Cohesion Fund Project „Establishment of infrastructure for information and reduction of anthropogenic pressure in Natura 2000 territories (3DP/3.5.1.3.0/10/IPIA/VIDM/001 and 3DP/3.5.1.3.0/12/IPIA/VARAM/001). Part of the infrastructure development is supported also by JSC "Latvijas Valsts Meži".
- Measures include:
  - Visitor infrastructure (boardwalks and information boards) in recreation places at Užava river mouth and Užava lighthouse;
  - Barriers for the prevention of off-road driving;
  - Construction project for the establishment of several car parks is approved.
- Barriers, car parks and information signs help to regulate the flow of visitors.
- The mouth of Užava river mouth is cleaned – sediments are removed. Statistics of fish catches is not available. However, it can be assumed that the prevention of sediment accumulation in river mouth is beneficial to lampreys and migratory fish.

4. Priorities of management and conservation

- Maintenance and restoration of open grey dunes (habitat types 2130, 2140, 2170)
- Improvement of vegetation structure in wooded dunes (2180).

- Restoration of white dune ridge in places of interruptions.
- Eradication of invasive and expansive plant species.
- Limitation of sand blowing at Užava lighthouse and on southern border of nature reserve.
- Reduction and limitation of anthropogenic load.
- Maintenance of conservation regime for disturbance-sensitive species.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of migration possibilities for migratory fish and lampreys.

5. Necessary management and conservation measures

5.1. General measures

- Approval of Individual regulations on protection and use, in order to specify habitat management measures allowed in the territory, as well as to establish the necessary protection regime for disturbance-sensitive species. The second option proposes the establishment of micro-reserves in territory which is specified as a zone of regulated regime in the nature management plan (2014).
- Maintenance of existing visitor infrastructure and establishment of new one, in order to reduce anthropogenic influence on nature values.
- Establishing a barriers and rows of poles at habitats of protected species.
- Construction of barriers for the limitation of sand blow in the recreation sites – at Užava lighthouse and on southern border of nature reserve (total length up to 107 m), in accordance to recommendations provided in nature management plan.
- Establishment of barriers and rows of restricting poles (up to 150 m) in order to avoid vehicle use and to decrease the influence of visitors in localities of protected lichens (particularly *Evernia divaricata*) and rare snail *Helicigona lapicida*.
- Abatement of invasive plant species (*Rosa rugosa*), expansive species (*Populus tremula*) and alien species (*Pinus mugo* and *Syringa vulgaris*) which are planted or have established themselves in nature reserve, in order to ensure favorable conservation status of white dunes and grey dunes. Priority areas are specified in nature management plan.
- Water resource control and supervision during the migration of fish and lampreys.
- In the future, so called "Salmon action plan" must be developed in order to clarify population restoration and maintenance activities. As just a small part of Užava river crosses the nature reserve but measures are related to the entire drainage basin of river, an individual project is necessary.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	6.1	<1	Favourable.	Non-intervention.		6.1
9010*	Western Taïga	424.0	34.3	Poor.	Non-intervention, except structure improvement measures (pulling out of pine seedlings among old pines, preservation of dead wood).		424.0
3260	Natural river reaches and river riffles	2	<1	Poor.	River cleaning – if Užava river mouth is clogged by sand after severe storms.	On necessity.	

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
2180	Wooded dunes	1013.0	33.6	Poor.	Non-intervention. Maintenance of sparse woodlands: 1) Thinning of new pines; 2) Removal of pine seedlings in the openings among old pines; 3) Selective felling in middle-aged stands; 4) Eradication of alien tree species. In part of wooded dunes: restoration of grey dunes by felling of pines and restoration of grey dune characteristic structure – thinning of pines in overgrown grey dunes, leaving individual groups of large pines.	 37.0 81.0	976.0
2170	Dunes with Salix repens	14.5	1.2	Bad.	Selective felling of pines; avoiding groundfloor disturbance. Restoration of habitats 2130*, 2140*, 2170 within the overgrown areas: thinning of pines, groundfloor vegetation restoration.	0.4 14.1	
2140*	Decalcified fixed dunes with *Empetrum nigrum*	31.4	2.5	Poor.	Maintenance of open landscape. Selective felling of pines; avoiding groundfloor disturbance. Elimination of invasive and expansive species. Restoration of habitats 2130*, 2140*, 2170 within the overgrown areas: thinning of pines, groundfloor vegetation restoration.	8.6 2.5 0.09 20,2	
2130*	Grey dunes	119.8	9.7	Poor.	Manual removal of small pines. Felling of trees and shrubs. In territories with closed vegetation – removal of shrub shoots; groundfloor disturbance with vehicles or agricultural machinery (from 1st August to 15th March). Management of grassland-like habitats: raking of dry grass layer. Restoration of habitats 2130*, 2140*, 2170 within the overgrown areas: thinning of pines, groundfloor vegetation restoration.	55.8 10.0 (sparse stands) 40.0 (dense stands) 46.7	 20.0 2.3
2120	White dunes	13.5	1.1	Poor.	Promotion of sand accumulation: establishment of fences (described in nature management plan).		850 m in length
2110	Embryonic dunes	0.5	⟨1	Poor.	Gathering of municipal waste.	On necessity.	
1230	Sea cliffs	1.2	⟨1	Favourable.			

Užavas augštece | *Nature Reserve (LV0536000)*

1. Brief description

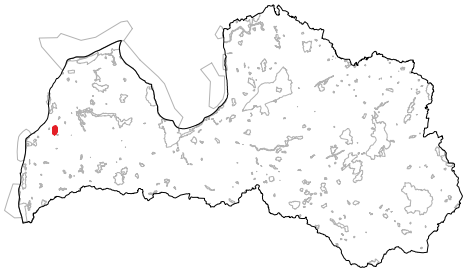
YEAR OF FOUNDATION: 2004.

LOCATION: Alsunga municipality.

AREA: 688 ha.

NATURE MANAGEMENT PLAN: 2005 (2006–2015).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Užavas augštece Nature Reserve includes a slightly modified section of Užava river with partly naturally flooded grasslands in the floodplain. Most of them are EU protected habitat types. Less than half of the territory is covered by fallow-lands and cultivated grasslands which are *Crex crex* breeding site of EU significance. For centuries, large areas of grasslands were maintained by mowing and grazing. In recent years, grasslands have rapidly overgrown, especially in heavily drained areas of the eastern and north-eastern part of the nature reserve. Woodlands in the territory are secondary – they developed when grasslands overgrew.

There are eight EU protected grassland habitat types. The largest areas are covered by alluvial grasslands. In terms of plant species diversity, the most significant are semi-natural dry grasslands on calcareous substrates, species-rich *Nardus* grasslands, as well as *Molinia* meadows on calcareous, peaty or clayey-siltladen soils. In the southern part of the nature reserve there are separate grasslands with juniper formations.

The nature reserve is the fourth most important Natura 2000 site in Latvia for habitat types 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) and 5130 Juniperus communis *formations on heaths or calcareous grasslands*, as well as the eighth most important for the conservation of 6450 *Northern boreal alluvial meadows* (7.6%, 10.5% and 2.3% respectively of the total area of Natura 2000 sites).

The diverse grasslands provide a habitat for nine rare and protected plant species. Out of these, the most important ones are *Crepis praemorsa, Serratula tinctoria, Orchis mascula, Iris sibirica, Dactylorhiza baltica.*

Wooded grasslands with clusters of *Carpinus betulus* and other trees are particularly valuable. Currently they are not managed and are quite overgrown. According to the currently known area of this habitat type, the territory is the third most important in Latvia (4% of the total habitat area of Natura 2000 sites).

"Užavas augštece" is an Important Bird and Biodiversity Area. Landscape mosaic of grasslands and surrounding woodlands is important for 47 rare and protected bird species. A significant number of *Crex crex* is breeding in the nature reserve. *Circus pygargus, Tringa totanus, Lanius collurio, Lullula arborea, Ciconia nigra, Porzana parva, Pernis apivorus, Aquila pomarina, Tetrao tetrix, Milvus migrants* can also be found here.

Grasslands are a habitat for nine rare and protected invertebrate species, such as *Lycaena dispar, Aeshna viridis*, and *Agrilus betuleti* whose locality in the nature reserve is the only one in Kurzeme region. *Unio crassus* can be found in Užava river.

Užavas augštece and Užavas lejtece Nature Reserves together with grasslands of central part of Užava river (currently not included in Natura 2000) and Diļļu Pļavas Nature Reserve form an important species dispersal corridor. This is one of the most important core areas for grassland habitats in Coastal Geobotanical District in the coastal part of Baltic Sea.

2. Threats to habitat and species conservation

- The most important factors affecting semi-natural grasslands are intensification of management (improvement, grubbing up) or lack of management causing grassland overgrowth and expansion of *Filipendula ulmaria*, resulting in grasslands which are unsuitable for grassland plant species and plant communities, and grassland birds.
- Due to Užava river channel straightening in the 1970s, the function of natural river floodplain is interrupted; therefore grasslands overgrow in a course of succession and due to lack of management. In some places, water runoff is hindered by berms created as a result of river dredging, and mowing is difficult due to excessive moisture.
- Drainage ditches overgrow with trees and shrubs. As a result, the open landscape is fragmented and becomes unsuitable for grassland birds.
- In the highly drained parts of grasslands, beaver dams are created, flooding and paludification of grasslands occur, several grasslands are permanently inundated.

- Dams of logs fallen by beavers in Užava river promote accumulation of sediments and burial of habitats of *Unio crassus*.
- Spread of invasive species *Heracleum sosnowskyi*.

3. Existing management of the protected habitats and its assessment

- Floodplain grassland restoration was carried out in the framework of the LIFE Nature Programme project "Restoration of Latvian Floodplains for EU priority species and habitats", LIFE04NAT/LV/000198).
- According to Rural Support Service, in 2014 around 60-80 % of semi-natural grasslands of the nature reserve were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". However, it is only a small part of the total grassland area. Cultivated grasslands were mostly managed within the framework of the measure, and there are also overgrown areas.
- Grasslands of the right bank of Užava river are highly drained, and they do not correspond to criteria of EU protected grasslands. They were also evaluated as unsuitable for grassland birds in 2013.

4. Priorities of management and conservation

The diversity and the number of species in semi-natural grasslands is very high, therefore the priority in the nature reserve is the conservation of both habitats and species habitats in favourable protection status.

The maintenance of semi-natural grasslands in favourable protection status is necessary in the maximum possible area on the left bank of the river and also in southern part of the right bank where a shallow drainage ditch system is established (including currently overgrown areas of historical grasslands).

Grasslands on the right bank of Užava river, northern part of nature reserve, must be maintained suitable for breeding of *Crex crex*. In long term, the mitigation of drainage impact must be planned by restoring the old channel of Užava river.)

Prevention of the establishment of new beaver-inundated areas.

Limitation of the spread of *Heracleum sosnowskyi*.

Improvement of the infrastructure necessary for grassland management (roads, bridges, etc.).

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of the consolidation of Užavas augštece, Užavas lejtece, Diļļu Pļavas Nature Reserves into one Natura 2000 site, including also grasslands of Užava river central part, thus establishing a landscape-ecologically compact area of grasslands.
- A comprehensive eco-hydrological research of the territory is necessary; assessment of impact of drainage (deep drainage in northern part of the nature reserve, shallow drainage in southern part) and river dredging (berms) on the grassland habitats of the left bank of the river.
- Development and implementation of a plan for rewetting and hydrological regime regulation. The purpose of the plan is to provide optimal conditions for grassland habitats and plant species as well as for *Crex crex* and other grassland birds and other protected bird species. Plan should include an assessment of the preservation of old drainage systems as a heritage of cultural history (a network of natural watercourses in the south and west of the nature reserve, where naturally curving watercourses are connected to the ditches to promote discharge of flood waters).
- Within the framework of the plan, it is necessary to evaluate the possibilities and necessity to preserve beaver inundated areas. Also their impact on protected species and habitats should be assessed.
- In the wettest sites of the nature reserve, where inundated areas will be preserved, the expansion of reedbeds and shrubs must be regularly restricted. Reeds and shrubs must be removed in winter, at least once every 2-3 years.
- Reconstruction/repair of access roads and bridges (according to the rewetting plan).
- Elimination of *Heracleum sosnowskyi* stands with agrotechnical methods (chemical methods are not allowed).
- Creation of semi-natural grasslands in the cultivated grasslands in the northern part of Užava river left bank must be evaluated; restoration plan must be elaborated.

5.2. Specific measures

5.2.1. Species

Population of *Crex crex* consists of 22 – 32 pairs, condition of the population is considered as poor. Necessary conservation measures include

restoration (shrub cutting along drainage ditches) and continuous management (mowing after July 20, hay removal) of fallow-lands and cultivated grasslands (not a habitat of EU importance) which previously have been important grasslands for birds.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	37.0	5.4	Poor.	Restoration. Maintenance.	37.0	37.0
6450	Northern boreal alluvial meadows	231.1	33.6	Poor.	Restoration. Maintenance.	77.0	231.1
6410	*Molinia* meadows	59.0	8.6	Poor.	Restoration. Maintenance.	23.3	59.0
6230*	Species-rich *Nardus* grasslands	7.3	1.1	Poor.	Restoration. Maintenance.	1.6	7.3
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	21.8	3.2	Poor.	Restoration. Maintenance.	8.8	21.8
6210	Semi-natural dry calcareous grasslands	19.1	2.8	Poor.	Restoration. Maintenance.	6.0	19.1
6120*	Xeric sand calcareous grasslands	5.8	<1	Poor.	Restoration. Maintenance.	1.5	5.8
5130	*Juniperus communis* formations on heaths or calcareous grasslands	4.9	<1	Poor.		1.7	4.9
6000	Grasslands to be restored	300.0	43.6	-	Restoration. Maintenance.	300.0	300.0
3260	Natural river reaches and river riffles	1.0	<1	Poor.	Limitation of beaver dams and large woody debris in order to ensure river water discharge. On necessity.		0.1

One-time grassland restoration measures are necessary in the entire area of the nature reserve. Restoration measures and sites are not specified, and Nature management plan of 2008 is outdated – it can not be used efficiently without a repeated inventory of grasslands. Restoration of semi-natural grasslands in the southern part of the nature reserve is a priority (they can be restored before rewetting). It is expected that large-scale and financially intensive grassland rewetting, construction of infrastructure (access roads and bridges) and the restoration of grasslands overgrown with shrubs and forests will be necessary.

Vadaiņu purvs | *Nature Reserve (LV0515900)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Valka municipality, Zvārtava rural territory.

AREA: 238 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Vadaiņu purvs Nature Reserve is located at the southern edge of a very large forest massif. It includes part of Vadaiņi Mire, small areas with transition mires, as well as coniferous forests, and mineral-ground islets in the mire. The dystrophic Lake Vadaiņi is adjoining the nature reserve. It is 1.4 km long and its coastal part is a stopover site for migratory waterbirds as well as a feeding site for invertebrates and birds. Rare and protected bird species such as *Tetrao urogallus, Dryocopus martius, Caprimulgus europaeus*, and *Picoides tridactylus* can be found in the territory. Rare moss species *Anastrophyllum hellerianum, Geocalyx graveolens, Jungermannia leiantha* grow in forests.

2. Threats to habitat and species conservation

Wet habitats of the territory are affected negatively by drainage which was carried out around 1960s in the southern part of the nature reserve (currently located outside the nature reserve). Several ditches adjoin the south-western part of the mire, and there is no information about the efficiency of their functioning.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage habitats.
- In 2012, an artificial nest for the osprey *Pandion haliaetus* was constructed.

4. Priorities of management and conservation

- Restoration of optimal hydrological regime in mire and in bog woodlands.
- Undisturbed course of natural processes in natural mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of possibilities of rewetting in a complex of mire and bog woodland.
- Adjustments of the nature reserve borders by including the entire mire. Currently, high-quality mire habitats and drainage-influenced mire parts are both located outside the territory, and therefore habitat protection and management is hindered.
- There are no specific management measures necessary for Lake Vadaiņu which is located next to the nature reserve.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	43.3	18.2	Favourable.	Non-intervention, except rewetting, in complex with mire, if necessary.	According to hydrological research results.	43.3
9010*	Western Taïga	1.5	<1	Favourable.	Non-intervention.		1.5
7140	Transition mires and quaking bogs	4.6	1.9	Poor.	Non-intervention.		4.6
7110	Active raised bogs	129.6	54.4	Poor.	Rewetting (ditch damming or filling up), if possible.	According to hydrological research results.	

Vāveres ezers | *Nature Reserve (LV0500700)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Vecumnieki municipality Valle rural territory.

AREA:225 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Vāveres ezers Nature Reserve is located in an area rich in forests, on the right bank of the River Daugava. It includes Lake Vāveres and the surrounding transition mire, bog woodlands and swamp woods. Svētupe river flows out of the Lake Vāveres, the river is modified. Probably, Svētupe river has caused the lowering of lake water level and further acceleration of eutrophication processes. There are four habitat types of EU importance in the territory.

Several rare bird species can be found in the nature reserve - *Aegolius funereus, Dryocopus martius, Botaurus stellaris, Lullula arborea, Aythya fuligula*, and others. Transition mire is a habitat for rare dragonfly *Leucorrhinia pectoralis*, and for orchid *Dactylorhiza incarnata*.

2. Threats to habitat and species conservation

- Transition mire overgrows with *Phragmites australis, Typha latifolia*, and other species – both due to natural succession and eutrophication.
- Submerged and floating-leaf plants and their micro-habitats are threatened due to lake overgrowth with monodominant emergent vegetation.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Creation and maintenance of a habitat suitable for *Botaurus stellaris*.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	91.0	40.4	Favourable.	Non-intervention.		91.0
9080*	Fennoscandian deciduous swamp woods	39.4	17.5	Favourable.	Non-intervention.		39.4
7140	Transition mires and quaking bogs	15.8	7.0	Favourable.	Non-intervention.		15.8
3150	Natural eutrophic lakes	14.3	6.4	Poor.	Maintenance or creation of vegetation structure suitable for *Botaurus stellaris* – a belt of reeds in 15-30 cm deep water. Maintenance of conditions for successful breeding – water level, availability of fish in reedbeds and adjoining territory, gently-sloping lakebed. Every 5-10 years.	0.5	
3260	Natural river reaches and river riffles	0.1	<1	Poor.	Removal of beaver dams, in order to ensure water discharge, slow down coastal paludification and overgrowing with monodominant emergent vegetation.		0.1

Vecdaugava | *Nature Reserve (LV0518300)*

1. Brief description

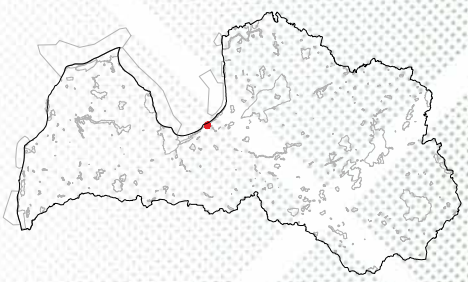
YEAR OF FOUNDATION: 1987.

LOCATION: Rīga City.

AREA: 237.7 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2026).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Vecdaugava Nature Reserve includes a peninsula in Vecdaugava waterbody (a large oxbow of river Daugava), and its surrounding aquatorium with oxbow lakes and water bodies separated by a dense belt of emergent vegetation. Coastal meadows of the nature reserve are a nature value of national importance because this is the largest locality of *Armeria maritima* in Latvia. Most part of the terrestrial area of nature reserve is occupied by extensive alluvial grasslands. Xeric sand calcareous grasslands are located in the central part, and large reedbeds and willows are found along the open water. Vecdaugava Peninsula with its aquatorium is an important breeding and concentration site for grassland birds and waders.

Six EU protected semi-natural grassland habitats (and one EU protected aquatic habitat) are found in nature reserve, as well as 18 protected plant species, such as *Angelica palustris, Gladiolus imbricatus, Triglochin maritimum, Carex aquatilis, Zannichellia palustris, Dactylorhiza baltica, Dactylorhiza maculata, Jovibarba globifera*, and others.

The nature reserve is an important Natura 2000 territory for the maintenance of grassland and coastal habitat landscape-ecological connectivity, as an important part of Eastern Baltic species dispersal corridor along the coast of the Baltic Sea. It is important for the conservation of Rīga City biodiversity and for public education.

61 species of birds can be observed in nature reserve regularly; of them, 35 are possibly nesting here. Of all the bird species found in the nature reserve, 27 are protected species. Examples: *Cygnus cygnus, Haliaeetus albicilla, Philomachus pugnax, Falco tinnunculus, Circus aeruginosus*, and others. Out of these, 4 are breeding: Botaurus stellaris, Crex crex, Locustella luscinioides, and Lanius collurio.

Nature reserve is important for several fish species, such as *Cobitis taenia, Rhodeus sericeus amarus, Pelecus cultratus, Aspius aspius,* as well as *Misgurnus fossilis* for which the species management plan will be developed.

2. Threats to habitat and species conservation

- Lack of grassland management, management of too low intensity and paludification promotes the overgrowth of territory with the common reeds *Phragmites australis* and the fragmentation of grasslands. Although protected bird species are breeding in reedbeds, the further spread of reedbeds is considered as negative.
- There are high levels of biogenes in Vecdaugava aquatorium. Grasslands are flooded with the water of Vecdaugava, and grassland eutrophication is promoted.
- Birds in grasslands and reedbeds are disturbed by unleashed walking dogs.
- Plant communities and protected species are endangered by free pasturing (in one large enclosure, without regulation of grazing duration and intensity). Grazing intensity in grasslands is too high – horses are grazing in the territory during the whole vegetation season, and tend to move beyond the fenced area. Some areas are overgrazed, but others – not grazed at all.
- There is a rather large proportion of shrubs in nature reserve, also in the grazed part. This increases the negative influence of predators (corvids) on grassland breeding birds.
- Protected habitats, especially 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* are adversely affected by spread of invasive species *Amelanchier spicata* and *Rosa rugosa.*
- A flood prevention project has been developed for the whole Vecdaugava. It includes the construction of dykes and a water flow regulator or a dam. It is possible that the project will result in local humidity regime changes. The territory is included in a list of Flood risk areas of national significance.

- Potential risk of chemical pollution. The nearest end of the territory of Freeport of Rīga is located at a distance of 20 m from the nature reserve. Chemical storage facilities are located about 70 meters from the nature reserve.
- Eutrophication of Vecdaugava (oxbow lake) is promoted by increased input of nutrients from Mangaļi and Vecāķi housing areas (Rīga City).
- EU protected grassland habitat is adversely affected by bathing site (increased anthropogenic load).

3. Existing management of the protected habitats and its assessment

- Part of the nature reserve is used as pasture for horses. Grazing has stabilized the condition of grassland habitats. However, grazing is not uniform throughout the area, some places are overgrazed or undergrazed.
- Emergent vegetation is mowed at bathing sites. This measure has improved both the scenic quality of the territory and the functionality of habitats.
- Invasive species (*Amelanchier spicata* and *Rosa rugosa*) are regularly mown or cut, their distribution and vitality have decreased although invasive plants are not completely eliminated in their localities.

4. Priorities of management and conservation

- Conservation and increase of semi-natural grassland biodiversity in maximum possible area; conservation of their characteristic species populations.
- Conservation of localities of protected plant species, particularly *Armeria maritima*.
- Restriction of spread of invasive species *(Amelanchier spicata* and *Rosa rugosa*) in grasslands.
- Reduction of monodominant reedbeds (priority around the Vecdaugava central water body), in order to extend places with free access to water and to increase the areas of grasslands.
- Mowing in shores of distributaries and small water bodies in the territory, with aim to improve conditions for waterbirds and spawning fish.
- Reduction of emergent vegetation in water bodies (eutrophication).
- Maintenance of recreation sites (removal of waste). Improvement or recultivation of degraded territory (opposite to Vecdaugavas Street).

5. Necessary management and conservation measures

5.1. General measures

- Cleaning of oxbow lakes, culverts and old drainage ditches, in order to improve water exchange in the nature reserve, thus reducing the eutrophication and flood risk.
- Gathering the waste from recreation sites and transporting it away.
- Establishment of seasonal restricted area in the north of peninsula (site suitable for waterbird breeding).
- Management of the water body in accordance with the operation (management) regulations of the Vecdaugava aquatorium.
- Development of recommendations for the thematic planning of aquatic and shore areas.
- Repair of enclosure fences; regulation of grazing pressure according to nature management plan of 2016.
- Restriction of overgrowth with shrubs using regulated grazing.
- Development of grassland restoration and conservation plan. The plan must include detailed description of the necessary work by years and months, in line with the manager's technical, financial and other resources. (Rather detailed information is included in nature management plan, however, it is insufficient for the practical planning of tasks. For example, it is not described how to regulate the grazing intensity, there is no plan for reed mowing, etc.).
- Management success monitoring.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
1630*	Coastal meadows	2.83	1.2	Poor.	Restoration. Maintenance.	2.83	2.83
6120*	Xeric sand calcareous grasslands	11.84	5.0	Favourable.	Restoration. Maintenance.	11.84	11.84
6230*	Species-rich *Nardus* grasslands	1.04	<1	Favourable.	Restoration. Maintenance.	1.04	1.04
6430	Hydrophilous tall herb fringe communities	0.25	<1	Bad.	Restoration. Maintenance.	0.25	0.25
6450	Northern boreal alluvial meadows	19.73	8.0	Poor.	Restoration. Maintenance.	19.73	19.73
6410	*Molinia* meadows	3.68	1.6	Poor.	Restoration. Maintenance.	3.68	3.68
3150	Natural eutrophic lakes	130.0	54.7	Favourable.	Mowing of emergent vegetation (mainly *Phragmites australis*). *Botaurus stellaris* nesting site must be clarified before the mowing, and left unmown. Thinning of dense belts of continuous vegetation, creating access to open water. Skimming of free-floating plants, annually, in south-eastern part of nature reserve (at Airu Street).	~42.0 2.0 10.6	

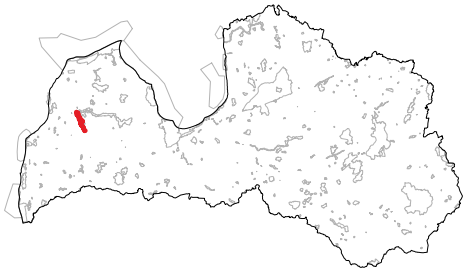
One-time restoration measures are necessary in the whole area of nature reserve. Measures include: felling of shrubs, restorative mowing or grazing, elimination of invasive species, restriction of reeds; repair of enclosure fences and maintenance of pastures (periodical felling of shrubs and intense grazing to restrict shoots); shredding of roots. Restoration measures are specified in nature management plan (2016).

Annual management measures are necessary in the whole area of grasslands (39 hectares in EU protected grassland habitats and former allotment gardens which are now overgrown with reeds and shrubs), and will be necessary in restored grassland areas. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

The grazing pressure recommended in nature management plan in xeric sand grasslands is 0.5 livestock units per hectare. It needs to be adapted to the actual natural conditions, as it is a rather heavy pressure for grasslands with such low fertility. In alluvial grasslands of the southern part of the territory, early mowing or mowing at least twice per season is recommended in the first years of restoration, in order to limit the expansion of reeds. After the limitation of reeds, management can be continued as recommended in nature management plan.

Ventas ieleja | *Nature Reserve (LV0507100)*

1. Brief description



YEAR OF FOUNDATION: 1957.

LOCATION: Kuldīga municipality, Padure and Rumba rural territory; Kuldīga town.

AREA: 2513 ha.

NATURE MANAGEMENT PLAN: 2010 (2010–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 648 of 16 May 2014, Regulation on Individual Protection and Use of the Ventas Ieleja Nature Reserve.

INCLUDES OTHER PROTECTED NATURE AREAS: Ventas rumba Geological and Geomorphological Nature Monument and Maņģene Dendrological Plantings Nature Monument.

Ventas Ieleja Nature Reserve includes valley of Venta River with its fluvial terrace above floodplains and coastal slopes, its tributaries with ravine slopes, as well as adjoining forests and agricultural land. It continues a series of protected nature territories of the Abava river valley, and it borders with Riežupe Nature Park.

Steep slopes are characteristic for Venta, Krāčupīte and Padure rivers. Venta River is important for recreation, especially in the vicinity of Ventas Rumba Waterfall in Kuldīga town. Forests cover more than half of the nature reserve, mainly north of Kuldīga town. Agricultural land covers about one third of the territory. Especially large agricultural areas are located south of Kuldīga town and near it. In the rest of the nature reserve area, arable lands and grasslands are fragmented. Woodlands of *Pinus sylvestris, Picea abies* and *Betula* spp. of various ages dominate the territory; also *Quercus robur* woodlands cover a significant proportion of the area. Only 14 % of the territory is occupied by old forests; most of the forests are relatively intensively managed. The large and very old solitary noble trees in Veckuldīga castle mould are particularly valuable; they are valuable both for the scenic and beautiful landscape and as a habitat for various plant and animal species.

There are 17 EU protected habitat types in the nature reserve, the most important of which are forests on slopes, screes and ravines, western Taïga, and semi-natural dry grasslands on calcareous substrates which are found in considerably large areas. The nature reserve is one of the ten most important Natura 2000 sites in the country in preserving this habitat type and includes 3% of the total habitat area in the Natura 2000 network. Outcrops, especially the Sarkanās sienas sandstone outcrops ("The red walls") and limestone outcrops at Venta Rumba waterfall are some of the important values of the territory, despite their small area.

The territory is part of the most important landscape ecological corridor in Western Latvia's Geobotanical District - the Venta valley. It forms a united complex with Abavas senleja Nature Park and Riežupe Nature Reserve; therefore habitats must be jointly restored and managed in all these territories.

The nature reserve is a habitat for a large number of rare and protected plant and animal species – 44 protected vascular plant species, 19 moss, 15 bird, six mammal, two amphibian, 12 fish and 27 invertebrate species in the area.

Important plant species are *Allium schoenoprasum, Asplenium ruta-muraria, Corydalis cava, Lathyrus niger, Carex brizoides, Laserpitium latifolium, Crepis mollis, Liparis loeselii, Stellaria crassifolia*. Moss *Hamatocaulis vernicosus* can be found in transition mires, but *Trichocolea tomentella* in springfens. Important bird species are *Bonasa bonasia, Haliaeetus albicilla, Pernis apivorus, Pandion haliaetus, Crex crex*. Invertebrates - *Unio crassus, Parnassius mnemosyne, Liocola marmorata, Stenocorus meridianus*. Reptiles - *Triturus cristatus* and *Lacerta agilis*. Venta River is a habitat for many species of fish: *Cobitis taenia, Cottus gobio, Aspius aspius, Rhodeus sericeus amarus, Lampetra fluviatilis*, and *Salmo salar*; lamprey *Lampetra planeri*. Five bat species use Venta River as a foraging site, including *Myotis dasycneme*.

2. Threats to habitat and species conservation

- Lack of grassland management causing their overgrowth; inappropriate management such as grass shredding, too intense management (fertilization, admixture sowing), building construction, establishment of lawns, afforestation.

- Large-scale forestry activities, which have had a negative impact on the quality of habitats.
- Logging in slope forests promotes erosion.
- Overgrowth and clogging of sediments of Venta River riffles. Disappearance of microhabitats of oxygen-sensitive rare and protected invertebrates.
- Formation of large woody debris and beaver dams in Krāčupīte and Padure rivers, impeding the fish migration.
- Spread of invasive species *Heracleum sosnowskyi* (found in Kuldīga town and at the mouth of the Riežupe River in Venta).
- Tourism and recreation. For example, plant communities in spring discharge sites are very vulnerable to trampling, and trails established at sandstone caves promote unwanted influxes of tourists. Visitors also leave waste in overnight and picnic places (Veckuldīga castle mound at Abava river mouth).

3. Existing management of the protected habitats and its assessment

- In 2012 and 2016, the restoration of river riffles at Venta Rumba waterfall was carried out in area of 7 – 10 hectares, using a tractor which was equipped for shredding of roots and loosening of river bed substrate, as well as mowing of macrophytes and restoration of river riffle habitat. Measures were supported by Latvian-Lithuanian cross-border programs as well as by Kuldīga County Council and Environmental Protection Fund. It has been concluded that the positive effect is temporary (2-3 years) if biogene inflow from the drainage area is not eliminated. Therefore management measures need to be repeated on a regular basis. Certain irregular measures in Venta and its tributaries (mowing, removal of large woody debris, demolition of beaver dams) have been organised by non-governmental organizations and fishing clubs with no external financing.
- In 2004, the project financed by the ERDF "Eco tourism infrastructure development in Venta Valley Nature Reserve" was implemented. Nature trails in a length of 8 km were created; as well as other infrastructure (car park, access roads, picnic sites, etc.).
- According to Rural Support Service, in 2014 more than half (62-72 %) of the grasslands of habitat types 6450 *Northern boreal alluvial meadows* and 6120* *Xeric sand calcareous grasslands* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Less than half (48%) of habitat types 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* were managed. Grasslands of habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) are the most important for the biodiversity but only 6 % of their area was managed. The impact of management on the conservation status of grasslands has not been evaluated.

4. Priorities of management and conservation

- Restoration and maintenance of semi-natural grasslands in at least 130 hectares (restoration of historical but now overgrown grasslands is the priority, as well as cultivated grasslands and fallow lands with a good restoration potential – potential grasslands of EU significance).
- Restoration of river riffles in Venta River; increase of areas suitable for spawning and for juveniles of protected species such as *Salmo salar, Lampetra fluviatilis, Vimba vimba.*
- Supervision and control during spawning of protected fish and lamprey species.
- Increasing the area of micro-habitats of oxygen-sensitive rare and protected invertebrate species, as well as maintaining the spawning and fish migration sites in tributaries of Venta River (Krāčupīte, Padure, etc.).
- Regular maintenance of the adjoining section of Ventas Rumba waterfall.
- Conservation of habitats suitable for bats by limiting the felling of old trees.
- Undisturbed course of natural processes in natural forest, outcrop, spring and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Protection of sandstone outcrops, using appropriate infrastructure for redirecting visitors to less sensitive sites.

5. Necessary management and conservation measures

5.1. General measures

- Update of Individual regulations on protection and use, adding restrictions for logging.
- Development and implementation of habitat restoration and management plan for semi-natural grasslands. In Nature conservation plan in 2010, the objective of preserving natural grassland habitats

in the area of 60 ha was specified, which was the area known at that time. However, information was lacking the amount of minimal grassland area for their long-term conservation, both for landscape structure preservation and for conservation of habitats and birds (*Crex crex*). The high level of fragmentation indicates that the current area can not provide a favorable conservation status for natural grassland habitats in the long term. In order to increase the landscape ecological connectivity of semi-natural grasslands, the restoration of semi-natural grasslands in an area of at least 130 ha should be evaluated, including their development in the areas of historic grassland and in areas of extensively managed cultivated grasslands, and fallow-lands with good potential of restoration.

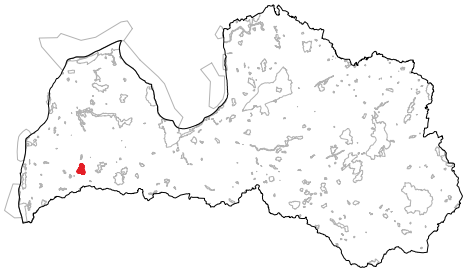
5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	10.4	<1	Favourable.	Non-intervention.		10.4
9180*	Slope forests	110.9	4.4	Poor.	Non-intervention.		110.9
9010*	Western Taïga	192.8	7.7	Poor.	Non-intervention.		192.8
91E0*	Alluvial forests	14.1	<1	Poor.	Non-intervention.		14.1
8310	Caves not open to the public	0.01	<1	Poor.	Non-intervention, except construction and maintenance of the appropriate infrastructure.		0.01
8220	Siliceous rocky slopes	0.16	<1	Favourable.	Non-intervention, except construction and maintenance of the appropriate infrastructure.		0.16
8210	Calcareous rocky slopes	0.09	<1	Poor.	Non-intervention, except construction and maintenance of the appropriate infrastructure.		0.09
7160	Fennoscandian mineral-rich springs and springfens	0.1	<1	Favourable.	Non-intervention.		0.1
7140	Transition mires and quaking bogs	8.8	<1	Favourable.	Non-intervention.		8.8
6450	Northern boreal alluvial meadows	7.7	<1	Poor.	Restoration. Maintenance.	2.1	7.7

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	2.3	<1	Bad.	Restoration. Maintenance.	1.3	2.3
6430	Hydrophilous tall herb fringe communities	18.3	<1	Favourable.	Restoration. Maintenance.	0.0	18.3
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	7.1	<1	Bad.	Restoration. Maintenance.	4.5	7.1
6210	Semi-natural dry calcareous grasslands	56.3	2.2	Bad.	Restoration. Maintenance.	52.0	56.3
6120*	Xeric sand calcareous grasslands	2	<1	Poor.	Restoration. Maintenance.	2.0	2.0
6000	Grasslands to be restored	35.0	1.4	-	Restoration. Maintenance.	35.0	35.0
3270	Rivers with muddy banks	0.6	<1	Poor.	Non-intervention.		0.6
3260	Natural river reaches and river riffles	100.9	4.0	Poor.	Decrease of overgrowth with aquatic plants in riffle areas in Venta. Mowing of macrophytes and their root removal. Loosening of river bed. Restoration of spawning grounds for salmonids, lampreys and *Vimba vimba*. Increase of habitats for oxygen-sensitive rare invertebrate species. Removal of large woody debris and beaver dams – on necessity.		30 On necessity.

Ventas un Šķerveļa ieleja | *Nature Reserve (LV0507200)*

1. Brief description



YEAR OF FOUNDATION: 1957.

LOCATION: Skrunda municipality Nīkrāce rural territory; Skrunda town with rural territory; Saldus municipality Pampāļi rural territory.

AREA: 1459 ha.

NATURE MANAGEMENT PLAN: 2002 (2002–2007).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 13 of 03 January 2012, Regulation on Individual Protection and Use of Ventas un Šķerveļa Ieleja Nature Reserve.

INCLUDES OTHER PROTECTED NATURE AREAS: Ātraiskalns, Šķerveļa akmens, Šķerveļa lejteces dolomīta atsegums, Zoslēnu atsegumi, Gobdziņu klintis, Ketleru atsegums Geological and Geomorphological Nature Monuments.

Ventas un Šķerveļa Ieleja Nature Reserve includes valley of Venta River, a sector between the mouths of Šķervelis and Lētiža rivers, as well as reaches with river riffles of Šķervelis and Lētiža rivers. The two smaller rivers are fast, with a great stream gradient, in deep and wide ravines, creating a visually expressive landscape. The territory includes a number of geologically significant outcrops of sedimentary rocks; the most important ones of them are Ātrās klintis ("The Fast rocks") in Venta river and dolomite outcrops at Šķervelis river.

There are 13 EU protected habitat types in the nature reserve. Forests on slopes, screes and ravines can be found in ravines and side-ravines of Venta and smaller rivers. Old broad-leaved deciduous forests are located in the vicinities of rivers, especially at Šķervelis. The area of western Taïga is rather small. Petrifying springs with tufa formation and Fennoscandian mineral-rich springs and springfens can be found in slope forests. Grasslands can be found in vicinity of old farmsteads in the Venta valley. Out of these, the largest areas are occupied by Xeric sand calcareous grasslands, Fennoscandian lowland species-rich dry to mesic grasslands and Semi-natural dry grasslands and scrubland facies on calcareous substrates. The territory is a part of Venta valley which is an important landscape ecological corridor, forming a united complex with Abavas Seneleja Nature Park, Riežupe Nature Reserve, Zaņas lejtece Nature Monument.

The territory is rich with rare and protected species – 13 protected species of birds, 3 mammals, 11 fish and two protected invertebrate species can be found here. Protected plant species are found in river valleys, such as *Lithospermum officinale, Lathyrus niger, Polygonatum verticillatum, Arctium nemorosum, Orchis mascula, Laserpitium latifolium*. All watercourses in the nature reserve are salmonid rivers, as well as important bird breeding and stopover sites. Important bird species in forest are *Ciconia nigra* and various species of woodpeckers. *Riparia riparia* and *Alcedo atthis* can be found at sandstone outcrops. Also *Mergus serrator, Grus grus, Crex crex* are breeding in the nature reserve. Water courses in nature reserve are foraging sites for several species of bats, for example *Myotis dasycneme*. Old noble oaks found in the territory of Šķerveļi farmstead, as well as woodlands of broadleaved trees are potentially suitable for populations of insect species *Osmoderma barnabita* and *Cerambyx cerdo*. The Venta River as a natural species migration route is important for spawning of *Salmo trutta, Lampetra planieri, Thymallus thymallus* and other aquatic species. Thick shelled river mussel *Unio crassus* can be found here. River valley and its surrounding forests are habitats for *Lutra lutra*.

2. Threats to habitat and species conservation

- Lack of grassland management causing their overgrowth; inappropriate management such as grass shredding, too intense management (fertilization, admixture sowing), building construction, establishment of lawns, afforestation.
- Landscape is degraded due to lack of visitor infrastructure (camping sites, marked trails, barriers at outcrops). Especially degraded sites are at Ātrās Klintis, at Šķervelis river mouth. Due to lack of appropriate infrastructure, a pressure on nature values, such as riparian forests, outcrops of sandstone and carbonate rocks, is increased.
- There are clogs and beaver dams in some places in Šķervelis River. River also overgrows with herbaceous plants.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in 2014 in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands", grassland habitats were managed fragmentarily and in small areas. 6120* *Xeric sand calcareous grasslands* are the most important for the biodiversity conservation and they were managed in an area of 94 %. 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* ware managed only in 36 % of their total area. The impact of management on the conservation status of grasslands has not been evaluated.
- In other habitat types, management measures have not been carried out.

4. Priorities of management and conservation

- Restoration and maintenance of semi-natural grasslands in at least 80 hectares. Restoration of historical but now overgrown grasslands is the priority (especially in valleys of Lētīža and Venta rivers), as well as cultivated grasslands and fallow lands with a good restoration potential – potential grasslands of EU significance).
- Restoration of river riffles and areas suitable for spawning of salmonids.
- Redirection of visitors from sensitive habitats (outcrops and caves) by establishing picnic sites, and campsites, and other appropriate infrastructure elements.
- Undisturbed course of natural processes in natural forest, outcrop and spring habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- It is necessary to establish the necessary infrastructure and develop a network of nature trails for the management of visitor flow and at the same time for redirecting it from the sensitive habitats (outcrops and caves). Establishment and maintenance of campsites and picnic sites is necessary.
- Development and implementation of restoration and management plan for semi-natural grasslands is necessary. The high level of fragmentation indicates that the current area can not provide a favorable conservation status for natural grassland habitats in the long term. In order to increase the landscape ecological connectivity of semi-natural grasslands, the restoration of semi-natural grasslands in an area of at least 80 ha should be evaluated, including their development in the areas of historic grassland and in areas of extensively managed cultivated grasslands and fallow-lands with good potential of restoration.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91F0	Riparian mixed forests	0.4	<1	Poor.	Non-intervention.		0.4
9180*	Slope forests	49.3	3.3	Favourable.	Non-intervention.		49.3
9160	Oak forests	6.5	<1	Favourable.	Non-intervention.		6.5
9020*	Broad-leaved deciduous forests	0.1	<1	Favourable.	Non-intervention.		0.1
9010*	Western Taïga	15.3	1.0	Favourable.	Non-intervention.		15.3

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
8310	Caves not open to the public	0.2	<1	Poor.	Construction of barriers if paths are established.		0.2
8220	Siliceous rocky slopes	0.25	<1	Favourable.	Construction of barriers if paths are established.		0.25
8210	Calcareous rocky slopes	0.1	<1	Favourable.	Construction of barriers if paths are established.		0.1
7220*	Petrifying springs	0.2	<1	Favourable.	Non-intervention.		0.2
7160	Fennoscandian mineral-rich springs and springfens	0.1	<1	Favourable.	Non-intervention.		0.1
6430	Hydrophilous tall herb fringe communities	0.8	<1	Poor.	Restoration. Maintenance.	0.8	0.8
6510	Lowland hay meadows	3.8	<1	Favourable.	Restoration. Maintenance.	0.0	3.8
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	2.3	<1	Bad.	Restoration. Maintenance.	2.3	2.3
6210	Semi-natural dry calcareous grasslands	26.7	1.8	Bad.	Restoration. Maintenance.	17.0	26.7
6120*	Xeric sand calcareous grasslands	12.3	<1	Favourable.	Restoration. Maintenance.	1.3	12.3
6000	Grasslands to be restored	34.0	2.3	-	Restoration. Maintenance.	34.0	34.0
3260	Natural river reaches and river riffles	5.9	<1	Poor.	Removal of large woody debris, demolition of beaver dams. Mowing of aquatic macrophytes; removal of their roots. Restoration of potential spawning grounds for salmonids.	20.0	

Semi-natural grasslands must be restored in an area of at least 80 hectares (information in Nature management plan of 2002 is outdated; therefore areas to be restored must be clarified during the development of grassland restoration plan).

Vesetas palienes purvs | *Nature Reserve (LV0524800)*

1. Brief description

YEAR OF FOUNDATION: 1999.

LOCATION: Pļaviņas municipality Vietalva and Aiviekste rural territories; Madona municipality Kalsnava rural territory.

AREA: 424 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2015), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Vesetas Palienes Purvs Nature Reserve includes a single complex of wetlands – Veseta river floodplain, Veseta river and oxbow lakes, as well as modified river reach, alluvial grasslands, transition mires with springs, wet forests, and drained woodlands. There is a peculiar hydrological regime in the territory, prompted by Veseta river straightening which was carried out in the 19th century to facilitate log driving: Veseta river forms dispersed surface water flow along the entire floodplain area. Veseta river flows mainly via the straightened channel which is naturally meandering. Woodlands in an area of about 150 hectares have remained between the old and new river channel, forming Ezišsala Island. Also the old river channel has remained, it is overgrowing, and the flow velocity is small.

Eight EU protected habitat types have been found in the nature reserve. This is one of the few territories in Central Vidzeme Geobotanical District with rather large areas of alluvial grasslands. They are important both locally, for the conservation of biodiversity in nature reserve, and as an important area of alluvial grasslands in the region, and also as a species dispersal ecological corridor in the region.

The territory is rich in rare and protected species; 28 species of plants, 13 bird, 10 mammal, one amphibian, 13 invertebrate species. Particularly valuable is the species-rich transition mire; there, a large variety of orchids and mosses can be found in a small area, as well as one of the largest populations of protected plant species *Saxifraga hirculus* in Latvia. Protected plant species in transition mire include *Corallorhiza trifida, Dactylorhiza russowii, Gymnadenia conopsea, Hammarbya paludosa, Carex atherodes, Hamatocaulis vernicosus.* In wet woodlands, *Carex paupercula* and *Carex disperma* can be found. *Leucobryum glaucum* grows in forests, *Geocalyx graveolens* and *Trichocolea tomentella* in springfens.

The most important bird species in the territory are *Bonasa bonasia, Ciconia nigra, Pernis apivorus, Crex crex, Porzana porzana, Circus aeruginosus.* The territory is an important foraging site for bats; protected bat species *Pipistrellus nathusii, Plecotus auritus, Myotis daubentoni* can be found here, as well as migratory species *Eptesicus nilssonii. Lutra lutra, Canis lupus* and *Lynx lynx* have been observed in the territory. The most important invertebrate species include *Unio crassus* and *Lycaena dispar.* River habitats are suitable for *Ophiogomphus cecilia,* but dryer grasslands – for *Coenonympha hero.*

2. Threats to habitat and species conservation

- Semi-natural grasslands overgrow due to lack of management. Alluvial grasslands have not been mown for about 60 years, their overgrowth with willows, reeds and other herbaceous plants continues.
- Paludification of alluvial grasslands due to beaver impoundments.
- Transition mire with spring discharges (locality of *Saxifraga hirculus* and several other protected species) overgrow with reeds and shrubs.
- In the former Veseta riverbed and oxbow lakes, water flow is very slow, sediments accumulate, river channel overgrows, and the diversity of aquatic organisms is decreasing.

3. Existing management of the protected habitats and its assessment

- In 2006, in the framework of LIFE programme project "Implementation of Mire Habitat Management Plan for Latvia" (LIFE04 NAT/LV/000196), reeds were mown in individual sampling plots in transition mire. In alluvial grasslands, shrubs were felled; herbaceous plants were mown and removed. In total, two areas of 9 ha and 17 ha were restored. Management was not continued, and the areas overgrew again.
- Wooden boardwalks and an information board have been established in the floodplain. Visitors use the boardwalks, and habitats are conserved in the vicinity of trails. Boardwalks have been repaired in some parts, and further repair is necessary.

- According to Rural Support Service, in 2014 grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Restoration of open transition mire. Maintenance of favourable growing conditions for species associated with this habitat, particularly *Saxifraga hirculus*.
- Restoration of grasslands as bird breeding and foraging area. Restoration of *Lycaena dispar* habitat; maintenance in favourable conservation status.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Maintenance of visitor infrastructure.
- Hydrological regime research in grasslands; evaluation of management possibilities. Grasslands were mown 50-60 years ago, and a shallow ditch system was functioning. For the grassland restoration, both restoration of the shallow ditch system and limitation of beaver activities are necessary.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	14.2	3.3	Poor.	Non—intervention.		14.2
91D0*	Bog woodland	51.2	12.1	Poor.	Non—intervention.		51.2
9080	Fennoscandian deciduous swamp woods	11.1	2.6	Poor.	Non—intervention.		11.1
7160	Fennoscandian mineral-rich springs and springfens	0.1	<1	Favourable.	In complex with transition mire: felling of shrubs, mowing (with removal) of shoots, reeds, herbaceous plants (repeatedly; at least once per 2-3 years).		0.1
7140	Transition mires and quaking bogs	4.9	1.2	Poor.	Felling of shrubs and mowing of herbaceous plants in the whole area of transition mire, with removal (next year – mowing and removal of shoots and reeds).		4.9
6450	Northern boreal alluvial meadows	42.2	9.9	Bad.	Restoration. Maintenance.	42.2	42.2
3260	Natural river reaches and river riffles	4.9	1.2	Poor.	Removal of large woody debris and beaver dams in river reach at Ezīšsala Island (on necessity).	0.2	4.7
3150	Natural eutrophic lakes	0.5	<1	Poor.	Mowing of excessive overgrowth (on necessity).	0.5	

One-time grassland restoration measures are necessary in at least 42 hectares of alluvial grassland habitats. Restoration measures include felling of trees and shrubs, milling of roots, restorative mowing or grazing, restoration of shallow ditch system, and repair of access roads.

Vērenes purvi | *Nature Reserve (LV0525300)*

1. Brief description

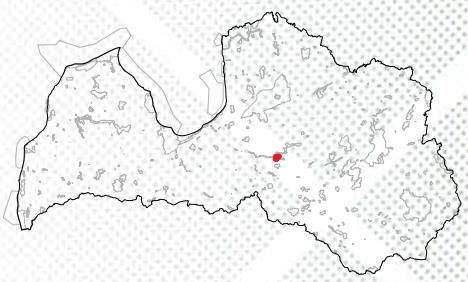
YEAR OF FOUNDATION: 1999.

LOCATION: Ogre municipality, Madliena rural territory.

AREA: 1248 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Vērenes purvi Nature Reserve includes a massif of woodlands and mires located between the Ogre River and its tributaries Lobe and Mākulīte. There are three raised bogs whose central parts are characterised by hummock-hollow microrelief. These are Zirnaite (Gulbju), Sivenīca and Jeiska Mires, separated from each other by bog woodlands, swamp woods, hemiboreal natural old broad-leaved deciduous forests and Western Taïga. The territory is within the borders of a forest block roads (*stigas*), therefore parts of the mire are located outside of the protected territory. Ditches can be found both in the nature reserve and outside. In the southern part of the Vērene Mire, a micro-reserve for the protection of *Tetrao urogallus* has been established. Sivenīca Mire is overgrown with low pines typical of bogs; ditches are almost invisible and more distinct on bog edges. The Zirnaite Mire is the least affected, there is a greater cover of trees on its western edge. The Jeiska Mire is the most affected, because peat has been extracted here in the past.

In total there are six protected habitat types of EU importance. There are important lek sites for *Tetrao tetrix* and *Tetrao urogallus*. Also other rare and protected bird species such as *Glaucidium passerinum, Pandion haliaetus, Dryocopus martius, Dendrocopos medius, Pluvialis apricaria, Caprimulgus europaeus* can be found. *Ophiogomphus cecilia* is the most important invertebrate species in this territory.

2. Threats to habitat and species conservation

Mires and bog woodlands are influenced adversely by previous drainage. The maintenance and renovation of existing drainage ditches and the establishment of new ditches in the surroundings of nature reserve are potential threats.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting in bog woodlands and mires.
- Undisturbed natural processes in natural forest and mire habitats, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

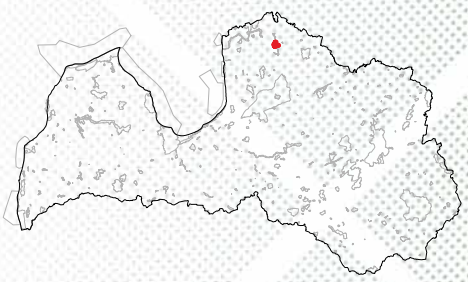
- Extension of the nature reserve in order to include all mires within their natural edges as unitary hydrological systems (current borders do not allow to ensure the conservation of these mires).
- Hydrological regime research and development of a construction project taking into account that almost all significant drainage ditches are located outside the territory (planning of rewetting must include also hydrologically associated surrounding areas). The measure also includes the preparation of a monitoring program and methodology to evaluate the efficiency of habitat restoration works.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	194.4	15.6	Favourable.	Non-intervention, except rewetting in bog woodlands in complex with mire habitats.		194.4
9080*	Fennoscandian deciduous swamp woods	36.7	2.9	Poor.	Non-intervention.		36.7
9020*	Broad-leaved deciduous forests	6.3	<1	Poor.	Non-intervention.		6.3
9010*	Western Taïga	16.7	1.3	Favourable.	Non-intervention.		16.7
7120	Degraded raised bogs	7.7	<1	Poor.	Rewetting (ditch filling up or damming).	7.7	
7110*	Active raised bogs	551.4	44.2	Poor.	Rewetting (ditch filling up or damming).	551.4	

Vidusburtnieks | *Nature Reserve (LV0000120)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Burtnieki municipality Burtnieki and Vecate rural territory; Rūjiena municipality Jeri rural territory; Mazsalaca municipality Sēļi rural territory.

AREA: 812.8 ha.

NATURE MANAGEMENT PLAN: 2005 (2006–2015), validity extended until 2021.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Vidusburtnieks Nature Reserve is located on the shore of Lake Burtnieks. It includes the reaches of Rūja and Seda rivers with extensive alluvial grasslands, and woodlands dominated by pine (*Pinus sylvestris*), spruce (*Picea abies*) and birch (*Betula* spp.). In smaller areas, also wet forests with Alnus glutinosa and broadleaved forests (*Sub-Atlantic and medio-European oak or oakhornbeam forests of the* Carpinion betuli, *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes*) can be found. The nature reserve includes a large variety of habitats and species – large wooded pastures, alluvial grasslands, rivers, floodplains, oxbow lakes, inundated areas. In total, 12 EU protected habitats have been found. In many places, solitary, large, old trees can be found – mostly oaks *(Quercus robur), Tilia cordata, Ulmus glabra*. In smaller areas, elements of wooded meadows can be found as well (for example, at Viesturi farmstead and in Lukstiņi Grassland).

The territory is an Important bird area of European significance in Latvia (LV089); 18 rare and protected bird species are breeding here. Old woodlands and oaks on the banks of Seda and Rūja rivers are particularly suitable for cavity-nesting birds. *Strix uralensis, Bonasa bonasia, Ciconia nigra, Haliaeetus albicilla, Pernis apivorus, Tetrao tetrix* can be found in forests. Grasslands are gradually overgrowing but still suitable for *Gallinago media* and *Crex crex*. Also *Porzana porzana* and *Gallinago gallinago* can be found here.

There are 11 protected plant species found in the nature reserve, including *Cnidium dubium, Iris sibirica, Dactylorhiza incarnata, Dactylorhiza maculata*, and others. The territory is particularly important for several invertebrate species. In total, 15 rare and protected invertebrate species have been found, for example, *Osmoderma barnabita, Leucorrhinia albifrons, Leucorrhinia pectoralis, Ophiogomphus cecilia, Ceruchus chrysomelinus*. In Rūja and Seda rivers, *Misgurnus fossilis* and *Lutra lutra* are observed.

From landscape-ecological point of view, grasslands of Vidusburtnieks Nature Reserve are related Rūjas paliene and Burtnieku ezera pļavas Nature Reserves, and together they form a species distribution corridor. The management and conservation should be planned for all territories together. In particular, it must be taken into account that "Vidusburtnieks" and "Rūjas paliene" are among the ten Natura 2000 areas in Latvia for the protection of *Gallinago media,* but "Burtnieku ezera pļavas" are among the ten most important territories for the protection of grassland-breeding waders.

2. Threats to habitat and species conservation

- Part of grasslands is overgrown as a result of grassland management discontinuation.
- Due to overgrowth of grasslands, the great snipe (*Gallinago media*) has almost disappeared both from Košķele Grassland on the right bank of Rūja river, and from Lukstiņu Grassland on the left bank of the Seda river.
- Due to the lack of management, wooded grasslands are almost overgrown, so they are not suitable for *Osmoderma barnabita*.
- A stand of invasive plant species *Heracleum sosnowskyi* has developed in the immediate vicinity of river. This may be a reason for a rapid spread of this species in the rest of the territory.
- Forest habitats are fragmented due to clear-felling and by spruce plantations established in clear-felled areas. They are as insurmountable barriers for species with low dispersal ability, for example, several species of invertebrates, mosses, lichens.
- Beaver dams and fallen logs in river contribute to slowdown of the water flow, rise of the water temperature, decrease of dissolved oxygen.
- Overgrowth of banks of oxbow lakes, increase of shading. Oxbow lakes are being clogged with twig litter which consumes oxygen and reduces the potential diversity of aquatic organisms. The

creation of open littoral belts is necessary for aquatic invertebrates (dragonflies, caddisflies, mayflies etc) emerging to adults.
- The illicit building construction at the boat facility at Rūja river mouth degrades the landscape, creates localized pollution with wastewaters.
- Previously open littoral part of the lake overgrows with continuous belt of reedbeds. This is making the stay of waders and ducks which can potentially breed here worse or impossible.

3. Existing management of the protected habitats and its assessment

- In 2013, felling of advance growth around oaks was carried in oak forests. As a result, insolation was improved. It will be possible to assess the influence on habitat after a few years; in the first years after management, excessive growth of herbaceous plants and *Rubus idaeus* can be observed. Selective felling was carried out in boreal forests (western Taïga) that negatively affected the structure of the habitat.
- In scope of LIFE programme project "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), management of semi-natural grasslands was carried out. Also the mouth of Rūja river was cleaned.
- According to Rural Support Service, in 2014 about 84 % of the grasslands of habitat types 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and 33 % of 6450 *Northern boreal alluvial meadows* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Grasslands of other habitat types were managed in a smaller area.

4. Priorities of management and conservation

- The diversity of habitats and the number of species in the nature reserve is very high in nature reserve, therefore the maintenance of both habitats and plant and bird habitats in a favourable conservation status is the priority.
- Restoration of grassland habitats in their maximum possible area (including wooded grasslands) and maintenance in favourable conservation status. Reduction of drainage influence on hydrological regime in grasslands.
- Restoration and maintenance of hydrological regime (particularly – regime of spring floods) which is suitable for favourable conservation status for *Gallinago media*, grassland-breeding waders, and grassland habitats.
- Limitation of the spread of invasive species.
- Restoration of wooded meadows; liberation (improvement of insolation conditions) of solitary, large broadleaved trees.
- Maintenance of open areas and gaps at solitary growing oaks, *Tilia cordata, Ulmus glabra, Ulmus laevis*, in order to create potentially suitable habitats for *Osmoderma barnabita* and other species.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of the functionality of oxbow lakes.
- Restoration of open littoral areas (necessary for waders and for fish reproduction).

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of the possible merging of Burtnieka ezera pļavas, and Rūjas paliene Vidusburtnieks Nature Reserves, in order to promote an integrated and landscape-ecological management and conservation of grasslands.
- Extension of the nature reserve by including grasslands and mires on the right bank of Rūja river; carry out their restoration.
- Development of a rewetting project for Lake Burtnieku, Rūja and Seda rivers. The rewetting project must be in a form of an action programme. In alluvial grasslands, it is recommended to completely fill certain drainage ditches, or construct dams on them. Recommended measures are described in nature management plan, however, additional research on the grassland management possibilities after rewetting is necessary. Since the development of nature management plan (2005), understanding of the impact of grassland management methods on conservation status of grasslands and birds has improved. Restoration measures must be planned in such a way that grassland mowing and grass removal is possible after the rewetting. Project must be supplemented with drawings and construction instructions for the necessary hydraulic structures, such as dams and water flow regulators.
- Inventory of grasslands; development of grassland restoration and management plan. The currently available grassland maps are outdated and do not show the real situation. To improve habitats for *Gallinago media* and to increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must

be considered. Restoration of currently preserved grasslands is the priority. Grasslands of Seda river floodplain, which are only partly inventoried for the mapping of habitats of EU importance, must be restored in their maximum possible area. Possibilities of access for the management of grasslands must be evaluated, and solutions for the improvement of access must be provided.

5.2. Specific measures

5.2.1. Species

- *Osmoderma barnabita* population in the territory consist of 10 – 250 individuals; the status is evaluated as poor. For the species conservation in the entire area of nature reserve, the following activities are necessary, according to the expert's recommendations:
  - Liberation (insolation improvement) for large trees (oaks), by felling all trees and shrubs around the oak, in an area of a double projection of its crown.
  - Restoration of wooded meadows; regular mowing or extensive grazing in wooded grasslands or in vicinity of solitary, large deciduous trees.
  - Creation of future large-crowned trees – creation and maintenance of canopy gaps around Quercus robur, Tilia cordata, Ulmus glabra, U. laevis in young and middle-aged woodlands. In gaps, open conditions must be created and maintained (by mowing every 5 years) in the radius of 5 m, measured from the trunk.
- For the protection of Gallinago media, reduction of fragmentation is necessary in habitats suitable for the species – by felling of shrubs along drainage ditches, rewetting, mowing of grasslands.

5.2.2. Habitats

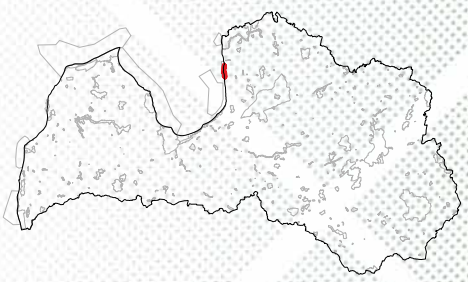
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	0.5	<1	Bad.	Non-intervention, except liberation of old oaks (felling of all trees and shrubs around the oak, in an area of a double projection of its crown).	On necessity.	0.5
9020*	Broad-leaved deciduous forests	3.3	<1	Bad.	Non-intervention, except liberation of old oaks (felling of all trees and shrubs around the oak, in an area of a double projection of its crown).	On necessity.	3.3
9010*	Western Taïga	37.3	4.6	Bad.	Non-intervention, except liberation of old oaks (felling of all trees and shrubs around the oak, in an area of a double projection of its crown).	On necessity.	37.3
9080*	Fennoscandian deciduous swamp woods	252.0	31.0	Bad.	Non-intervention.		252.0
6530*	Fennoscandian wooded meadows	Unknown.		Bad.	Restoration. Maintenance.	Unknown.	Unknown.
6510	Lowland hay meadows	15.4	1.9	Poor.	Restoration. Maintenance.	2.0	15.4

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	212.8	26.2	Bad.	Restoration. Maintenance.	141.8	 212.8
6430	Hydrophilous tall herb fringe communities	3.7	<1	Poor.	Restoration. Maintenance.	3.7	 3.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	23.3	2.9	Bad.	Restoration. Maintenance.	16.7	2 3.3
6120*	Xeric sand calcareous grasslands	1.5	<1	Bad.	Restoration. Maintenance.	1.5	 1.5
6000	Grasslands to be restored	100.0	12.3	-	Restoration. Maintenance.	100.0	 100.0
3260	Natural river reaches and river riffles	2.0	<1	Poor.	Removal or reduction of large woody debris in sites where they promote coastal erosion. Cleaning of Rūja river mouth, in order to improve water discharge and fish migration. Annually.		0.1
3150	Natural eutrophic lakes	7.9	1.0	Poor.	On the bank of Lake Burtnieku, mowing of aquatic macrophytes and removal of their roots, leaving a mosaic of separate reed clusters. Every 5 years. Felling of shrubs and low-value trees in oxbow lakes (particularly the drying-out ones). Creation of open littoral part. The interval between activities depends on the speed of the unwanted processes.	2.7 0.2	

Semi-natural grasslands must be restored in their maximum possible area, including historical grasslands which are now overgrown with shrubs and new forests. These grasslands must be specified during the development of grassland restoration plan. Restoration includes felling of shrubs, their root shredding, limitation of reedbeds, and restorative mowing or grazing. Conservation status must be improved in the managed grasslands – the possibilities of soil fertility reduction must be evaluated and implemented, and followed by restorative mowing with removal of grass or hay, or grazing, and abatement of expansive species, especially *Phragmites australis*. Nature reserve includes also perennial grasslands which do not correspond to EU protected habitat criteria but where development towards semi-natural grasslands should be promoted. As they are drained grasslands, the lowering of soil fertility and targeted creation of species composition should be applied.

Vidzemes akmeņainā jūrmala | *Nature Reserve (LV0508600)*

1. Brief description



YEAR OF FOUNDATION: 1957.

LOCATION: Salacgrīva town with rural territory, Liepupe rural territory.

AREA: 1540.5 ha.

NATURE MANAGEMENT PLAN: 2004 (2004–2014), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 512 of 7 July 2008, Regulation on Individual Protection and Use of the Vidzemes Akmeņainā Jūrmala Nature Reserve.

INCLUDES OTHER PROTECTED NATURE TERRITORIES: Veczemju klintis and Ežurgu Sarkanās klintis Geological and Geomorphological Nature Monuments.

Vidzemes Akmeņainā Jūrmala Nature Reserve includes nearly undisturbed section of Riga Gulf coast with a coastal landscape and rare habitat complex which is unique for Latvia. Territory is located in North Vidzeme Biosphere Reserve, and it includes several micro-reserves which are established for the protection of forest habitats. Nature reserve has borders with the protected marine area "Vitrupe-Tūja".

There is a very large diversity of coastal habitats in the area – the habitats of open sea, beaches and dunes, as well as forest and grassland habitats. There are sea cliffs with sandstone outcrops and beaches with pebbles. The old-growth (about 250 years old) pine forests are particularly valuable and are located throughout the territory of the nature reserve. The wet and mixed old deciduous forests (especially *Alnus glutinosa* and *Fraxinus excelsior*) are also valuable. There are sandstone outcrops on the banks of Kurliņupe river, and wooded grasslands with groups of old oaks.

25 EU protected habitat types are found in the area. The largest areas are occupied by deciduous swamp woods, western Taïga, wooded dunes, species-rich dry to mesic grasslands, wooded meadows. Coastal habitat which is very rare in Latvia – 1220 *Perennial vegetation of stony banks* is particularly important. Territory is also the eighth most significant Natura 2000 site for the conservation of habitat type 6230 **Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* in Latvia (3.1% of the total habitat area in Natura 2000 sites). From the landscape ecology point of view, this territory is one of the most important core areas of species of the grasslands in Vidzeme coastal part of Coastal Geobotanical District, Gulf of Riga.

The nature reserve is an important habitat for several protected plant and animal species – 11 species of plants, seven bird, 10 invertebrate, one mammal and two protected fish species. *Cypripedium calceolus* grows in forests of the territory, *Atriplex calotheca* and *Corispermum intermedium* grow in coastal habitats, *Jovibarba sobolifera, Platanthera chlorantha, Dactylorhiza incarnata* and *Primula farinosa* in grasslands.

Thanks to the abundance of aquatic plants and molluscs in marine habitats, the territory is one of the most important bird wintering and moulting sites in the Baltic Sea. In terrestrial part of the territory, *Bonasa bonasia* can be found. *Alcedo atthis* is living in sandstone habitats of the lower reaches of Kurliņupe river. *Picoides tridactylus, Dryocopus martius, Dendrocopus leucotos, Glaucidium passerinum* can be found in the old forests. *Osmoderma barnabita* and *Ancylus fluviatilis* are rare invertebrate species in the territory. *Lutra lutra* can be found in the vicinity of watercourses but *Lampetra fluviatilis* and *L. planeri* in aquatic habitats.

2. Threats to habitat and species conservation

- Overgrowing of semi-natural grasslands with trees and shrubs; lack of management; in many places also mowing of grasslands with shredding or leaving the mown grass.
- Paludification of semi-natural grasslands due to clogging of shallow local drainage systems.
- Transformation of semi-natural grasslands into lawns in vicinities of villages and farmsteads.
- Trampling of dry sandy grassland vegetation (used for recreation).

- Lack of management; overgrowth of wooded grasslands.
- Spread of invasive species *Rosa rugosa.*
- Due to the overgrowth of drainage ditches, water accumulates behind the coastal bank, promoting the paludification of inland areas.
- The removal of logs and snags.
- Negative impact of recreation on dune habitats; efficient planning and in some sites also habitat restoration or closure of recreation sites is necessary.
- Beaver activities in Kurliņupe and Zaķupe rivers - the beaver dams are a barrier to salmonid fish migration.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in 2014 most of the grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 27 % of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* and 55 % of habitat type 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* received financial support. Managed grasslands are negatively affected by mowing with shredding (or mulching) which promotes spreading of expansive species, especially *Deschampsia flexuosa.*
- Beaver dams in the lower reaches of Kurliņupe river are demolished regularly since 2014 but the desired result has not been achieved and other solutions are necessary.
- Zaķupe river (from Zaķakmens to Vecmuiža level crossing) and its mouth were cleaned in 2016 (implemented by JSC "Latvijas Valsts meži"). River was cleaned manually and largest logs were left in the river. In order to clean Zaķupe river mouth, excavator would be necessary to remove beaver dams and sediments.

4. Priorities of management and conservation

- Restoration of semi-natural grasslands in the area of at least 55-100 ha (including overgrown historical grasslands and abandoned fallow land) and maintenance in a favourable conservation status; restoration of habitat types 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* and 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* is a priority.
- Elimination of invasive species *Rosa rugosa*.
- Demolition of beaver dams in the lower reaches of Kurliņupe river.
- Removal of sandy sediments from Kurliņupe river mouth in order to ensure water flow rate, conserve habitats of the river riffles and ensure fish migration.
- Restoration and maintenance of shallow drainage ditches for the conservation of grasslands.
- Maintenance of infrastructure elements for the protection of sea cliffs (barriers, waste management, toilets, downward trails to the sea); necessity of the roadside car parks must be evaluated.
- Undisturbed course of natural processes in forest, as well as in habitats of species that need undisturbed, natural environment.
- Evaluation of nature reserve expansion, in order to include valuable semi-natural grasslands (especially *Nardus* grasslands) located north of the territory.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps.
- Amendments of Individual Regulations on Protection and Use, ensuring of non-interference; logging in swamp woods should be banned.
- Restoration of clogged drainage systems, to decrease the water accumulation and sea cliff erosion.
- Development of thematic plan for the Salacgrīva municipality, to coordinate the use and conservation of sea coast in the nature reserve and outside of it.
- Development and implementation of a plan for the restoration and protection of semi-natural grasslands. Assessment of the necessity of local drainage system restoration must be included in the plan. The plan should include innovative solutions for grassland management and use, as the development of conventional agricultural activities and the use of grasslands in the area is not expected.
- The 2004 Nature management plan provides a detailed assessment of every grassland from a nature conservation point of view (also useful for grassland restoration planning) and a description of the restoration measures (this should be specified according to the current situation and knowledge). Grasslands are highly fragmented and the current area which is not overgrown can not ensure a favourable conservation status for grassland habitats in the long run. In order to increase the landscape ecological connection of grassland habitats, the following should be evaluated: establishment of grassland habitats in the areas of historic grasslands, perennial grasslands and fallow lands; areas that have remained grasslands whose restoration is a priority.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	3.5	<1	Poor.	Non-intervention.		3.5
9180*	Slope forests	0.2	<1	Favourable.	Non-intervention.		0.2
9080*	Fennoscandian deciduous swamp woods	168.4	10.9	Poor.	Non-intervention.		168.4
9020*	Broad-leaved deciduous forests	16.1	1.0	Favourable.	Non-intervention, except removal of smaller trees and shrubs around the *Quercus robur* and *Tilia cordata* (increase of insolation).		16.1
9010*	Western Taïga	71.0	4.6	Poor.	Non-intervention.		71.0
91E0*	Alluvial forests	32.0	2.1	Poor.	Non-intervention.		32.0
8220	Siliceous rocky slopes	0.03	<1	Favourable.	Non-intervention.		0.03
7160	Fennoscandian mineral-rich springs and springfens	0.01	<1	Favourable.	Non-intervention.		0.01
6120	Xeric sand calcareous grasslands	<1.0	<1	Poor.	Restoration. Maintenance.	<1.0	<1.0
6530*	Fennoscandian wooded meadows	17.3	1.1	Bad.	Restoration. Maintenance.	17.3	17.3
6510	Lowland hay meadows	6.3	<1	Bad.	Restoration. Maintenance.	6.3	6.3
6410	*Molinia* meadows	1.0	<1	Bad.	Restoration. Maintenance.	1.0	1.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	24.0	1.5	Bad.	Restoration. Maintenance.	15.5	24.0
6230*	Species-rich *Nardus* grasslands	4.7	<1	Poor.	Restoration. Maintenance.	2.1	4.7
6000	Grasslands to be restored	50.0	3.2	-	Restoration. Maintenance.	50.0	50.0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3260	Natural river reaches and river riffles	1.2	<1	Poor.	Demolition of beaver dams in lower reaches with sandstone outcrops of Kurliņupe river; sandy sediment cleaning in Kurliņupe river mouth to ensure the river flow rate and migration of fish and lampreys.	If necessary	
2180	Wooded dunes	35.6	2.3	Favourable to poor.	Cutting of invasive and expansive woody species.	If necessary	
2130*	Grey dunes	3.6	<1	Poor.	Removal of woody species.	If necessary	
2120	White dunes	1.3	<1	Poor.	Non-intervention.		1.3
2110	Embryonic dunes	4.1	<1	Poor.	Non-intervention.		4.1
1640	Sandy beaches with perennial vegetation	0.5	<1	Poor.	Non-intervention.		0.5
1230	Sea cliffs	0.8	<1	Poor.	Sea coast strengthening (sites indicated in Nature management plan). Construction of barriers around car parks at sea cliffs. Construction of trails downwards to the sea.	0.1	
1220	Perennial vegetation of stony banks	3.2	<1	Favourable.	Non-intervention.		3.2
1210	Annual vegetation of drift lines	3.4	<1	Favourable to poor.	Non-intervention.		3.4
1170	Reefs	0.03	<0.01	Favourable.	Non-intervention.		0.03

Semi-natural grasslands must be restored to a minimum of 55-100 ha, including the areas of historical grasslands, which currently are overgrown with shrubs and new forests, as well as perennial grasslands and fallow lands. Restoration measures include cutting woody species, milling of their roots and stumps, restorative mowing and/or grazing, as well as restoration of shallow local drainage systems. Priority areas for restoration are indicated in the Nature management plan of 2004. Areas of historical grasslands must be clarified in the course of development of grassland restoration plan.
Continuous management measures are to be carried out throughout the existing area of EU protected grassland habitats (55 ha), and will have to be carried out in the restored grassland area. For recovery methods and habitat and species-specific management see Rūsiņa (ed.) 2017.

Virguļicas meži | *Nature Reserve (LV0529200)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Alūksne municipality Pededze rural territory.

AREA: 745 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2012).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 706 of 16 October 2007, Regulation on Individual Protection and Use of Virguļicas Meži Nature Reserve.

Virguļicas Meži Nature Reserve is located in a large massif of forests. It includes old *Populus tremula* and *Picea abies* woodlands (western Taïga), *Alnus glutinosa* swamp woods, bog woodlands and wet broadleaved forests. This is one of largest and oldest such woodlands in Latvia. There are two micro-reserves for the protection of rare bird species. The territory is crossed by Virguļicas (Plintaukas) river. According to publicly available information, the territory of nature reserve has been covered by forests in the last 200-300 years. Due to wet conditions, its management was difficult until the second half of the 20th century when intensive forestry was started.

There are five EU protected woodland and aquatic habitat types and rather high diversity of rare and protected species: three protected species of lichens, 11 plant, 17 invertebrate, one cyclostome, 12 bird, two mammal species.

The Siberian flying squirrel *Pteromys volans* was previously found in *Populus tremula* and *Picea abies* woodlands. The territory still is a potential habitat of *Pteromys volans*. *Alnus glutinosa* swamp woods, mainly along Virguļica river, are the most abundant locality of *Cinna latifolia* in Latvia. Several rare and protected plant species can be found in wet forests, such as *Glyceria lithuanica, Carex disperma, Poa remota, Corallorhiza trifida*, lichen *Menegazzia terebrata*, moss *Trichocolea tomentella*, and others. Rare and protected invertebrate species include *Acicula polita, Bulgarica cana, Clausilia cruciata,* and others. Several rare and protected bird species can be found in woodlands – *Bonasa bonasia, Ciconia nigra, Pernis apivorus, Tetrao tetrix, Tetrao urogallus*. Abundant *Lampetra planeri* population can be found in Virguļica river.

2. Threats to habitat and species conservation

- Changes in natural hydrological regime. Groundwater level is lowered due to drainage carried out in 1960s. Forests in the current area of nature reserve are drained. The degradation of wet forests in south-eastern part of the nature reserve still continues.
- Although Virguļica river is partly naturalised, its previous straightening and deepening has left a negative influence. Before the drainage, river was a habitat of *Margaritifera margaritifera* and *Salmo trutta*.
- Beaver dams and fallen logs in river promote slowdown of the water flow, rise of the water temperature, decrease of dissolved oxygen, shore erosion or paludification (depending on the longitudinal profile of river reach), cover of gravel and boulders with sediments, and disappearance of habitats suitable for *Margaritifera margaritifera* and *Unio crassus*.
- Due to intensive forestry in years 1990-2003, part of the nature reserve is covered by clear-cut areas and new woodlands. *Picea abies* and *Pinus sylvestris* are planted in most of the clear-cut areas, therefore now there are purely monodominant woodlands.
- Capercaillie *Tetrao urogallus* leks are overgrowing with *Picea abies* due to drainage of wet forests.
- Spread of invasive plant species *Heracleum sosnowskyi.*

3. Existing management of the protected habitats and its assessment

In 2007, maintenance of *Tetrao urogallus* leks was carried out.

4. Priorities of management and conservation

- Rewetting in degraded *Alnus glutinosa* swamp woods and bog woodlands.
- Restoration of *Tetrao urogallus* leks according to requirements of species.
- Elimination of *Heracleum sosnowskyi* (sites specified in nature management plan).
- Undisturbed course of natural processes in forest

habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards protected woodland habitats is expected.
- Areas of grasslands in nature reserve are small and fragmented; therefore their restoration is not a priority. However, their restoration is recommended, as it will increase the total biodiversity in the nature reserve.
- Prevention of the creation of beaver dams and beaver inundations in river reaches with gravel and pebble substrate – in order to provide suitable conditions for *Lampetra planeri* population (which is abundant here).

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps according to the newest methods and approaches.
- Hydrological regime research; evaluation of rewetting possibilities in degraded *Alnus glutinosa* woodlands and swamp woods (sites specified in nature management plan).
- Eradication of *Heracleum sosnowskyi* (along road verges, along Virguļica river and in forest – sites specified in nature management plan). *Heracleum sosnowskyi* colonies are located in the direct vicinity of river, therefore the use of chemical substances for their elimination is not permitted. The eradication must be continued annually until the species is eliminated. Approximate area: 2 km along Virguļica river and roads; about 2.2 ha large colony in forest.

5.2. Specific measures

5.2.1. Species

- Capercaillie *Tetrao urogallus* (two males).
- To increase the suitability of habitat to leks, *Picea abies* subcanopy must be felled, starting from the centre of lek (13 hectares; 4th and 7th compartments of block 144).

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	3.9	<1	Favourable.	Non-intervention.		3.9
91D0*	Bog woodland	272.2	36.5	Poor.	Non-intervention, except maintenance of *Tetrao urogallus* leks and rewetting (ditch blocking or filling up).	According to research results.	272.2
9080*	Fennoscandian deciduous swamp woods	84.7	11.4	Poor.	Non-intervention, except rewetting (ditch blocking or filling up).	According to research results.	84.7
9010*	Western Taïga	52.2	7.0	Favourable.	Non-intervention.		52.2
9000*	Potential Protected woodland habitat			-	Maintenance of future habitats: development of mixed woodlands in coniferous plantations by selective felling (described in nature management plan).	17.5	
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.65	<1	Bad.	Restoration. Maintenance.	Up to 1.0	1.65
3260	Natural river reaches and river riffles	1.0	<1	Poor.	Maintenance of water discharge: removal of beaver dams and large woody debris in sites where they promote shore erosion, as well as in reaches where riverbed with gravel or pebbles indicate on river riffles of high quality (suitable for of *Lampetra planeri*).		1.0

Viskūžu sala | *Nature Reserve (LV0529100)*

1. Brief description

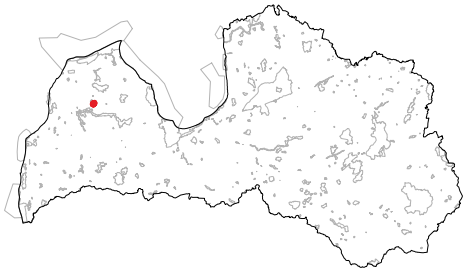
YEAR OF FOUNDATION: 2004.

LOCATION: Ventspils municipality Usma rural territory.

AREA: 304 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2015); validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Viskūžu sala Nature Reserve is one of the largest lake islands in Latvia. Almost all area of the island is covered by pine (*Pinus sylvestris*) woodlands, smaller stands are dominated by birch (*Betula* spp.) and *Alnus glutinosa*. Old pine woodlands cover a significant part of the island. Transition mire is located in the middle of the island, and small grassland covers the edge of the island. There are five EU protected habitat types, and 32 rare and protected species: one mammal, 20 bird, eight vascular plant, three moss species. The nature reserve is one of the few localities of mosses *Hamatocaulis vernicosus* and *Meesia triquetra* in Latvia. The central part of the territory is the most valuable for rare and protected plant species, with transitional mire and adjoining woodlands, with rare species such as *Carex dioica, Carex loliacea, Carex pulicaris, Carex paupercula,* orchids *Dactylorhiza russowii, Listera cordata, Dactylorhiza incarnata, Dactylorhiza maculata*, and others.

Together with the nearby Moricsala Island, Viskūžu Island is included in a list of Internationally Important Bird and Biodiversity Areas (LV074 *Moricsala un Viskūžu sala*). Old pine woodlands of the island is an important habitat for rare and protected bird species, such as *Haliaeetus albicilla* and *Pandion haliaetus* that feed in the fish-rich Lake Usma. Also breeding species such as *Bubo bubo, Glaucidium passerinum, Botaurus stellaris, Picus canus, Dryocopus martius, Ficedula parva, Grus grus, Bonasa bonasia* has been observed on the island.

2. Threats to habitat and species conservation

- Anthropogenic load is one of the most important threats for the conservation of island biodiversity, mainly for rare bird species. Municipal waste is left in the forest by vacationers, groundfloor is being trampled, and fireplaces are created in many places. Dwarf shrubs are being damaged by berry picking tools.
- Grassland is not managed and it overgrows.
- Invasive plant species – *Sorbaria sorbifolia* and in some places also *Lupinus polyphyllus* – are spreading in pine woodlands and suppressing native plants.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Restriction of the spread of invasive species – elimination of *Sorbaria sorbifolia*.
- Restoration and management of grassland.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

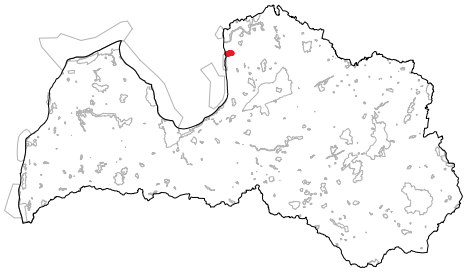
- Maintenance of recreation areas: installation of a few benches, tables, fireplaces, garbage cans and toilets (sites specified in nature management plan).
- Regular collection of waste.
- Installation of information board in order to inform about the nature values of the territory, as well as about the permitted and prohibited activities.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	13.3	4.4	Favourable.	Non-intervention.		13.3
9080*	Fennoscandian deciduous swamp woods	4.3	1.4	Poor.	Non-intervention.		4.3
9010*	Western Taïga	96.6	31.7	Poor.	Non-intervention in natural processes. Felling of *Sorbaria sorbifolia*.		96.6
7140	Transition mires and quaking bogs	6.9	2.3	Favourable.	Non-intervention.		6.9
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.3	<1	Bad.	Restoration (brush cutting); mowing with grass/hay removal, or grazing.		0.3

Vitrupes ieleja | *Nature Reserve (LV0530500)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Salacgrīva municipality, Salacgrīva town and rural territory; Limbaži municipality Viļķene rural territory.

AREA: 126 ha.

NATURE MANAGEMENT PLAN: 2005 (2006–2013).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 254 of 2009, Regulation on Individual Protection and Use of the Vitrupes Ieleja Nature Reserve.

Vitrupes ieleja Nature Reserve includes a scenic section of the Vitrupe river valley with natural forests on slopes, old boreal *Pinus sylvestris* forests, forests with *Alnus incana*, old broad-leaved forests with *Quercus robur, Fraxinus excelsior*, and *Tilia cordata*, mainly in the river floodplain. Sandstone outcrops, springs and side ravines with streams that flow into Vitrupe river are located in the central part of the territory. Relatively small areas are occupied by grasslands; there are mainly wet meadows in the river floodplain. Mesic and dry grasslands can be found on the higher terraces. Grasslands are unmanaged and overgrown with shrubs in varying degrees. However, the nature reserve is potentially important (in case of restoration) as a stepping stone facilitating dispersal of semi-natural grassland species of Coastal Geobotanical region, Coast of Vidzeme, where semi-natural grasslands are highly fragmented. Although the territory is not among the most important for the conservation of grasslands at a national scale, however, their conservation is important for the protection of biodiversity of the region and the nature reserve.

Despite its small area, there is a high biodiversity in the nature reserve. There are 13 EU protected habitat types. The most significant ones of them are forests on slopes, alluvial forests and old broad-leaved deciduous forests.

Vitrupe river valley is rich in rare and protected species: 49 species of birds, nine invertebrates, five fish, two EU protected lamprey species. *Allium ursinum* and *Lunaria rediviva* grow in forests. In forests on slopes there is one of the few localities of *Helicigona lapicida* in the country. Other rare invertebrate species are *Unio crassus* and *Lycaena dispar*.

Three protected woodpecker species have been found in the territory - *Dendrocopos leucotos, Dendrocopos medius*, and *Picoides tridactylus*. *Mergus merganser* and also *Alcedo atthis* nest in sandstone outcrops along the river. Vitrupe is a typical salmonid river which is of great value in the Baltic Sea region. It is also a habitat for *Lutra lutra, Lampetra fluviatilis* and *Salmo salar*. Colonies of algae *Batrachospermum spp.* and *Hildenbrandia spp.* can be found in river.

2. Threats to habitat and species conservation

- Overgrowing of grasslands due to cessation of management; in some sites also due to building construction and establishment of lawns.
- Building construction on the Vitrupe river coasts.
- Forestry activities that result in the removal of dead wood and removal of mature, old and large trees.
- Large woody debris in river promotes the water level rise, exposing of tree roots and further trees falling into the river. Fallen trees clog the river, stream velocity decreases. Excessive fallen trees and in some cases also the activities of beavers interfere with the migration of salmonid fish.
- Illegal landfills in the coastal zone outside the nature reserve (near the Ķirbiži, Vidzemnieki, Upīši surroundings).
- Impact of the RailBaltica track bed and its infrastructure.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, semi-natural grasslands in 2014 were not managed in scope of the Rural Development Programme measure "Maintaining biodiversity in grasslands".
- Removal of large woody debris in Vitrupe river in a 3.7 km long sector was carried out in 2011 and 2012 – supported by the Latvian Environmental Protection Fund, as well as by volunteers during events organised by local fishing clubs and various non-governmental organizations. The measure has a temporary positive effect, and it should be continued on a regular basis.

4. Priorities of management and conservation

- Restoration and maintenance of semi-natural grassland habitats in a favourable conservation status in area of at least 32 hectares (including the historical grassland in Vitrupe floodplain and on the terraces overgrown with forest). Restoration of habitat types 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) and 6230* Species-*rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* is the priority.
- Removal of large woody debris in Vitrupe river to ensure migration and spawning for salmonids and *Lampetra fluviatilis*.
- Undisturbed course of natural processes in forest, outcrop and spring habitats, as well as in habitats of species that need undisturbed, natural environment.
- Expansion of the nature reserve territory, based on the "Salmon and sea trout pilot plan for Vitrupe river", developed in 2013. River reach from Ķirbiži to Vitrupe mouth is recognized as salmon and sea trout distribution site. There are seven spawning areas with the total area of 0.665 hectares, measuring 21.7% of the total salmon spawning area in Vitrupe river. Nature reserve extension will be also important for the conservation of valuable grassland habitats and for ensuring the functionality of Vitrupe valley as a species distribution corridor. For the conservation of grasslands, the territory must be expanded to the upstream of the river from the Ķirbiži to Blome.

5. Necessary management and conservation measures

5.1. General measures

- Inventory of semi-natural grasslands and cultivated grasslands; development and implementation of grassland restoration plan. Grassland maps are outdated and must be updated. In order to increase the landscape ecological connectivity of grassland habitats, the establishment of grasslands in their historical areas must be evaluated. Restoration of currently remained grasslands is the priority.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91F0	Riparian mixed forests	2.3	1.8	Poor.	Non-intervention.		2.3
91E0*	Alluvial forests	10.6	8.4	Poor.	Non-intervention.		10.6
7160	Fennoscandian mineral-rich springs and springfens	0.04	<1	Favourable.	Non-intervention.		0.04
9180*	Slope forests	6.6	5.2	Favourable.	Non-intervention.		6.6
9010*	Western Taïga	7.4	5.9	Bad.	Non-intervention.		7.4

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	4.8	3.8	Favourable.	Non-intervention.		4.8
9160	Oak forests	0.8	<1	Poor.			0.8
9050	Herb rich spruce forests	3.0	2.4	Poor.			3.0
8220	Siliceous rocky slopes	0.1	<1		Non-intervention.		0.1
6450	Northern boreal alluvial meadows	4.1	3.2	Bad.	Restoration. Maintenance.	4.1	4.1
6510	Lowland hay meadows	3.8	3.0	Bad.	Restoration. Maintenance.	3.8	3.8
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.1	<1	Bad.	Restoration. Maintenance.	0.1	0.1
6210	Semi-natural dry calcareous grasslands	< 1.0	< 1	Bad.	Restoration. Maintenance.	Up to 1.0	1.0
6410	*Molinia* meadows	<1.0	< 1	Bad.	Restoration. Maintenance.	Up to 1.0	1.0
6000	Grasslands to be restored	24.0	19.0	-	Restoration. Maintenance.	24.0	24.0
3260	Natural river reaches and river riffles	8.6	6.8	Poor.	Decrease of large woody debris and beaver dams.		Regularly if necessary, in river reaches where migration of fish and lampreys is encumbered.

One-time restoration measures are necessary in at least 32 hectares of grassland habitats. Grassland restoration measures include tree and shrub cutting, restorative mowing or grazing.
Annual management measures must be carried out in all the area of EU protected grassland habitats (8 ha), and these measures will be necessary also for the restored grasslands. Restoration methods and habitat specific management: see Rūsiņa (ed.) 2017.

Vīķu purvs | *Nature Reserve (LV0504700)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Auce municipality, Lielauce rural territory.

AREA: 876 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2015), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Vīķu purvs Nature Reserve includes Lake Lielauce with its paludified coastal parts, as well as Vīķi Mire adjacent to the southern part of the lake, and a small belt of forests around the mire and lake.

Lake Lielauce is an internationally important bird area – a stopover site for migratory birds and a breeding site for waterbirds. The lake is characterized by clear water, low concentration of dissolved minerals and abundant submerged vegetation dominated by charophytes *Chara* spp. and *Nitella* spp. Lake shore is paludified and inaccessible in the 200-500 m wide strip around the lake, except for the southeast coast, where the footbridge and canal are established. The coast of Auce river outflow is especially paludified. Transition mires and quaking bogs with protected species of EU importance *Liparis loeselii* can be found in the nature reserve. The complex of transition mires and quaking bogs concentrates in the Vīķi Mire.

The forests in the nature reserve cover a small area, mostly they are swamp woods of *Alnus glutinosa* and *Betula* spp., in small areas also bog woodlands. Woodland of oaks (*Quercus robur*) and other broad-leaved trees can be found on the eastern part of Raga Hill (an ancient coastal formation). At least 24 bird species protected in Latvia and EU have been found in the nature reserve, such as *Anser fabalis, Cygnus cygnus, Podiceps cristatus, Bonasa bonasia, Haliaeetus albicilla, Porzana parva*. Examples of protected plant species found in the nature reserve are *Hammarbya paludosa, Malaxis monophyllos, Dactylorhiza incarnata*, and others.

2. Threats to habitat and species conservation

- Overgrowth of Lake Lielauce. Although the overgrowth and paludification of lake shore occurs naturally, overgrowth is accelerated due to inflow of wastewater from the nearby Lielauce village.
- Localities of rare plant species are affected negatively by the overgrowth of the mire. Part of the mire is open, wet and rich in species, but now it overgrows with reeds and *Betula* spp. in some areas.
- In 1970s, gyttja was extracted from the lakebed for scientific purposes. Recessions and channels were established in the mire, and two sedimentation ponds were established in southern part of the lake. At present, gyttja extraction is no longer taking place and the threat is only potential. The extraction of gyttja can cause the dieback of charophytes.
- Charophyte colonies are threatened due to waves caused by watercraft.

3. Existing management of the protected habitats and its assessment

- Reeds were mown in south-western part of the lake. The influence on the lake coast quaking bogs is not studied.
- The five-meter deep channels which were established for the extraction of gyttja and which are connected to the lake, now serve as fish overwintering sites, as well as an access channel to the lake. Based on the location of the ponds, it can be concluded that gyttja was extracted in the paludified part of the lake and did not significantly affect the open part of the lake and charophyte colonies, or charophytes have recovered.

4. Priorities of management and conservation

- Construction of sedimentation ponds for the improvement of wastewater entering Lake Lielauce (in order to slowdown the lake overgrowth and prevent damages to charophytes).
- Provision of unchanged water level in the lake and transition mire by maintenance of dam on the outflow of Auce river.
- Undisturbed course of natural processes in forest and mire habitats, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- It is necessary to improve the quality of wastewaters entering the lake by improving the operation of wastewater treatment plant, or by creating the sedimentation ponds for the assimilation of biogenes. The distribution of charophytes in the area of inflow of wastewater can be used as an indicator of the wastewater treatment quality.
- Evaluation of a possible cleaning of the lake area at Auce river outflow, in order to improve water discharge and exchange, and to prevent further paludification of Auce outflow area.
- Maintain and adequately manage the hydrotechnical construction on the outflow of Auce river.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	11.4	1.3	Favourable.	Non-intervention.		11.4
9180*	Slope forests	0.6	<1	Poor.	Non-intervention.		0.6
9080*	Fennoscandian deciduous swamp woods	18.0	2.1	Favourable.	Non-intervention.		18.0
7140	Transition mires and quaking bogs	115.3	13.2	Favourable.	Non-intervention. Mowing of reeds in SW coast of the lake, in territory specified in nature management plan.	3.0	115.3
3140	Charophyte lakes	374.9	42.8	Poor.	Non-intervention. Prevention of expansion of dense vegetation of emergent macrophytes in areas occupied by charophytes.	1.0	373.9

Vīķvēnu purvs | *Nature Reserve (LV0516200)*

1. Brief description

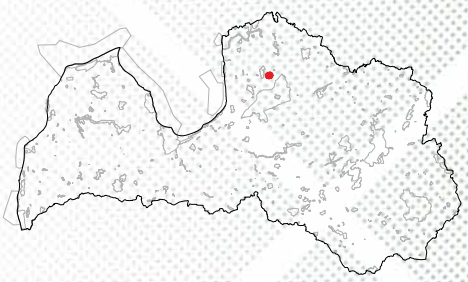
YEAR OF FOUNDATION: 1977.

LOCATION: Kocēni municipality, Dikļi and Kocēni rural territories.

AREA: 77 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Vīķvēnu purvs Nature Reserve includes the Vīķvēni and Mazbrenguļi lakes and their surrounding habitats, as well as natural reaches of Briede (Grūžupīte) river. Four EU protected habitat types can be found in the territory. Out of these, alkaline fens are especially significant. The most important rare and protected species in the territory are plants *Primula farinosa* and *Dactylorhiza incarnata*, invertebrates *Leucorrhinia pectoralis* and *Leucorrhinia caudalis, Lampetra planeri, Cobitis taenia* and *Lutra lutra* can be found in the watercourse.

2. Threats to habitat and species conservation

During the last decades, calcareous fen is rather overgrown with *Betula* spp. Overgrowth is promoted by ditch at the border of the nature reserve. Activities of beavers in the ditch are evaluated as positive so far.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Restoration and maintenance of open alkaline fen.
- Undisturbed course of natural processes in natural mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of hydrological situation – the influence of ditch and beavers on mire habitats.
- In case of necessity, a plan and a building project for hydrological regime improvement must be developed.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7230	Alkaline fens	1.5	2.0	Poor.	Felling of trees and shrubs. Maintenance of open fen landscape (by regular cutting of regrowth, at least once per 2-3 years).	1.5	
7140	Transition mires and quaking bogs	9.7	12.6	Favourable.	Non-intervention.		9.7
3260	Natural river reaches and river riffles	0.4	<1	Poor.	Non-intervention.		0.4
3150	Natural eutrophic lakes	11.4	14.8	Poor.	Non-intervention.		11.4

Vjadas meži | *Nature Reserve (LV0527600)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Viļaka municipality Susāji rural territory.

AREA: 208 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Vjadas meži Nature Reserve includes boreal forests at Vjada river, alluvial forests with broad-leaved trees, as well as small areas with old broad-leaved deciduous forests, and petrifying springs with tufa formation. In the wet forests, there are structures and elements which are characteristic to woodlands that are not affected by economic activities. Some compartments of the broad-leaved forests are considered as excellent examples of woodlands of these habitat types. Vjada river has been modified in part of nature reserve. There are beaver-inundated areas in some parts of the nature reserve.

Woodlands of Vjada river are important for several protected plant species, such as *Cinna latifolia, Festuca altissima, Poa remota, Glyceria lithuanica*, mosses *Dicranum viride, Trichocolea tomentella*, and others.

The territory is also important for protected species of birds and invertebrates. Birds *Dryocopus martius* and *Bonasa bonasia* can be found here. Forests are very suitable for door snails, such as *Ruthenica filograna, Clausilia cruciata, Bulgarica cana*. *Lutra lutra* lives in river.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of woodland fragmentation and increase of area size and integrity of protected habitats by ensuring non-intervention in woodlands which have not yet reached the quality of protected habitats. Development towards habitat types *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes* and *Western Taïga* is expected.

5. Necessary management and conservation measures

5.1. General measures

Update of habitat maps.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	3.8	1.8	Favourable.	Non-intervention.		3.8
9020*	Broad-leaved deciduous forests	1.6	<1	Favourable.	Non-intervention.		1.6
9010*	Western Taïga	63.9	30.7	Favourable.	Non-intervention.		63.9
9000	Potential Protected woodland habitat	45.0	21.6	-	Non-intervention.		45.0
7220*	Petrifying springs	0.03	<1	Favourable.	Non-intervention.		0.03
91E0*	Alluvial forests	53.3	25.6	Favourable.	Non-intervention.		53.3

Zaķu riests | *Nature Reserve (LV0536200)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Viesīte municipality, Viesīte town with rural territory.

AREA: 142 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Zaķu riests Nature Reserve is located in a wooded area between the Biržupe Canal and the Klauce River. There are bog woodlands of various ages in the territory, especially in the central part – particularly biodiverse pine woodlands. Sparse pine woodlands with dwarf shrubs are suitable for capercaillie *Tetrao urogallus* leks.

In the northern part of the nature reserve, a micro-reserve for the protection of *Tetrao urogallus* lek is established. Part of the buffer zone of the micro-reserve is located outside the territory, and includes the forest adjacent to the nature reserve.

Other important species observed in the nature reserve are birds *Bonasa bonasia* and *Dryocopus martius*, and invertebrate *Boros schneideri*.

2. Threats to habitat and species conservation

It is possible that habitats of the territory are threatened by previous drainage (ditches) which promote overgrowth of capercaillie *Tetrao urogallus* leks with spruces (*Picea abies*).

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Optimal conditions in capercaillie leks – improvement of quality of bog woodlands in the entire micro-reserve, gradually improving conditions also for other rare and protected species. Woodland structure in the lek site must be maintained open. Spruce advance growth must be felled on necessity.

5. Necessary management and conservation measures

5.1. General measures

Research of the hydrological regime; development of a construction project if it is concluded that rewetting is necessary.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	142.0	100.0	Poor.	Non-intervention, except rewetting after the evaluation of filling of the ditches that are crossing the territory, if they are functional. If necessary, felling of spruce advance growth in *Tetrao urogallus* lek.	According to research results. According to expert recommendations.	142.0

Zaļezera purvs | *Nature Reserve (LV0502800)*

1. Brief description

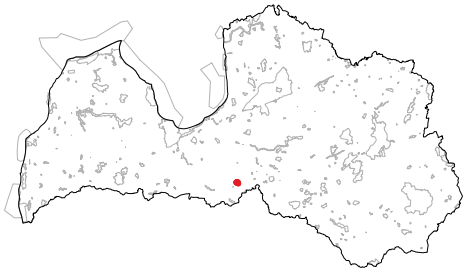
YEAR OF FOUNDATION: 1977.

LOCATION: Vecumnieki municipality Bārbele rural territory.

AREA: 324 ha.

NATURE MANAGEMENT PLAN: 2010 (2010–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Zaļezera purvs Nature Reserve includes Zāļezers Mire (former Lake Zāļezers) and Lake Bārbele, as well as wet forests and transitional mire. There are six EU protected habitat types. The largest areas are covered by bog woodlands and transition mires and quaking bogs – in the area of overgrown Lake Zāļezers and around Lake Bārbele. There are also swamp woods and natural eutrophic lake (Lake Bārbele). The nature reserve is located in a region of sulfate karst, there are karst sinkholes; Lake Bārbele is located in the largest of them. Around 1975, the territory of nature reserve was drained, ditches were excavated and Mīlupīte river channel was modified. In result, water level in mire and bog woodlands was lowered, promoting partial overgrowth of mire and growth of shrubs in bog woodlands in some places. The south-western and western parts are drained by several small drainage ditches which is a part of older drainage system which currently is not maintained or improved.

In total, 26 rare and protected species have been found in the nature reserve: three plant species, one mushroom, five mammal, eight bird, six invertebrate species. There are several species of orchids, such as *Platanthera bifolia, Dactylorhiza maculata ssp.. maculata* and *Dactylorhiza maculata ssp. elodes* (both subspecies), *Dactylorhiza incarnata*. Protected mushroom *Geastrum quadrifidum* can be found. Protected invertebrate species include *Graphoderus bilineatus, Leucorrhinia pectoralis,* and *Dytiscus latissimus*. Examples of protected bird species are *Bonasa bonasia, Pernis apivorus, Tetrao tetrix, Mergus merganser, Circus aeruginosus*.

2. Threats to habitat and species conservation

- The condition of wet forests, mires and lake is adversely affected by previous drainage.
- The water level in Mīlupīte river is elevated due to activities of beavers (*Castor fiber*). In result, the moisture in surrounding woodlands is increased. However, the influence of beavers in the nature reserve can be evaluated as positive because the influence of drainage is reduced.
- In dry coniferous forests south from Lake Bārbele, there are dense stands of invasive shrub *Amelanchier spicata*.
- Heavy trampling in Zāļezers Mire during the berry picking season.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Rewetting; maintenance of optimal hydrological regime.
- Maintenance of water discharge in Mīlupīte river (which is a channelized watercourse); its cleaning, at the same time preventing unfavourable impacts to bog woodland and Zāļezers Mire.
- Limitation of the spread of *Amelanchier spicata* in the territory.

5. Necessary management and conservation measures

5.1. General measures

- Development of a construction project for the construction of dams on ditches.
- Monitoring of hydrological conditions and vegetation after the blocking of ditches, in order to evaluate the restoration success (monitoring is described in nature management plan).
- Maintenance of free water flow and cleaning of Mīlupīte river (channelized watercourse) in order to provide optimal hydrological conditions in the territories adjoining the nature reserve, and to prevent their paludification.
- Felling of *Amelanchier spicata* stands; monitoring of its distribution in the managed sites; felling must be repeated on necessity.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	161.7	50.0	Bad.	Non-intervention.		161.7
9080*	Fennoscandian deciduous swamp woods	27.1	8.4	Poor.	Non-intervention.		27.2
7140	Transition mires and quaking bogs	60.7	18.7	Poor.	Non-intervention, except construction of at least three dams according to nature management plan (there is an initial assessment of a hydrologist).	According to research results.	61.9
3260	Natural river reaches and river riffles	0.4	<1		Non-intervention, except removal of beaver dams (on necessity).		0.4
3190*	Lakes of gypsum karst	3.7	1.1	Favourable.	Non-intervention.		3.7
3160	Natural dystrophic lakes and ponds	0.5	<1	Favourable.	Non-intervention.		0.5
3150	Natural eutrophic lakes	11.6	3.6	Poor.	Non-intervention.		11.6

Zāgadu kalni | *Nature Reserve (LV0536100)*

1. Brief description

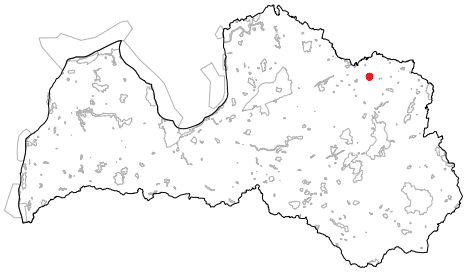
YEAR OF FOUNDATION: 2004.

LOCATION: Alūksne municipality, Alsviķi rural territory.

AREA: 86 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Zāgadu Kalni Nature Reserve is located in a wooded area and includes outstanding western Taïga woodlands with *Pinus sylvestris* and *Picea abies*, as well as *Pinus sylvestris* bog woodlands, and mineral-rich springs and springfens. The territory is characterized by an expressive undulated terrain. The regulated river Dzirnavupīte flows in the terrain depression in the northern part of the territory. Its surrounding forests have been drained. Forests are very important for capercaillie *Tetrao urogallus* leks. Near the nature reserve and partly also in its territory, micro-reserves have been established for the protection of capercaillie *Tetrao urogallus* leks. Mixed forest spruce and deciduous woodlands is habitat for protected plant species which is very rare in Latvia and Europe - *Cypripedium calceolus*. There also several other rare and protected plant species, such as *Diphasiastrum complanatum, Carex disperma*, moss *Trichocolea tomentella*.

2. Threats to habitat and species conservation

- Wet habitats in the territory are affected negatively by previous drainage.
- The diversity of invertebrates and woodpeckers in western Taïga is influenced negatively by the lack of structures and conditions caused by wildfire, and by the lack of dead wood.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Maintenance of the existing hydrological regime or restoration of the optimal hydrological regime in bog woodlands.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

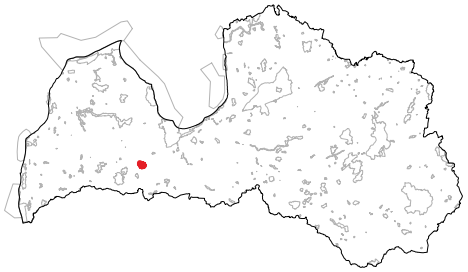
Research of the hydrological regime; development of a construction project if it is decided that rewetting is possible. The measure is complex and must also include evaluation of the situation in adjacent micro-reserves and the necessary activities for the improvement of conditions in *Tetrao urogallus* leks, if necessary. The measure also includes development of a monitoring programme and methods for the evaluation of restoration success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	13.4	15.6	Poor.	Non-intervention, except rewetting (ditch blocking or filling up).		13.4
9010*	Western Taïga	45.2	52.6	Favourable.	Non-intervention. Felling of trees and shrubs in *Tetrao urogallus* leks.		45.2
7160	Fennoscandian mineral-rich springs and springfens	6.2	7.2	Favourable.	Non-intervention.		6.2

Zebrus un Svētes ezers | *Nature Reserve (LV0525800)*

1. Brief description



YEAR OF FOUNDATION: 1957.

LOCATION: Dobele municipality Zebrene and Biksti rural territories.

AREA: 935 ha.

NATURE MANAGEMENT PLAN: 2003 (2004. – 2014), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 390 of 16 May 2006, Regulation on Individual Protection and Use of Zebrus un Svētes ezers Nature Reserve.

INCLUDES OTHER PROTECTED NATURE AREAS: partly includes Zebrus avoti Geological and Geomorphological Nature Monument.

Zebrus and Svētes ezers Nature Reserve includes two natural eutrophic lakes Zebrus and Svēte Lakes, surrounded by woodlands of various types – western Taïga, bog woodlands, swamp woods, and others. The highest point of the nature reserve is a large-size hill – Elku Kalns. It is covered by old forest of oaks (*Quercus robur*) and aspen (*Populus tremula*). Two micro-reserves are established for the conservation of woodland habitats. The lakes occupy 51% of the nature reserve area. In 1930s, large drainage was carried out in the area, and water level in Zebrus lake was lowered. Later, it was raised again. There are transition mires and quaking bogs on the southeast coast of the lake, as well as small fragments of raised bog. Villiku Mire which is also located in nature reserve is overgrown.

There are eight protected habitat types of EU importance in the nature reserve, as well as rare and protected species – 12 species of plants, 21 bird, seven mammal, one protected fish species. The most important protected plant species are *Cypripedium calceolus* and *Liparis loeselii*. There are also other rare orchid species – *Listera cordata, Platanthera bifolia, Orchis mascula, Dactylorhiza incarnata, Malaxis monophyllos, Hammarbya paludosa*. Small localities of *Primula farinosa* and *Pulsatilla pratensis* are located in N and NE coast of the lake.

During the autumn migration, Zebrus and Svēte lakes are important stopover sites for *Anser albifrons, Anser fabalis* and *Cygnus cygnus*. There are breeding and foraging habitats which are important for protected bird species, such as *Ciconia nigra* and *Aquila pomarina*. The nearly uninfluenced woodlands is an outstanding foraging site for rare species of woodpeckers – *Dendrocopos medius, Dendrocopus leucotos*, and *Picoides tridactylus*, as well as *Bonasa bonasia*. The territory is a particularly suitable breeding site for bats, with at least six species observed, including *Myotis dasycneme, Pipistrellus nathusii*, and others.

2. Threats to habitat and species conservation

- Zebrus and Elku Mires both have been previously drained, and peat was extracted in small volumes. The water discharge from both lakes via Zušupīte river was established. Bog woodlands were partly drained, and the drainage impact continues also today.
- Hydrological regime changes are a potential threat and must be carefully evaluated as it may cause a decrease in lake water level and an acceleration of overgrowing processes.
- Water level in lakes was lowered in 1937. This encouraged the mineralization of peat layers at the lake. After that, water level was raised again. At present, lake water level is maintained by a dam and beaver dam on Zušupīte river (connecting the lakes). The once constructed dam – the concrete threshold in the outflow of Zušupīte – is not functioning properly. There is beaver dam before the artificial dam, that keeps the water level elevated by about 20 cm. It has encouraged nutrient runoff from soil horizons which were previously drained but now are wetted, as indicated by excessive development of blue-green algae in the lake in 2015. Water level rise will promote the development of wet forests at lake coast.
- In woodlands of Elku Hill, it is expected that the composition of tree species will change due to succession. Currently, there is a dense *Corylus avellana* understory in woodlands, regeneration of oaks and other broadleaved species does not occur.
- An increase in the flow of visitors is a potential threat which may negatively influence the quality of protected habitats.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Rewetting in bog woodlands.
- Maintenance of optimal hydrological regime in Zebrus and Svēte lakes.
- Measures for the promotion of viability and regeneration of oaks.
- Control of angling and reduction of fishing in Zebrus and Svēte lakes.
- Maintenance of open littoral parts in NE coast of Svēte lake, where fragments of lakebed with sandy and gravelly substrate have remained.

5. Necessary management and conservation measures

5.1. General measures

- Optimization of the borders of nature reserve, to include alkaline fens adjoining the Zebrus lake (locality of *Liparis loeselii*).
- Research of hydrological regime, evaluation of rewetting possibilities in bog woodlands. Development of a construction project of rewetting if such measure is supported by research results. At the same time, evaluation of rewetting influence on mineralized mire areas and lake ecosystem.
- Modification of Individual regulations on protection and use providing non-intervention in EU protected woodland habitats (selective felling ("tendering" and "sanitary felling") is allowed in accordance to existing regulations in force).
- Measures for controlling the flow of visitors and for the mitigation of their impact (for example, container-based toilets in recreation sites, etc.).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	71.6	7.6	Poor.	Non-intervention. Rewetting (ditch blocking or filling, according to research results).		71.6
9160	Oak forests	15.8	1.7	Poor.	Felling of trees around the largest oaks (in their crown projection). Artificial regeneration of oaks; their planting in canopy gaps.	 1.0	15.8
9080*	Fennoscandian deciduous swamp woods	19.4	2.1	Poor.	Non-intervention.		20.2
9010*	Western Taïga	163.8	17.5	Favourable.	Non-intervention.		165.8
7140	Transition mires and quaking bogs	13.2	1.4	Poor.	Maintenance of optimal water regime in lake (to avoid adverse influence on quaking bogs).		13.2
7110*	Active raised bogs	1.73	<1	Bad.	Non-intervention.		1.73
7230	Alkaline fens	0.4	<1	Poor.	Felling of shrubs. Reed mowing.	0.4	
3260	Natural river reaches and river riffles	0.5	<1	Poor.	Maintenance of the existing water level in Zušupīte river until the influence of beaver activities on Zebrus and Svēte lakes is evaluated. Further activities in accordance to research results. It is not recommended to limit beavers as their dams maintain the water level in lakes.		0.5
3150	Natural eutrophic lakes	469.9	50.2	Poor	Establishment of open littoral zone in vicinity of residential areas and recreation areas; improvement of recreation possibilities for people will improve habitats for ducks and juvenile fish. Non-intervention.	1.0	 468.9

Zemgaļu purvs | *Nature Reserve (LV0514500)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Talsi municipality, Valdemārpils and Lube Rural Territory.

AREA: 462 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Zemgaļu purvs Nature Reserve is located between Lake Lubezers and drained forests of Coastal Lowland. It includes raised bog with *Trichophorum cespitosum* (variant typical for western Latvia) and bog woodlands in a narrow belt around the bog. Several protected bird species can be found in a territory, such as *Grus grus, Caprimulgus europaeus, Lullula arborea*. The area is particularly suitable for *Tetrao tetrix*. *Juncus bulbosus*, rare and protected plant species, is found in bog woodlands.

2. Threats to habitat and species conservation

The northern and southern parts of the territory are relatively overgrown due to drainage (there are old ditches in the northwest, north and west edges of bog and in the bog itself). Although most of the ditches are old and small, and most of them are quite overgrown, their impact has caused the overgrowth with trees; dwarf shrubs are abundant in the groundcover; sphagnum cover in the northern and southern parts is insufficient.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting in bog and bog woodland
- Undisturbed course of natural processes in habitats, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Hydrological regime research; preparation of construction project for the rewetting. This measure must include also the preparation of monitoring program and methodology for the evaluation of restoration tasks.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	74.6	16.1	Poor.	Non-intervention, except for rewetting, which is carried out in mires and bog woodlands	74.6	
7120	Degraded raised bogs	36.1	7.8	Bad.	Rewetting (ditch damming or filling up). Tree felling in the overgrown areas of mire.	36.1	
7110*	Active raised bogs	303.2	65.6	Poor.	Rewetting (ditch damming or filling up).	303.2	

Zepu mežs | *Nature Reserve (LV0534200)*

1. Brief description

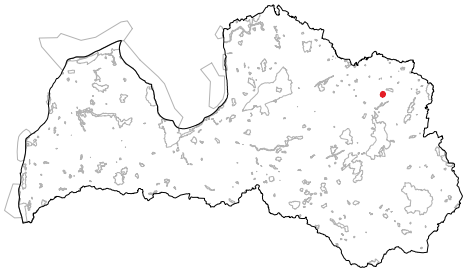
YEAR OF FOUNDATION: 2004.

LOCATION: Gulbene municipality Stāmeriena rural territory.

AREA: 65 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Zepu mežs Nature Reserve is located in a hilly area with a mosaic of agricultural lands and woodlands. It includes western Taïga, as well as swamp woods and small areas of bog woodlands. Western Taïga (old boreal forests) corresponds to woodland habitat of very high quality, with abundant structures characteristic to pristine forest. For example, there are large volumes of logs in the area, and it is an important habitat for rare invertebrate species.

Examples of rare and protected plant species in the territory are *Glyceria lithuanica, Poa remota, Carex disperma, Listera cordata, Platanthera bifolia.* Western Taïga is characterised by large diversity of moss species, for example, *Jungermannia leiantha, Neckera pennata,* and other.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

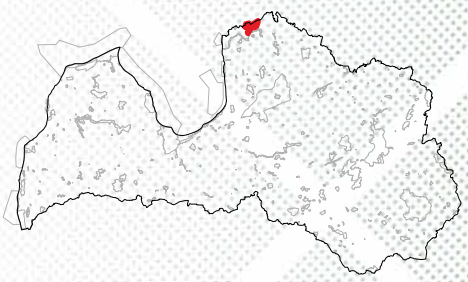
Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	0.5	<1	Poor.	Non-intervention.		0.5
9080*	Fennoscandian deciduous swamp woods	6.7	10.3	Poor.	Non-intervention.		6.7
9010*	Western Taïga	52.6	80.9	Favourable.	Non-intervention.		52.6

Ziemeļu purvi | *Nature Reserve (LV0000130)*

1. Brief description



YEAR OF FOUNDATION: 2004 (since 1977 there have been several separate nature reserves).

LOCATION: Aloja municipality Staicele rural territory, Mazsalaca municipality Ramata rural territory.

AREA: 7703 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2026).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Ziemeļu purvi Nature Reserve includes one of the largest massifs of raised bogs of the Baltic region. It is located at the border of Latvia and Estonia, and it includes Sokas, Oļļas, Limšānu, Pirtsmeža and Kangaru Mires with their adjoining forests and agricultural lands. Sokas, Kangaru and Oļļas Mires continue beyond the border, and together with the parts located in Estonia they are included in a list of Ramsar sites – wetlands of international importance. The territory is also an Internationally Important Bird Area in Latvia (LV031).

Active raised bogs with hummock-hollow microrelief and dystrophic lakes cover most of the areas of Ziemeļu Mires. Relatively small areas are covered by transition mires and quaking bogs. Forests in the nature reserve have an outstanding value. In some parts of the territory, for example, on bog islets with mineral ground, woodlands of almost pristine conditions have remained. The largest areas are covered with wet forests.

A large part of the area is occupied by lakes located in massifs of raised bogs – lakes Ramatas Lielezers, Ramatas Mazezers and Lake Sokas. There are 11 EU protected habitat types that occupy more than 80% of the territory. The most important ones are active raised bogs, transition mires and quaking bogs, natural dystrophic lakes or bog lakes. Of the forest habitats, the largest area is covered by bog woodlands, deciduous swamp woods with *Alnus glutinosa*, and western Taïga, while other forest habitats cover small areas. The grasslands are few, very fragmented just around the old farmsteads.

The nature reserve is a habitat for may typical and also for rare and protected species – 39 species of plants and 37 species of animals. A large number of protected bird species have been found, for example, the golden eagle *Aquila chrysaetos, Philomachus pugnax, Bonasa bonasia, Circus pygargus, Tetrao tetrix, Tetrao urogallus, Falco subbuteo, Tringa glareola, Pluvialis apricaria, Dendrocopos leucotos, Picoides tridactylus* and others.

Ziemeļu Purvi is one of the few places in Latvia, where such species can be found whose distribution area in Latvia reaches both the southern and western borders of distribution. These species are *Betula nana* and *Trichophorum cespitosum*. Other important plant species are *Cypripedium calceolus, Drosera intermedia, Hammarbya paludosa, Nuphar pumila*, mosses *Geocalyx graveolens, Scapania irrigua, Schistostega pennata, Lejeunea cavifolia* and others. Rare dragonflies -*Leucorrhinia pectoralis* and *Leucorrhinia albifrons*. From the list of the protected mammals, *Lutra lutra, Ursus arctos*, can be found in the area, as well as three species of bats, for example, *Eptesicus nilssoni*. Habitat is suitable for the Siberian flying squirrel *Pteromys volans*.

2. Threats to habitat and species conservation

- Part of the nature reserve is influenced by drainage. Ezergrāvis Ditch that is outflowing of the Ramatas Lielezers Lake drains part of the Saklaura Mire. A dense drainage ditch system is established also in NW part of Pirtsmeža Mire and in SE part of Sokas Mire.
- *Populus tremula* woodlands which are habitats of many protected species disappear due to succession.
- *Tetrao urogallus* leks are affected by drainage. *Picea abies* advance growth develops in bog woodlands, causing the decrease of *Tetrao urogallus* breeding success.
- The spread of invasive species *Heracleum sosnowskyi* from adjoining areas.
- Activities of beavers. Beaver dams as well as large woody debris threaten the river riffle habitats in the Līvupe and Piģele rivers in the nature reserve area outside the mires.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Rewetting, whenever possible, preventing the adverse effects of drainage.
- Increasing the proportion of *Populus tremula* woodlands.
- Maintenance of artificial nests of *Aquila chrysaetos*; construction of new nests according to zoning of the territory.
- Maintenance of *Tetrao urogallus* leks in an optimal condition for the species.
- Elimination of invasive species *Heracleum sosnowskyi*.
- Undisturbed course of natural processes in mire and forest habitats, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of natural river habitats in Gaņģupīte, Piģele and Līvupa rivers.
- Grasslands in the territory are fragmented and degraded therefore their restoration and maintenance is not the priority. However, their restoration and maintenance is desirable for the preservation of the whole biodiversity of the territory. Ziemeļgauja Protected Landscape Area with the largest areas of semi-natural grasslands in the country is located near Ziemeļu purvi, therefore grassland restoration in the nature reserve can be successful if access roads are provided and if restoration takes place in the maximum possible area (including the historical grassland areas).

5. Necessary management and conservation measures

5.1. General measures

- Development of building project for the stabilisation of hydrological regime in mires; also construction of dams on drainage ditches in Oļļas and Pirtsmeža Mires is necessary (sites are specified in the Nature management plan; the measure is planned to be implemented in scope of LIFE project "Conservation and management of Priority wetland habitats in Latvia" LIFE13 NAT/LV/000578). Monitoring of the restoration efficiency is necessary.
- Increase of proportion of *Populus tremula* in woodlands. It is necessary to systematically create *P. tremula* stands (by creating gaps) in the area of 24 ha. Forest compartments suitable for development of *Populus tremula* stands are specified in the Nature management plan. Protected habitats and localities of important species are not located in these compartments.
- Reduction of *Heracleum sosnowskyi*. Currently, species is found close to the border of the nature reserve, and must be eradicated.

5.2. Specific measures

5.2.1. Species

- Population of *Tetrao urogallus* is formed by 13 – 18 specimens, population condition is considered as poor. Improvement (felling of trees) is a priority in two leks (sites specified in Nature management plan).
- There are 1 – 2 couples of *Aquila chrysaetus* nesting in the nature reserve, population condition is considered as poor. Monitoring of breeding success in the existing nests; establishment of new artificial nests or repair of existing nests in case of necessity.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	1618.4	21.0	Favourable to poor.	Non-intervention. Rewetting, in complex with mires.	According to hydrological research results.	1618.4
9080*	Fennoscandian deciduous swamp woods	175.7	2.3	Favourable to poor.	Non-intervention. Rewetting, in complex with mires.	According to hydrological research results.	175
9010*	Western Taïga	106.7	1.4	Poor.	Non-intervention.		106.7
9020*	Broad-leaved deciduous forests	4.9	<1	Poor.	Non-intervention.		5
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	3.0	<1	Bad.	Restoration. Maintenance.	4.3	4.3
6000	Grasslands to be restored	30.8	<1	-	Restoration. Maintenance.	30.8	30.8
7150	Depressions on peat substrates	694.5	9.0	Favourable.	Non-intervention.		512.7
7140	Transition mires and quaking bogs	244.6	3.2	Favourable.	Non-intervention.		243.3
7120	Degraded raised bogs	44.3	<1	Bad.	Rewetting (ditch blocking or filling up).		On necessity.
7110*	Active raised bogs	3152.3	41.0	Favourable.	Non-intervention.		On necessity.
3260	Natural river reaches and river riffles	3.2	<1	Poor.	Improvement of water flow rate in Geņģupīte, Piģele and Līvupe rivers, by removal of large woody debris and controlling the number of beaver dams. Decrease of the number of beavers (hunting).	On necessity.	3.4
3160	Natural dystrophic lakes and ponds	287.3	3.7	Favourable.	Non-intervention.		287.3

Ziemupe | *Nature Reserve LV0508100*

1. Brief description

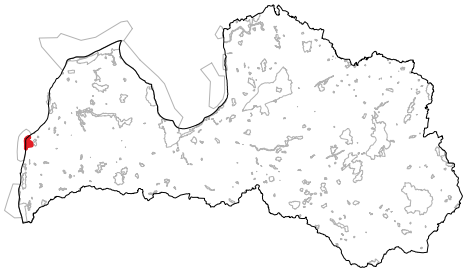
YEAR OF FOUNDATION: 1987.

LOCATION: Pāvilosta municipality, Saka and Vērgale rural territories.

AREA: 2458 ha.

NATURE MANAGEMENT PLAN: 2016 (2016 – 2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Ziemupe Nature Reserve includes rare coastal dune habitats. Grey dunes (fixed coastal dunes with herbaceous vegetation), white dunes (shifting dunes along the shoreline with *Ammophila arenaria*) and embryonic shifting dunes are especially important. In the inland area, there are *Pinus sylvestris* forests on poor substrate (*grīnis*) which is a very rare forest site type in Latvia, and wet heaths with *Erica tetralix*. One of the two known localities of *Eryngium maritimum* in Latvia is located here, also one of the localities of *Dianthus arenarius* ssp. *arenarius*, as well as large and persistent stands of *Myrica gale*. There are several naturally meandering rivers in the nature reserve - Rudupe, Griguļupe, Laiku Valks un Žožupe rivers. In total, 16 EU protected habitat types have been found in the nature reserve. They cover about 60 % of the territory.

The nature reserve is rich in protected species: 42 vascular plant species, 16 moss, two lichen, 11 insect, 35 bird species can be found here. Important plant species are *Linaria loeselii, Lathyrus maritimus, Crambe maritima, Tragopogon heterospermus, Anthyllis maritima, Juncus baltica, Primula farinosa, Pinguicula vulgaris*; lichen *Cladonia foliacea*, and others. The territory is suitable for breeding for several rare bird species: *Upupa epops, Tetrao urogallus, Columba oenas*. In open sandy areas, *Anthus campestris* can be found. Rare invertebrate species include *Maculinea arion, Laphria gibbosa, Bembix rostrata*.

2. Threats to habitat and species conservation

- Populations of rare species and protected dune habitats are threatened by the fast spread of invasive species *Rosa rugosa*.
- The quality and area of grey dunes is reduced by their overgrowth with trees and shrubs.
- Afforestation of the grey dunes (carried out in the second half of the 20th century, also with non-native species *Pinus mugo*) has caused the decline of native habitats.
- Wet heaths overgrow with trees and shrubs and their rare species disappear due to drainage, afforestation and management cessation.
- In some areas, vegetation of natural habitats is degraded due to excessive anthropogenic pressure (trampling, vehicle use).
- The typical vegetation of grey dunes and xeric sand calcareous grasslands is degraded due to lack of management.

3. Existing management of the protected habitats and its assessment

- In 2006, in the framework of the EC LIFE program "Protection and Management of Coastal Habitats in Latvia" (LIFE02 NAT/LV/008498), *Rosa rugosa* shrubs were felled in an area of 20 hectares.
- In 2014, in the framework of the EC LIFE program "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371) experimental grey dune management (elimination of *Rosa rugosa*) was carried out in an area of 8.5 hectares. Although the results were good, it is necessary to continue the management activities.

4. Priorities of management and conservation

- All management measures and their quantities are detailed in Nature management plan.
- Restoration and optimal management of grey dunes and xeric sand calcareous grasslands by improving their structural quality and reducing fragmentation.
- Elimination of invasive species. Reducing the area of plantations of non-native species.
- Improvement of the quality of wooded dunes; creation and maintenance of the characteristic mosaic structure.
- Management of fens; conservation of their characteristic plant species.

- Mitigation of drainage impact for the conservation and restoration of wet habitats including wet heaths. Improvement and restoration of the structural quality of wet habitats.
- Insolation improvement for old *Pinus sylvestris* trees - for the maintenance of habitats of rare invertebrate species.
- Construction of visitor infrastructure for the redirection of visitor flow (pedestrian trails, stairs, roads downwards and information signs) for the reduction of trampling in white dunes, embryonic dunes and grey dunes.
- Undisturbed course of natural processes in natural forest, wooded dune, mire, spring habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- The approval of Individual regulations on protection and use for Ziemupe Nature Reserve.
- Mitigation of drainage impact in order to conserve EU protected wet habitat types and for the restoration of swamp woodlands. After the research of hydrology and development of detailed plan of rewetting for the eastern part of the nature reserve, rewetting in this part of nature reserve is necessary, for the improvement of quality of fens, wet heaths and swamp woods and for the restoration of drained *Pinus sylvestris* forests (grīnis).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	261.7	10.6	Poor.	Non-intervention. Mitigation of drainage impact by blocking or filling up the drainage ditches. Thinning of fast-growing pines. Improvement of light conditions for old pines.	 54 18.7 11.2	
9080*	Fennoscandian deciduous swamp woods	20	<1	Favourable to poor.	Non-intervention. Mitigation of drainage impact.	 5.9	
9010*	Western Taïga	104.7	4.3	Favourable to poor.	Non-intervention. Promotion (increase) of structural elements. Improvement of light conditions for old pines.	 42.9 25.3	
91E0*	Alluvial forests	13.2	<1	Favourable.	Non-intervention.		
7140	Transition mires and quaking bogs	15.6	<1	Favourable.	Non-intervention. Mitigation of drainage impact (in complex with habitat types 4010 and 7230)	 14.7	
7160	Fennoscandian mineral-rich springs and springfens	0.2	<1	Favourable.	Non-intervention in the natural processes.		

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7230	Alkaline fens	36	1.5	Favourable to poor.	Non-intervention. Experimental mowing in fen (9.3 ha). Mitigation of drainage impact (in complex with 4010 un 7140). Thinning of fast-growing pines.	 8.5 12.9 1.0	
6000	Grasslands to be restored (aim: 6120* Xeric sand calcareous grasslands)	3.5	<1	-	Restoration. Maintenance.	3.5	
3260	Natural river reaches and river riffles	1.4	<1	Favourable.	Non-intervention in natural processes.		
4010	Northern Atlantic wet heaths with *Erica tetralix*	24.3	1.0	Favourable to poor.	Felling of fast-growing trees and shrubs. Mitigation of drainage impact (in complex with 7230)	22.8 23.5	
1230	Sea cliffs	2.1	<1	Favourable.	Non-intervention. Elimination of *Rosa rugosa.*		
2170	Dunes with *Salix repens*	1	<1	Poor.	Felling of fast-growing pines, including non-native *Pinus mugo.* Pulling out the pine seedlings.	1.0	
2190	Humid dune slacks	15.1	<1	Poor.	Mitigation of drainage impact.	4.7	
2180	Wooded dunes	863	35.1	Poor.	Elimination of *Rosa rugosa.* Restoration of grey dunes by felling plantations of *Pinus sylvestris* or *P. mugo*; in area of 0.3 ha all *P. mugo* planted among *P. sylvestris* must be felled. Development of landscape mosaic of grey dunes and wooded dunes. Improvement of natural structures in young and middle-aged pine forests. Renaturalization of pine plantations established in agricultural lands. Felling of subcanopy and advance growth of *Picea abies.* Felling of *Pinus mugo* plantations. Felling of *Caragana arborescens.* Increase of natural structural elements. Insolation improvement for old pines.	 15.7 46.8 91.0 84.5 9.7 25.1 0.1 70 7.2	

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
2130*	Grey dunes	50.8	2.1	Poor.	Felling of fast-growing pines, incl. felling of all *P. mugo* planted among *P. sylvestris*. Elimination of *Rosa rugosa*. Creation of open sand patches. Pulling out the pine seedlings. Construction of pedestrian trails and roads downwards.	25.0 14.4	
2120	White dunes	16.5	<1	Favourable to poor.	Elimination of *Rosa rugosa*. Felling of fast-growing pines. Construction of pedestrian trails and roads downwards.	0.8	
2110	Embryonic dunes	2.4	<1	Favourable to poor.	Non-intervention.		

Zilaiskalns | *Nature Reserve (LV0536300)*

1. Brief description

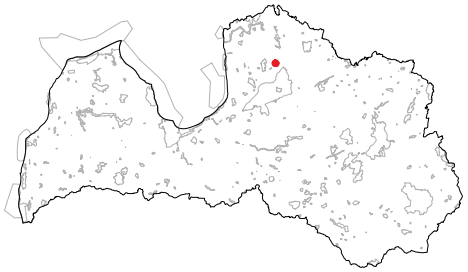
YEAR OF FOUNDATION: 2004.

LOCATION: Kocēni municipality, Kocēni rural territory.

AREA: 118.2 ha.

NATURE MANAGEMENT PLAN: 2005 (2006 – 2018).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Zilaiskalns Nature Reserve includes the highest point of the North-western Vidzeme Upland – Zilaiskalns Hill. It is covered with old forests of broad-leaved trees – *Tilia cordata*, *Quercus robur* and mixed forests, as well as old boreal *Pinus sylvestris* and *Picea abies* forests. There are three EU protected habitat types in the territory. On the periphery of the reserve there are dry *Pinus sylvestris* and *Picea abies* forests, also small areas of *Betula* spp. and *Alnus incana* wet forests. The essential structural elements are the old trees, old *Corylus avellana*, snags, naturally developed stumps and logs. Broadleaved trees, especially *Tilia cordata* and *Quercus robur*, are richly covered with epiphytic mosses. Three micro-reserves for the protection of forest habitats have been established in the territory.

In old broadleaved forests, protected plant species such as *Lathyrus niger* can be found, as well as moss species *Dicranum viride, Lejeunea cavifolia, Geocalyx graveolens* and *Anastrophyllum hellerianum*, lichens *Lobaria pulmonaria, Chaenotheca chlorella, Sclerophora spp., Cetrelia spp.*, and others.

2. Threats to habitat and species conservation

- Structure of natural forest is threatened by unauthorized removal of dead wood by local people.
- Protected habitats are negatively influenced by pollution from municipal waste.
- Protected habitats and species may be adversely affected by the network of trails established by tourists and local people.
- The number of visitors may rise in the future, and consequently their influence on habitats may increase.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Concentration of the tourism infrastructure around the existing car park, in order to reduce the visiting time at the top of Zilaiskalns Hill.
- Undisturbed natural processes in natural forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Improvement of infrastructure in the vicinity of existing car park in order to minimize the impact on habitats in the upper part of the hill.
- Maintenance of the existing network of trails.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	12.7	10.7	Poor.	Non-intervention.		12.7
9020*	Broad-leaved deciduous forests	1.0	<1	Favourable.	Non-intervention.		1.0
9010*	Western Taïga	38.0	32.1	Poor.	Non-intervention.		38.0

Zodānu purvs | *Nature Reserve (LV0502400)*

1. Brief description

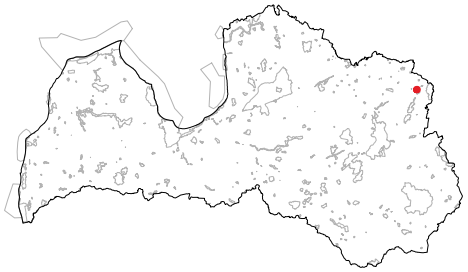
YEAR OF FOUNDATION: 1977.

LOCATION: Viļaka municipality Žīguri rural territory.

AREA: 98 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Zodānu purvs Nature Reserve is located in an area rich in woodlands and mires. It includes raised bog, transition mire and also bog woodland. Part of the raised bog is located outside the nature reserve, it is drained and overgrown with forest. Protected habitats in the territory may also be adversely affected by ditches.

Examples of protected plant species in the nature reserve are: *Salix myrtilloides, Dactylorhiza baltica, Lycopodium annotinu*m, and *Lycopodium clavatum*. The territory is important for bird species such as *Haliaeetus albicilla, Tetrao tetrix, Tetrao urogallus*, and others.

2. Threats to habitat and species conservation

- The existing drainage system in the nature reserve and the adjoining territory has caused changes in the hydrological regime and the degradation of bog woodlands.
- There is an anthropogenic load in the autumn – trails are created and litter is left by berry pickers.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Prevention of the adverse impacts and further degradation of mire by changing the borders of the nature reserve and incorporating the whole mire with its buffer zone in the territory. This will allow the complex restoration of habitats of mire and bog woodlands.

5. Necessary management and conservation measures

5.1. General measures

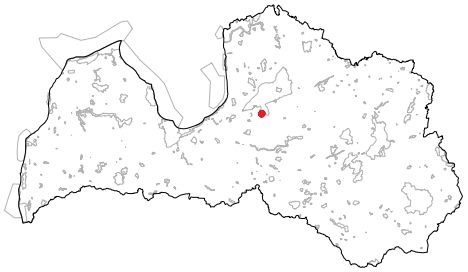
- Modification of the borders of the nature reserve. Currently, only the open part of the raised bog is included in the territory. The part of the nearby bog is heavily drained, partly overgrown with forest. However, the entire mire forms a single hydrological system, therefore the whole mire should be included in the nature reserve.
- Hydrology research and development of a building project for rewetting is necessary for the entire mire (also outside the nature reserve), if it is possible. This measure includes also development of monitoring program and methodology, for the assessment of efficiency of the restoration work.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	47.9	48.9	Poor.	Rewetting in bog woodlands and mire.	47.9	
7140	Transition mires and quaking bogs	5.2	5.3	Poor.	Rewetting (ditch blocking).	5.2	
7110*	Active raised bogs	19.2	19.6	Poor.	Rewetting (ditch blocking).	19.2	

Zušu-Staiņu sēravoti | *Nature Reserve (LV0536700)*

1. Brief description



YEAR OF FOUNDATION: 2013.

LOCATION: Sigulda municipality, Sigulda and More rural territories.

AREA: 51.4 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 1314 of 12 November 2013, Regulation on Individual Protection and Use of Zušu-Staiņu Sēravoti Nature Reserve.

Zušu un Staiņu sēravoti Nature Reserve is located on the shores of Zušupīte and Kaļķupīte rivers, on the edge of the wide complex of mires. This is one of the few sites of abundant sulphur springs in Latvia. The nature reserve is established for the protection of plant species of national and EU importance, especially *Ligularia sibirica*, as well as protected habitats - mineral-rich springs and springfens, *Molinia* meadows on calcareous, peaty or clayey-siltladen soils, and others.

One of the two localities of *Ligularia sibirica* in Latvia can be found in the nature reserve. This is also the only known locality of *Swertia perennis* which was considered as an extinct species in the country for a long time. Other protected species in the nature reserve are *Orobanche pallidiflora, Dactylorhiza fuchsii, Platanthera bifolia*, and others.

2. Threats to habitat and species conservation

- Activities of beavers. The river is inundated in almost its whole length, old beaver impoundments can be found, sulphur springs are partly flooded by the raised water level.
- Overgrowth and paludification of grasslands.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage habitats.
- In 2014, a new trail leading to the spring was constructed in the northern part of the territory. The spring was already previously equipped with infrastructure elements. Previously there has also been a trail from the former Zuši sulphur spring resort to sulphur springs.

4. Priorities of management and conservation

Maintenance of *Ligularia sibirica* localities and sulphur spring habitats in condition which is optimal for species and for habitat. It is urgent to limit the activities of beavers and to eliminate the adverse effects caused by them – the raised water level in the river. Thus further flooding of spring discharges and the degradation of woodlands and grasslands will be prevented.

5. Necessary management and conservation measures

5.1. General measures

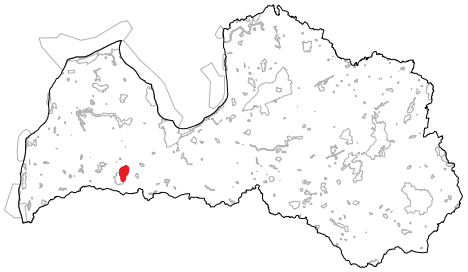
- Restriction of activities of beavers, also outside the nature reserve.
- Maintenance of the existing visitor infrastructure in the northern part of the nature reserve, at the former Zuši resort. Establishment of visitor infrastructure in new locations is not permissible, because of the threat to rare plant species and spring habitats.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6410	*Molinia* meadows	1.9	3.7	Bad.	Restoration. Maintenance.	1.9	1.9
7160	Fennoscandian mineral-rich springs and springfens	1.4	2.7	Bad.	Prevention of beaver impoundments in the river, in order to decrease water level in spring discharge habitats (beaver dams must be removed, beaver population must be reduced, and limited on a regular basis). Cutting of shrubs (especially in locality of *Ligularia sibirica*).	20	
3260	Natural river reaches and river riffles	0.1	<1	Bad.	Prevention of beaver impoundments in the river, in order to decrease water level in spring discharge habitats (beaver dams must be removed, beaver population must be reduced, and limited on a regular basis).		0.1

Zvārde | *Nature Reserve (LV0525600)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Brocēni municipality Blīdene rural territory, Saldus municipality Jaunauce and Zvārde rural territories.

AREA: 3072 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 414 of 25 September 2001, Regulation on Individual Protection and Use of the Zvārde Nature Reserve.

Zvārde Nature Reserve includes one of the largest mire massifs in Kurzeme Region, which includes two mires - the Zvārde Mire and the Stūru Mire, as well as their surrounding forests; the Lake Ķerkliņi and forests to the south of it. The territory is located in the former Zvārde military aviation training site where economic activity has been ceased for a long time and therefore various rare species and their habitats can be found. In total, 15 EU protected habitat types have been found in the nature reserve. Significantly large areas (25% of the territory) are covered by active raised bogs. There are also bog woodlands, western Taïga and herb-rich forests with *Picea abies*. Other protected forest habitat types cover small areas. The area of grasslands is very small because only a small part of previous agricultural land was managed in the period when military aviation training took place, and now they are overgrown. Also Lake Ķerkliņi and Lake Lapezers are important for the territory as natural eutrophic lakes. Lake Ķerkliņu is a peculiar lake in a subglacial valley. Beaver impoundments which occupy about 250 hectares is a particular feature of the territory.

The nature reserve is of particular value for the species in Annex I of the Birds Directive (30 species). The territory is also an Important Bird Area in Latvia (LV066). It is a significant breeding site for predatory birds and woodpeckers, and a stopover site for migrating birds.

Examples of rare bird species are *Bonasa bonasia, Ciconia nigra, Aquila pomarina, Haliaeetus albicilla, Cygnus cygnus, Tetrao tetrix, Picoides tridactylus, Dendrocopos leucotos, Botaurus stellaris, Tringa glareola*. In total, 16 protected vascular plant species have been in the territory, such as *Corallorhiza trifida, Trichophorum cespitosum, Salix myrtilloides, Hammarbya paludosa, Dactylorhiza baltica, Dactylorhiza incarnata*. There are also 13 rare and protected moss species (including *Scapania apiculata*), as well as four rare and protected mushroom species, including *Hapalopilus croceus*. Protected invertebrate species are *Lopinga achine* and *Leucorrhinia pectoralis*.

The nature reserve is important for bats. Five bat species are found here, including *Myotis dasycneme*. Also *Lutra lutra* and *Muscardinus avellanarius* live here.

2. Threats to habitat and species conservation

- The overgrowth of mire continues due to drainage. Drainage, river regulation and riverbed modification was started in the 1920s. It promoted mire drainage, overgrowth with forest and the decrease of open area; 29 ha of bog were drained long time ago and prepared for peat extraction. The extraction was carried out only in a small area.
- Fragmentation of old, biologically valuable woodlands is the consequence of previous logging (43% of the forest areas are new or middle-aged stands).
- Cessation of grassland management; overgrowth. Most of the former grasslands and other agricultural land are overgrown and covered by forest now.
- Paludification of grasslands in the floodplains of Ezere river.

3. Existing management of the protected habitats and its assessment

- Aquatic macrophytes in the littoral part of the Lake Ķerkliņi were mown at the residential area for the maintenance of bathing sites and to create access for anglers. The activity can be assessed as positive - productive and fast-warming littoral zones have developed, ensuring the feeding of juvenile fish, as well as better survival success of duck breeding. Also the landscape quality of the lake is improved.

4. Priorities of management and conservation

- Reduction of habitat fragmentation by promoting the development of mixed young forests.
- Restoration of grasslands is not the priority, however, it is desirable for the preservation of biodiversity conservation of the nature reserve. Grassland restoration is a priority in case if grasslands are restored also in Zvārdes meži Nature Park. Than, grasslands will be important for the increase of landscape continuity in both protected nature areas. In this case, restoration of grasslands will be necessary not only in 6 hectares (which is the grassland area indicated in the 2016 Nature management plan), but also in the areas of historical grasslands, increasing the total semi-natural grassland area to at least 30 ha.
- Non-intervention in the development of beaver-inundated areas; preservation of beaver dams, except in cases of necessity (for example, road flooding, destruction of protected habitats, negative influence on forest stands adjoining the nature reserve) in the areas specified in the Nature management plan.
- Reduction of runoff from the degraded bog at Stūrupe outflow from the mire.
- Provision of the optimal nesting conditions for eagle species in the area of seasonal restriction.

5. Necessary management and conservation measures

5.1. General measures

- Amendments to the Regulations on Individual Protection and Use, incl. setting a seasonal restriction during breeding of eagles.
- Provision of the optimal hydrological regime. Restoration, deepening or cleaning of old drainage ditches and watercourses (it is not a drainage system of state significance) in nature reserve should be avoided. In this way, the necessary moisture will be maintained in the woodland habitats and their associated beaver impoundments.
- Demolition of the beaver dams can be allowed only in cases of necessity and in locations indicated in the Nature management plan.
- Promotion of the formation of mixed forests by management of new woodlands and in *Alnus incana* woodlands, using the methods specified in the Nature management plan.
- Development of operating regulations for Lake Ķerkliņi (which is a public lake), to ensure the sustainable use of lake resources.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	233.1	7.6	Favourable.	Non-intervention.		
9020*	Broad-leaved deciduous forests	4.3	<1	Favourable.	Non-intervention.		
9050	Herb rich spruce forests	125.2	4.1	Favourable.	Non-intervention.		
9080*	Fennoscandi-an deciduous swamp woods	54.1	1.8	Poor.	Non-intervention.		
9180	Slope forests	7.7	<1	Favourable.	Non-intervention.		
91D0*	Bog woodland	405.7	13.2	Poor.	Non-intervention, except, if possible, rewetting in bog woodlands and mires.		

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	0.3	<1	Favourable.	Non-intervention.	According to hydrogical research results.	
7110*	Active raised bogs	779.0	25.4	Favourable.	Non-intervention in the natural processes (also demolishing of beaver dams is not necessary as they help maintain the necessary water level). Reduction of the runoff of the ditch (upstream of Stūrupe river) by constructing dams on the ditch in north part of Stūru Mire.	29	750
7120	Degraded raised bogs	29	1.0	Bad.	Rewetting by filling up or blocking dams in western part of Stūru Mire (site is specified in Nature management plan).	29	
7140	Transition mires and quaking bogs	56.3	1.8	Favourable.	Non-intervention.		56.3
7160	Fennos-candian mineral-rich springs and springfens	0.5	<1	Favourable.	Non-intervention.		0.5
7230	Alkaline fens	2	<1	Favourable.	Non-intervention.		2
6000	Grasslands to be restored	36.0	1.2	-	Restoration. Maintenance.	36.0	36.0
3150	Natural eutrophic lakes	52	1.7	Favourable.	Maintain the open littoral zone in Lake Ķerkliņi. Non-intervention.	0.5	
3160	Natural dystrophic lakes and ponds	0.2	<1	Favourable.	Non-intervention.		0.2
3260	Natural river reaches and river riffles	0.25	<1	Favourable.	Non-intervention, except in cases if activity is related to management of grasslands on the shore.		0.25

Zvirgzdenes ezera salas | *Nature Reserve (LV0510900)*

1. Brief description

YEAR OF FOUNDATION: 1925.

LOCATION: Cibla municipality Zvirgzdene rural territory.

AREA: 5 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Zvirgzdenes ezera salas Nature Reserve includes very valuable broadleaved woodlands on islands of Lake Zvirgzdene. The lake is actively used for recreation and fishing. Near the lake, there is an area of summer cottages and allotment gardens of Ludza Town.

The nature reserve includes Ozolu Island, Liepu Island, and two smaller islands. Woodlands on the islands correspond to EU protected habitat types - *Sub-Atlantic and medio-European oak or oakhornbeam forests of the Carpinion betuli, and Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus or Ulmus) *rich in epiphytes*. The vegetation is very rich, consisting of more than 100 vascular plant species. In 2002, a new locality of a very rare species, *Carex pilosa*, was found. Also *Lithospermum officinale* grows in the territory. *Sparganium gramineum* can be found on the coasts of islands. Islands are Important Bird and Biodiversity Area and a habitat for *Lutra lutra*.

2. Threats to habitat and species conservation

The negative influence of vacationers can be observed in the islands – trampling, illegal fireplaces. Liepu Island is the most affected one – hazels are cut, ground vegetation is trampled, a shack has been constructed, and fireplaces have been created. The impact is smaller in other islands. Watercraft, catamarans, boats with engines are used in the lake.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Development of Individual regulations on protection and use which ensure regulations on the behaviour when visiting Lake Zvirgzdene and its islands and reduction of recreational impact.

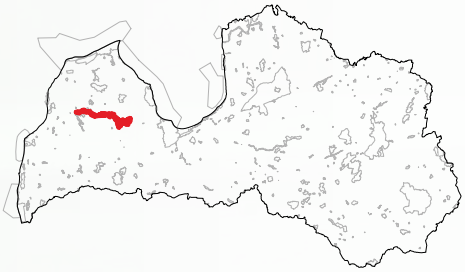
5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	1.9	38.0	Poor.	Non-intervention.		1.9
9020*	Broad-leaved deciduous forests	1.1	22.0	Poor.	Non-intervention.		1.1

NATURE PARKS

Abavas senleja | *Nature Park (LV0302100)*

1. Brief description



YEAR OF FOUNDATION: 1957.

LOCATION: Ventspils municipality Zlēkas, Ugāle, Usma rural territories; Kuldīga municipality Rumba, Renda rural territories; Talsi municipality Ģibuļi and Abava rural territories; Kandava municipality Kandava and Matkule rural territories.

AREA: 14 933 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 133 of 03 March 2008, Regulation on Individual Protection and Use of Abavas Senleja Nature Park.

INCLUDES OTHER PROTECTED NATURE AREAS:

- Čužu purvs Nature Reserve;
- Velna acs avots, Sudmaļu ūdenskritums, Imulas dolomīta klintis, Kalnamuižas kraujas, Cimmermaņu krauja, Īvandes ūdenskritumi, Muižarāju klintis, Langsēdes klintis, Abavas Velnala, Māras kambari Geological and Geomorphological Nature Monuments.

Abavas Senleja Nature Park is characterized by an interaction of natural and man-made environments, a diverse mosaic of landscapes, rich in species and their habitats. The territory is rich in monuments of culture and history. In 1996, Abavas Ieleja Protected Cultural Heritage Area was established. Here, the conservation of its values must be balanced with requirements for conservation of species and habitat. The characteristic terrain of the Abava river valley consists of slopes, ravines and side ravines, outcrops of sandstones and calcareous rocks, petrifying springs with tufa formation, fluvial terraces, diverse forests of slopes, alkaline fens and grasslands. In total, 28 protected habitats of EU importance and 252 protected species have been found in Abavas Senleja Nature Reserve.

At the national level, the nature park is the second most important Natura 2000 territory for the conservation of habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia), and the third most significant for 6120* *Xeric sand calcareous grasslands* (15 % un 9 % of the total area of habitat type in Latvia, respectively). It is among the ten most important territories for conservation of habitat types 5130 Juniperus communis *formations on heaths or calcareous grasslands*, 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae), and 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis). In Western part of Latvia, nature park is the most important Natura 2000 territory for five EU protected grassland habitat types (6120*, 6210, 6270*, 6430, and 6510), and the second most important for 6530* *Fennoscandian wooded meadows*. From landscape-ecological point of view, Abava valley is the most important species distribution corridor in Kurzeme Geobotanical District.

Forests cover 50 % of the territory of the park; protected woodland habitats – 6.8 %. There is an intensive forest management in the territory. The most important ones are forests of slopes, screes and ravines (9180), broadleaved forests (9020*), as well as bog woodlands (91D0*). Western Taïga (9010*) covers significant areas but its quality is uneven due to unsuitable management. Rock outcrops and caves are a very important value of the territory. Several objects, such as Māras Kambari Caves, are very popular visitor destinations. There are also very valuable alkaline fens. Čužu Mire is the only locality of *Pentaphylloides fruticosa* in Latvia.

The territory is rich in protected plant species including *Orchis militaris, Crepis praemorsa, Iris sibirica, Allium ursinum, Polygonatum verticillatum, Lunaria rediviva, Arctium nemorosum,* and others. Examples of protected invertebrates are *Vertigo angustior, Vertigo geyeri, Osmoderma barnabita, Unio crassus,* and others. For *Euphydryas aurinia* and *Lycaena dispar,* the territory is one of the most important localities in Latvia. Rare fish and cyclostome species include *Lampetra planeri, Cobitis taenia, Cottus gobio, Aspius aspius, Rhodeus sericeus.* Of rare reptile species, *Triturus cristatus* and *Lacerta agilis* can be found in the nature park. Birds – *Alcedo atthis, Bonasa bonasia, Crex crex*. Mammals – *Lutra lutra,* 11 species of bats, and others.

2. Threats to habitat and species conservation

- Semi-natural grasslands and alkaline fens overgrow due to lack of management or due to improper management (grass shredding, grass leaving on site, late mowing, overgrazing); decrease in their area size and quality, resulting in disappearance of characteristic species. Semi-natural dry grasslands and xeric sand calcareous grasslands and their characteristic plant and invertebrate species are the most threatened.
- Grassland habitats are threatened by expansion of building construction, especially in towns and in their vicinity.
- Protected woodland habitats are threatened by widespread selective felling (selection and sanitary felling: thinning; removal of infested and damaged trees) causing fragmentation and deterioration, and disappearance of characteristic species and structural elements (snags, laying dead wood).
- Broadleaved (oak *Quercus robur*) forests are threatened by succession – overgrowth with spruces (*Picea abies*).
- Aquatic habitats and their fauna are adversely influenced by eutrophication which is promoted by land management practices in the catchment area and lack of river bank management (in complex with abandonment of alluvial and fluvial grasslands).
- Aquatic and other habitats may be polluted in case of the oil pipeline (crossing the nature park) accident.
- Quality of aquatic habitats and species of riffles in small rivers (Amula and Imula rivers, small brooks) are adversely affected by beaver dams.
- In some places, the quality of rock outcrops and caves is threatened by activities of visitors – trampling, inscription (Māras Kambari Caves, Velnala Caves; to a lesser extent – outcrops in downstream part of Abava river). Bats in caves are threatened by presence of people (Velnala and Laupītāju Caves).
- Invertebrates are influenced by the deterioration of their habitats. Growth of shrubs at old, large oaks decreases the available habitats for saproxylophagous beetles (for example, *Osmoderma eremita*). Door snails *Clausiliidae* are threatened by overgrowth of grasslands and fens (including Čužu Mire).
- Habitats and native species are threatened by spread of invasive species.

3. Existing management of the protected habitats and its assessment

- A relatively large number of protected habitat management projects have been carried out in the Abava Valley. Most of them were implemented by private landowners and JSC "Latvijas Valsts Meži"; to a lesser extent – by non-governmental organizations and local municipalities.
- In the early 21th century, most of semi-natural grasslands were managed by mowing, rarely – by grazing. Largest grassland areas, mainly xeric sand calcareous grasslands, have been managed in a territory between Kandava and Sabile towns. The management success varies. In some areas, mowing and moderate grazing has contributed to conservation of grassland habitats and their species. In others – habitats are slightly degraded because late mowing and grass shredding (which was widespread in the last decade) have contributed to the eutrophication of grasslands. In some sites, the grazing is too intense. According to Rural Support Service, in 2014 only 34% of the grasslands of nature park were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".
- *Juniperus communis* formations are insufficiently managed. Only the juniper formation management at Drubazas farmstead (near Sabile town) and on shore of Abava ancient valley at Zvejnieku Bridge can be assessed as optimal. In other places, overgrowth and degradation of juniper formations occur.
- The same applies to alkaline fens which lay on slopes with spring discharges; most of them are overgrowing. In small areas, these grasslands are managed only in vicinity of Drubazas farmstead and also in Kandava town. Čužu Mire is a good example of fen management. Here, trees and shrubs were felled over several years, regrowth was mown, *Amelanchier spicata* shrubs were repeatedly eradicated, and a colony of *Heracleum sosnowskyi* was eliminated. These measures had a beneficial influence on populations of rare plant and invertebrate species.
- Wooded meadows are managed (pastured) in small areas – on the left slope of Abava ancient valley at Zvejnieku Bridge and in Sabile town ("Ēģipte" grassland).
- In several sites, infrastructure has been established at outcrop habitats (Māras Kambari, Velnala, Īvandes Ūdenskritumi). However, the management was aimed for the convenience of tourists and not for

the conservation of habitats and species. Therefore, habitat degradation signs such as trampling, scratching in outcrops and others can be observed in these sites.
- Forest management in the last decades (selective and sanitary felling, removal of fallen logs) has promoted the decline of forest biological value.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of semi-natural grasslands in a favourable conservation status. Increase of habitat landscape-ecological connectivity by restoration of historical grasslands (currently overgrown or grubbed up) to the maximum possible extent. At present, only 12 % of the grassland area identified in the early 20th century is preserved (it was about 400 hectares). In order to conserve grassland biodiversity, at least 500 hectares of grasslands should be restored.
- Conservation of alkaline fens, mineral-rich springs and springfens, juniper formations; improvement of their conservation status by choosing and implementing suitable management methods.
- Maintenance of watercourse functionality by removal of excessive overgrowth, beaver dams, and others.
- Limitation of spread of invasive plant species (priority – *Impatiens glandulifera, Solidago canadensis, Helianthus tuberosus, Amelanchier spicata*) by regular eradication of their colonies, until their complete elimination.
- Reduction of anthropogenic load in tourism objects of nature and cultural history, by ensuring the visitor infrastructure and by reduction of human presence in sensitive areas.

5. Necessary management and conservation measures

5.1. General measures

- Extension of the nature park: inclusion of the entire Mežzīles Millpond (EU protected habitat type 3150). The area of lake is 12 hectares, but only 8.7 hectares are currently included in Natura 2000 territory.
- Adoption of new Individual regulations on protection and use or amendment of the existing ones (according to project included in nature management plan of 2016).
- Inclusion of Čužu Purvs Nature Reserve in the nature reserve part of Abavas Senleja Nature Park.
- Development of grassland restoration and management programme, including measures for the increase of landscape-ecological connectivity: evaluation of grasslands currently overgrown with forest, identification of possible funding.

5.2. Specific measures

5.2.1. Species

- *Osmoderma barnabita:* liberation (insolation improvement) of old oaks and pines, at least in the priority habitats; 15 ha – once in five years.
- *Tetrao urogallus:* maintenance of leks (felling of spruces in advance growth and subcanopy); 50 ha.
- Large birds of prey: construction of artificial nest structures.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	325.0	2.2	Bad.	Non-intervention.		325.0
9020*	Broad-leaved deciduous forests	1.5	<1	Poor.	Non-intervention.		1.5
9080*	Fennoscandian deciduous swamp woods	7.4	<1	Poor.	Non-intervention.		7.4
9160	Oak forests	13.0	<1	Poor.	Liberation of old oaks: removal of young spruces close to their trunk.	6.95	
9180*	Slope forests	388.1	2.6	Poor.	Non-intervention. Felling of spruce advance growth, after a detailed evaluation of situation on site.	1.7	386.4
91D0*	Bog woodland	232.8	1.6	Poor - bad.	Non-intervention.		232.8
91E0*	Alluvial forests	30.2	<1	Favourable.	Non-intervention.		30.2
9050	Herb rich spruce forests	6.4	<1	Favourable.	Non-intervention.		6.4
9000	Potential Protected woodland habitat	195.0	1.3	-	Creation of canopy gaps and coarse woody debris.	10.0	185.0
8210	Calcareous rocky slopes	0.3	<1	Favourable.	Establishment of visitor infrastructure (trails, stairs) as recommended in monitoring result evaluation (2012).		0.3
8220	Siliceous rocky slopes	0.2	<1	Poor.	Decision on visitor objects where infrastructure must be established in order to protect outcrop habitats. Non-intervention in others.		0.2
8310	Caves not open to the public	0.001	<1	Poor.	Non-intervention.		0.001
7110*	Active raised bogs	3.8	<1	Bad.	Non-intervention.		3.8

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7160	Fennoscandian mineral-rich springs and springfens	5.7	<1	Favourable.	Non-intervention.		5.7
7220*	Petrifying springs	5.2	<1	Favorable - poor.	Non-intervention.		5.2
7230	Alkaline fens	10.0	<1	Bad.	Felling of trees and shrubs in overgrowing parts of fens. Brush cutting – annually in the following 5 years, afterwards less frequently. Mowing of reeds and invasive plants twice per season, at least 5 years in a row (in late June and August); removal of mown plants. Regular mowing, or grazing in winter (frozen conditions) – for the reduction of regrowth.	7.0	 7.0 2.0 6.0
6120*	Xeric sand calcareous grasslands	33.0	<1	Bad.	Restoration. Maintenance.	At least 26.0	3.03
6210	Semi-natural dry calcareous grasslands	236.0	1.6	Poor - bad.	Restoration. Maintenance.	At least 77.0	236.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	40.0	<1	Poor - bad.	Restoration. Maintenance.	At least 1.5	40.0
6410	*Molinia* meadows	30.0	<1	Bad.	Restoration. Maintenance.	At least 10.0	30.0
6430	Hydrophilous tall herb fringe communities	6.4	<1	Favorable - poor - bad.	Non-intervention. Limitation of invasive species (banks of Imula, Amula, and Abava rivers).	6.4	Unknown.
6450	Northern boreal alluvial meadows	103.0	<1	Poor - bad.	Restoration. Maintenance.	At least 30.0	103.0
6510	Lowland hay meadows	44.0	<1	Poor - bad.	Restoration. Maintenance.	Unknown.	44.0
6530*	Fennoscandian wooded meadows	7.7	<1	Poor - bad.	Restoration. Maintenance.	Unknown.	7.7

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6000	Grasslands to be restored	565.0	3.8	-	Restoration. Maintenance.	565.0	565.0
5130	*Juniperus communis* formations on heaths or calcareous grasslands	3.2	<1	Poor.	Restoration. Maintenance.	At least 0.8	3.2
4030	European dry heaths	0.7	<1	Poor.	Seasonal grazing or mowing (with grass removal).		0.7
3270	Rivers with muddy banks	0.03	<1	Favourable.	Non-intervention.		0.03
3260	Natural river reaches and river riffles	212.0	1.4	Poor.	Regular mowing of overgrown sites. Removal of beaver dams and fallen logs in small rivers. Restoration of riffle areas and salmonid spawning grounds. Mowing of aquatic macrophytes and removal of their rhizomes. Removal of beaver dams and fallen logs in Abava river.	6.0	
3150	Natural eutrophic lakes	14.00	<1	Favourable.	Non-intervention. Felling of shrubs and low-value trees in and around oxbow lakes (to avoid accumulation of litter and filling with organic matter). Creation of open littoral zones suitable for aquatic invertebrates (dragonflies, caddisflies, mayflies etc.) emerging to adults.	3.0	12.0
2180	Wooded dunes	1.42	<1	Poor.	No special requirements.		1.42

One-time grassland restoration measures are necessary in an area of at least 400 hectares. This area includes both EU protected grassland habitats which currently are in bad conservation status, and about 65 hectares of grasslands which were mapped as habitats of EU importance in early 2000s, but in nature management plan of 2016 were recognised as lost. In order to ensure long-term conservation of semi-natural grassland biodiversity, at least 500 more hectares must be restored; these grasslands are not identified in nature management plan of 2016. Restoration and management areas included in this plan are smaller than the real restoration necessities.
Annual grassland management measures are necessary in the entire area of EU protected grassland habitats, as well as in restored grassland areas. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Adamovas ezers | *Nature Park (LV0301600)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Rēzekne municipality, Verēmi rural territory.

AREA: 779 ha.

NATURE MANAGEMENT PLAN: developed in 2003 (2003–2008).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Adamovas ezers Nature Park was established for the conservation of landscape of Lake Adamova which is also the main nature asset of the territory. The lake is an important foraging site for several rare bat species, including *Myotis dasycneme*. Near the lake, there is the old Adamova manor, the manor park and the alley with old trees which also are important habitats for bats. Also three protected forest habitat types (in small areas) can be found at the lake.

Vegetation of Lake Adamova is well developed, and approximately 19% of the open lake area is overgrown. The whole 197.1 ha area of the lake corresponds to EU protected habitat type *Natural eutrophic lakes with* Magnopotamion *or* Hydrocharition - *type vegetation*.

Recreational territories with guest houses and bathing sites are located at the lake shores. Well-maintained recreation areas cover 8.3% of the total coastline length, insufficiently managed – only 0.9% of the total coastline length. Local residents and visitors use the lake for swimming, fishing, for recreational events, as well as for boat rides.

2. Threats to habitat and species conservation

- Lake Adamova can be adversely affected by multifold changes in the hydrological regime, which can promote the paludification of lake littoral part and higher runoff of nutrients to the lake. In 1926 - 1927 and in 1962 water level of the lake was lowered, but around 1972 it was raised by about 0.6 m. At the beginning of the 1980s, intensive drainage was carried out on lake coastal areas; four (4-5 m wide and 1.2-1.8 m deep) ditches were excavated which significantly increased the biogene input into the lake. Ditches are still functioning, promoting lake pollution and further degradation. This is evidenced by massive algal growth which occurs in Odumova, in Sondori and in Kapu Bay, in Mārku part of the Vacborisovas Bay, as well as on the east side of the Ozoli Island.
- Protected habitats are negatively influenced by municipal waste.
- Landscape quality is threatened by wrongly planned building construction, which may also affect the lake water quality.
- Jet skies are used in the lake, and their impact on habitats has not been adequately evaluated.
- One of the largest lake polluters since the early 1970s has been Adamova Residential School and wastewater of Sondoru Village. Since 1981, this waste water is partly treated by the Sondoru village biological wastewater treatment plant, however, the pollution of the lake with incompletely cleaned Sondoru village and Adamova residential school wastewater continues to some extent.

3. Existing management of the protected habitats and its assessment

Currently, four recreation areas are maintained in the territory. At the eastern part of the lake, in bathing areas which have been managed for a long time by mowing, habitat type protected in Latvia "*Open, wide lake beaches*" has developed in the area of 1.0 ha. Sites: southeast of the Sarkaņkolna bay, south of Zeļtenu river mouth, eastern side of Azargols, at Rūdžu Ezergals and at Āžraga river mouth.

4. Priorities of management and conservation

- Sufficient treatment of Sondoru Village wastewater.
- Regular reed mowing and removal. Most suitable places the east and south parts of the lake which are easily accessible from the coast and where the largest reedbeds are located.
- Continued management of lake beaches and their habitat types which are protected in Latvia.
- As far as possible, fragmentation of reedbeds and the creation of openings, with the aim of creating new open coastal parts with mineral bottom, which correspond to the protected habitat type of Latvia "*Open wide lake beaches*".

5. Necessary management and conservation measures

5.1. General measures

Update of the nature conservation plan, taking into account the latest guidelines for habitat mapping and guidelines for habitat management. Preparation of information and base for a well-designed functional zoning.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	185.87	23.9	Poor.	Reed mowing and removal from lake littoral part. Creation of openings in scenic sites (serving as wind corridors). Once per 5-10 years.	3.0 1.0	1.0
9020*	Broad-leaved deciduous forests	2.2	<1	Poor.	Non-intervention.		2.2
9080*	Fennoscandian deciduous swamp woods	0.82	<1	Poor.	Non-intervention.		0.82
9010*	Western Taïga	7.87	1.0	Bad.	Non-intervention.		7.87

Aiviekstes paliene | *Nature Park (LV0305100)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Madona municipality, Ļaudona, Prauliena and Mētriena rural territories.

AREA: 1155 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Aiviekstes paliene Nature Park includes Aiviekste river and its floodplains in a 21 km long section in the middle part of the river. Grasslands cover most of the area, woodlands are rare. There are nine EU protected habitat types, and nature park is among the first five Natura 2000 sites in the Latgale region regarding the protection of habitat types 6450 *Northern boreal alluvial meadows*, 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*, and 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis).

These habitats are important for protected plant species *Cnidium dubium*, *Gladiolus imbricatus*, *Iris sibirica*, butterfly *Lycaena dispar*, birds *Porzana porzana*, *Crex crex*, *Gallinago media*. The territory is an important stopover and concentration site for migratory birds such as *Cygnus cygnus, Cygnus columbianus, Mergellus albellus, Mergus merganser*. It is included in the list of Important bird areas in Europe. The nature park is an important concentration (foraging) site for bats and a corridor for *Lutra lutra* migration.

The area is very important for reducing the fragmentation of semi-natural grasslands in the North-eastern Geobotanical District. It is a significant part of the grassland species dispersal corridor, between Daugava River in the south and Pededze River in the north.

2. Threats to habitat and species conservation

- Changes in hydrological regime – both drainage and wetting (ditch clogging, ditch cleaning, drainage of adjoining areas, etc.).
- Decrease or cessation of spring floods in Aiviekste River.
- Wastewater pollution and runoff from agricultural lands; pollutants enter floodplain grassland habitats via flood waters.
- Lack of grassland management; grubbing up; too intensive management.
- Spread of invasive species *Echinocystis lobata*.

3. Existing management of the protected habitats and its assessment

- The current hydrological regime with regular spring flooding has developed after the Aiviekste dredging in 1938. In the 1990s grassland management was discontinued and most of grasslands in the nature park overgrew. Grassland restoration began in 2002 when more than 80 hectares of biologically valuable grasslands were restored in the framework of the EC LIFE project "Measures to Ensure the Nature Conservation Management of Teiči Area" (LIFE00NAT/LV/007127). Since 2004, several grasslands are managed according to requirements of "Maintaining biodiversity in grasslands".
- According to Rural Support Service information on Rural Development Programme measure "Maintaining biodiversity in grasslands" in 2014, habitat types 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* and 6230* *Species-rich Nardus grasslands* are not managed, and are at risk of overgrowth. Only 16 % of the total area of habitat type 6120* *Xeric sand calcareous grasslands* are managed. Habitat types 6510 *Lowland hay meadows*, 6450 *Northern boreal alluvial meadows*, 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* are in better condition – 60-70 % of their total area is managed. Mowing with grass shredding was widespread in the period from 2007 to 2015, and it contributed to eutrophication, spread of expansive species in grasslands, and decrease in biodiversity.

4. Priorities of management and conservation

- The preservation of flood regime is important for the conservation of grassland and aquatic habitats.
- Conservation and regular management of grassland habitats, including areas which are not protected habitats but whose condition can be improved by proper management.

- Limitation of anthropogenic pressure, including disturbances, in order to ensure suitable breeding and foraging conditions for bird species.

5. Necessary management and conservation measures

5.1. General measures

- Development of nature conservation plan which includes conservation measures for main nature values.
- Evaluation of the suitability of the existing hydrological regime for all types of grassland habitats, from the point of view of biodiversity conservation and improvement, and from the point of view of management options. Explain the necessary changes in hydrological regime and the possibilities for their realization.
- Evaluation of the possibilities for heavily overgrown grassland restoration, as grassland areas in the nature park should be increased significantly, and their biodiversity must be improved.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91F0	Riparian mixed forests	4.5	<1	Poor.	Non-intervention.		4.5
6510	Lowland hay meadows	31.5	2.7	Poor.	Restoration. Maintenance.	9.1	31.5
6120*	Xeric sand calcareous grasslands	4.9	<1	Bad.	Restoration. Maintenance.	4.1	4.9
6210	Semi-natural dry calcareous grasslands	7.2	<1	Bad.	Restoration. Maintenance.	7.2	7.2
6230*	Species-rich *Nardus* grasslands	3.8	<1	Bad.	Restoration. Maintenance.	3.8	3.8
6450	Northern boreal alluvial meadows	212.6	18.4	Poor.	Restoration. Maintenance.	52.4	212.6
6430	Hydrophilous tall herb fringe communities	8.7	<1	Favourable.	Non-intervention.	0.0	8.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	158.3	13.7	Poor.	Restoration. Maintenance.	52.2	158.3
6000	Grasslands to be restored	60.0	5.2	-	Restoration. Maintenance.	60.0	60.0
3260	Natural river reaches and river riffles	102.0	8.8	Poor.	Removal of large woody debris and beaver dams in Svētupe river.	On necessity.	

One-time restoration measures are necessary in at least 128 ha of grassland habitats. Restoration measures mainly include cutting of trees and shrubs, milling of roots, followed by mowing with grass/hay removal, or grazing. Rewetting or regulation of hydrological regime might be necessary. Reduction of soil fertility might be necessary in previously cultivated or ploughed grasslands.

Bauska | *Nature Park (LV0304100)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Bauska municipality Bauska town, Code and Mežotne rural territories; Rundāle municipality Rundāle rural territory.

AREA: 1079 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2019).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 827 of 06 October 2008, Regulation on Individual Protection and Use of Bauska Nature Park.

INCLUDES OTHER PROTECTED NATURE AREAS: Jumpravas dolomītu atsegumi Geological and Geomorphological Nature Monument.

Bauska Nature Park includes an unmodified confluence of Mēmele and Mūsa rivers becoming Lielupe river, as well as valuable rock outcrops, and cultural landscape and grasslands of Lielupe river valley. The territory is important as a refuge area for species characteristic to Zemgale Region, considering the historically large anthropogenic load and high fragmentation of natural habitats in this region. Although the majority of the territory is occupied by cultural landscapes and agricultural lands (managed at various intensity levels), there are eight EU protected habitats. The most important nature values are associated with coasts of Lielupe river, shore area, semi-natural grasslands in floodplains, fluvial terraces above floodplains, and slopes of ancient coast. This is also one of the few localities of calcareous rock outcrop habitats in Latvia.

There is one of the five localities of habitat type 6110* *Rupicolous calcareous or basophilic grasslands of the* Alysso-Sedion albi in Latvia. The territory is important as a part of united grassland aggregation site in Lielupe river floodplain. It forms a landscape-ecological species dispersal corridor on Zemgale and Coastal Geobotanical Districts. In Zemgale Geobotanical District, this is the most important protected nature territory for grassland conservation. Alluvial grasslands are important habitats for *Crex crex*.

In total, 71 rare and protected species of birds, invertebrates, amphibians and vascular plants have been found in the nature park. Rare ferns *Asplenium trichomanes* and *Asplenium ruta-muraria* grow on dolomite rocks. *Cotoneaster niger* and *Cotoneaster orientalis* grows in forest understorey. Rare *Allium* spp. species *Allium vineale* and *Allium schoenoprasum* grow in grasslands. *Triturus cristatus* lives in aquatic habitats; there are also spawning grounds for *Lampetra fluviatilis*. In total, 43 species of fish and lampreys can be found in Lielupe River.

There are nine bat species in the territory. *Myotis dasycneme* is particularly important. In Lielupe river there is a colony of *Chlidonias niger*. Rather rare species in Latvia, *Falco tinnunculus*, is breeding in Bauska Castle Ruins. Two *Osmoderma barnabita* populations have been found in nature park and in its direct vicinity.

2. Threats to habitat and species conservation

- Low water quality in rivers. Main threats causing water eutrophication and overgrowth with aquatic macrophytes are: non-point source pollution from agricultural lands, insufficiently treated wastewaters from residential areas. There is also a significant cross-border pollution.
- Increased habitat fragmentation; lack of species dispersal corridors.
- Semi-natural grasslands are threatened by management cessation, creation of lawns, as well as by grubbing up and building construction.
- In floodplains, semi-natural grasslands are threatened by eutrophication because there is an increased biogene concentration in Mūsa, Mēmele, Lielupe rivers (particularly nitrogen and phosphorus).

3. Existing management of the protected habitats and its assessment

- Since 1998, regular management of aquatic habitats for the improvement of fish resources is carried out in nature park. Measures include:

  - removal of aquatic macrophytes from riverbed,
  - creation of substrates and boulder constructions suitable for spawning.
- In 2004, experimental salmonid spawning grounds were created. In several suitable river reaches in an area of 6.5 hectares, *Vimba vimba* spawning sites were restored. In 2009 and 2013, fish spawning grounds were restored in an area of 2 hectares. In 2016, aquatic macrophytes were mown and their roots were eliminated in 2 hectares in an area directly adjoining the nature park. The restoration of spawning grounds contributes to the overall restoration of habitats of invertebrate species characteristic to river riffles, particularly the restoration of protected species habitats (*Ancylus fluviatile, Theodoxus fluviatilis*). Taking into account that rivers are open systems and receive nutrient-rich waters from the Mūsa and Mēmele rivers (their catchment basins include also the territory of Lithuania), management measures in Bauska Nature Park must be repeated regularly.
- According to Rural Support Service, in 2014 only 27-40 % of habitat types 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) management received the support. Only the habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* was managed in larger extent – 83 % of its total area received the support. The influence of management on grassland quality has not been evaluated.

4. Priorities of management and conservation

- Maintenance on Lielupe river riffles in an area of 6.5 hectares.
- Conservation of rock outcrops.
- Restoration of grassland habitats in maximum possible area and maintenance in favourable conservation status; maintenance of habitats suitable for *Crex crex*.

5. Necessary management and conservation measures

5.1. General measures

- According to the Lielupe river basin district management plan (2016-2021), in water objects "Mūsa" L176, "Lielupe" L143, and their drainage basins, winter green belts "stubble fields" must be maintained (vegetation cover in winter consists of perennial grasslands, perennial vegetables, crop stubble). Also 2 m wide vegetated buffer-zone must be maintained along the banks of watercourses and waterbodies, as well as along the drainage ditches. For the reduction of eutrophication, the efficiency of wastewater treatment plants must be improved, good agricultural practice must be implemented and buffer zones must be maintained.
- Establishment of micro-reserve at Ziedoņi farmstead for the protection of carbonate rock outcrop.
- Continuous co-operation and communication between the Nature Conservation Agency, Latvian Rural Advisory and Training Center, Rural Support Service, and owners/operators of grasslands which must be managed, in order to promote sustainable and knowledge-based grassland management and provision of ecosystem services.
- Development and implementation of semi-natural grassland restoration plan. Plan must include
  - Restoration of perennial grasslands and fallow-lands which currently do not correspond to criteria of EU protected grassland habitats;
  - Innovative solutions for grassland management and use in the territory of town (in area where traditional agriculture and grassland use are not expected);
  - Evaluation of possible grassland creation in their historical areas and in perennial grasslands and fallow-lands, in order to increase their landscape-ecological connectivity.
  - The restoration of currently remained grasslands is the priority.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	10.9	1.0	Poor.	Non-intervention.		10.9
8210	Calcareous rocky slopes	2.5	<1	Bad.	Jumpravmuiža: removal of *Syringa vulgaris* and *Lonicera* spp.; prevention of overgrowth with trees (but preserving the rare *Cotoneaster* spp.)		2.5
6110*	Rupicolous calcareous or basophilic grasslands	<0.5	<1	Poor.	Periodic and gradual felling of shrubs and trees.	<0.5	0.0
6510	Lowland hay meadows	60.5	5.6	Poor.	Restoration. Maintenance.	37.0	60.5
6430	Hydrophilous tall herb fringe communities	8.1	1.3	Poor.	Restoration. Maintenance.	8.1	8.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	11.7	1.1	Bad.	Restoration. Maintenance.	2.0	11.7
6210	Semi-natural dry calcareous grasslands	11.2	1.0	Poor, bad.	Restoration. Maintenance.	8.0	11.2
3260	Natural river reaches and river riffles	12.5	1.2	Poor.	Mowing of excessive aquatic macrophytes; removal of biomass for its composting. Removal of roots and re-opening of riverbed substrate. Annually. Cleaning of river riffles. Once per 5 years.	6.5	1 – 2

Semi-natural grasslands must be restored in the maximum possible area which is at least 39.3 ha (sites are specified in nature management plan of 2007) including historical grasslands which are overgrown with shrubs and new forests. Management measures include felling of trees and shrubs, milling of roots and stumps, restorative mowing and grazing, and reduction of eutrophication. Annual grassland management measures are necessary in the entire area of EU protected grassland habitats (91.5 ha), and will be necessary in restored grassland areas. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Beberbeķi | *Nature Park (LV0301800)*

1. Brief description

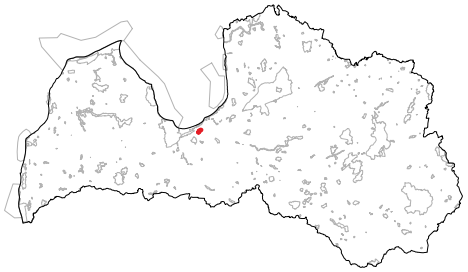
YEAR OF FOUNDATION: 1977.

LOCATION: Babīte municipality, Babīte rural territory.

AREA: 275 ha.

NATURE MANAGEMENT PLAN: 2002 (2003–2009).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 714 of 16 December 2012, Regulation on Individual Protection and Use of the Beberbeķi Nature Park.



Beberbeķi Nature Park is important for the recreation and education of residents of Rīga and its surroundings. At the same time, territory is important for the conservation of biologically valuable pine stands and peculiar dune terrain. Rare and protected plant species include *Dianthus arenarius* subsp. *arenarius, Lycopodium annotinum, Lycopodium clavatum*; protected bird species include *Dryocopus martius* and *Ficedula parva*.

2. Threats to habitat and species conservation

- The intense and growing influence of recreation, caused by vicinity of Rīga and by residential density of nearby areas.
- Eutrophication and overgrowth with invasive herbaceous and shrub species: *Impatiens glandulifera, Amelanchier spicata*, as well as native expansive shrub and broadleaved tree species.
- Pollution with municipal waste.
- Forestry activities that reduce the amount of dead wood and the proportion of mature, old or large-sized trees in the woodland.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Control and elimination of expansive and invasive species.
- Regular removal of municipal waste.
- Control of forestry activities by limiting the removal of biologically valuable trees.

5. Necessary management and conservation measures

5.1. General measures

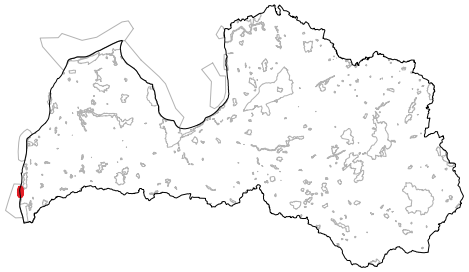
- Extension of nature park, to include adjacent biologically valuable woodlands.
- Development of a new Nature management plan.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	10.0	3.6	Bad.	Cutting of *Amelanchier spicata* (sites listed in the Nature management plan), every year or every few years (as necessary).		10.0
9080	Fennoscandian deciduous swamp woods	3.7	1.4	Poor.	Non-intervention.		3.7
2180	Wooded dunes	131.5	47.8	Bad.	Cutting of *Amelanchier spicata* (sites listed in the Nature management plan), every year or every few years (as necessary). Eutrophication reduction according to expert recommendations.		131.5

Bernāti | *Nature Park (LV0303600)*

1. Brief description



YEAR OF FOUNDATION: 1992 (Nature Reserve); Nature Park since 2003.

LOCATION: Nīca municipality Nīca rural territory.

AREA: 768 ha.

NATURE MANAGEMENT PLAN: 2015 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 273 of 08 April 2004, Regulation on Individual Protection and Use of the Bernāti Nature Park.

INCLUDES OTHER PROTECTED NATURE AREAS: Pūsēnkalns Geological and Geomorphological Nature Monument.

Bernāti Nature Park is important for the protection of a complex of coastal habitats, especially of wooded dunes. Nine EU protected habitats are found in the nature park, occupying 94 % of the area of the territory. The most important values are grey dunes, sandy beaches, white dunes, and a complex of dune ridges and humid dune slacks with stands of *Myrica gale*.

There are 13 rare and protected species of plants and mushrooms, three of them are EU protected species. *Linaria loeselii* is one of the most important species. In white dunes, *Lathyrus maritimus, Tragopogon heterospermus* can be found. *Alyssum gmelinii, Silene borysthenica, Corynephorus canescens* grow in grey dunes. Of rare invertebrate species, species associated with old forests and large woody debris should be noted: *Nothorhina punctata, Chalcophora mariana* and *Laphria gibbosa*. There are 69 bird species in the nature park, 12 of which are protected in the EU, and 14 in Latvia. Such species as *Columba oenas* and *Aegolius funereus* are particularly important.

2. Threats to habitat and species conservation

- Forest management with standard forestry methods promotes the growth of timber volume, but threatens the biodiversity conservation.
- Habitats of beaches, embryonic dunes and white dunes are threatened by trampling, excessive vehicle use, removal of dead wood, municipal waste.
- The area and quality of nutrient-poor habitats characteristic to sea coast is decreased due to removal of large-diameter snags and logs, overgrowth of open areas, illegal logging of individual trees, and humus accumulation.
- Area and quality of humid dune slacks and grey dunes and the areas of rare species habitats are decreased due to their overgrowth with trees.
- The breeding success of protected bird species is reduced due to disturbance caused by holidaymakers.
- The landscape quality is decreased due to excessive vehicle use on forest roads and trails, fireplaces outside the maintained areas, and waste left by holidaymakers.
- Area of protected habitats is decreasing due to fragmentation caused by management of land properties and by building construction.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in old forests which are only slightly affected by humans.
- Reduction, maintenance and structure improvement of grey dunes by overgrowth reduction.
- Improvement of the structural quality of wooded dunes; maintenance of open dune grasslands and forest gaps; creation of a vegetation mosaic.
- Removal of fast-growing trees and shrubs; conservation of hydrological regime that is characteristic to humid dune slacks.
- Provision of habitat structures necessary for protected invertebrate species.
- Reduction of the negative impact of recreation

5. Necessary management and conservation measures

5.1. General measures

For the protection of white dunes, grey dunes and embryonic dunes, it is necessary to establish an infrastructure for directing the visitor flow.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	129,8	16.9	Favourable.	Non-intervention. Improvement of insolation on individual trees.	 69.0	129.8
91D0*	Bog woodland	0.8	<1	Bad.	Non-intervention.		0.8
9080*	Fennoscandian deciduous swamp woods	37.8	4.9	Poor.	Non-intervention.		37.8
2190	Humid dune slacks	9.8	1.3	Bad.	Felling of fast-growing trees and shrubs.	9.8	
2180	Wooded dunes	645.5	84.0	Poor.	Non-intervention. Improvement of insolation on individual trees. Creation of structural elements. Re-naturalization of stand structure. Creation of stand mosaic.	 37.5 381.2 61.6 15.3	209.7
2130*	Grey dunes	19.2	2.5	Bad.	Thinning of fast-growing pines; pulling out the seedlings. Felling of *Pinus mugo*. Creation of bare sand patches.	19.1 3.7 0.7	
2120	White dunes	5.0	<1	Poor.	Evaluation of: excess vegetation (shrubs), coastal erosion, necessity of strengthening. Well-planned visitor infrastructure.	 4.1	4.1
2110	Embryonic dunes	4.1	<1	Favourable.	Non-intervention. Prohibition of organisation of major events at the beach. Well-planned visitor infrastructure.	 4.1	
1230	Sea cliffs	0.7	<1	Favourable.			0.7

Cārmaņa ezers | *Nature Park (LV0303100)*

1. Brief description

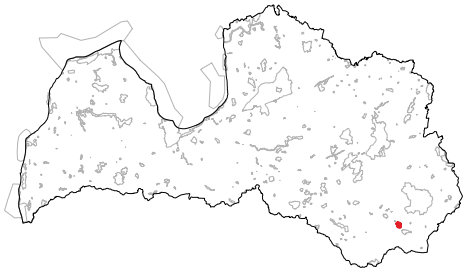
YEAR OF FOUNDATION: 2004.

LOCATION: Krāslava municipality Auleja rural territory, Aglona municipality Grāveri rural territory.

AREA: 529 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Lake Cārmaņa is visually impressive, bay-rich and scenically beautiful. It is located in Dagda Hillock of Latgale Upland, and occupies the most part of the nature park. The lake is exorheic, with bottom of gravel and sand, and it corresponds to EU protected habitat type. It is important for the protection of protected plant species *Hydrilla verticillata*. There are also other rare protected species – *Lobelia dortmanna, Isoëtes lacustris, Potamogeton rutilus*, and *Scolochloa festucacea*, as well as protected invertebrate species *Dytiscus latissimus*.

2. Threats to habitat and species conservation

- The eutrophication of lake is promoted by non-point source biogene pollution from the drainage basin. This causes decrease of water transparency and occasional excessive growth of algae, affecting the vitality of rare isoetids (Isoëtes and Lobelias).
- Water quality of the lake is influenced by increased building construction in the coastal zone as well as by recreational activities that are unsuitable for the territory and by unauthorized development of the tourism infrastructure.
- Changes in hydrology can adversely influence the preservation of habitats of the territory.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Ensuring long-term good ecological status to preserve the population of fish *Coregonus albula*, as well as protected plant species *Isoëtes lacustris, Hydrilla verticillata, Lobelia Dortmanna, Scolochloa festucacea*, and invertebrate *Dytiscus latissimus*.
- Undisturbed course of natural processes in lake, as well as in habitats of species that need undisturbed, natural environment.
- Restoration and management of grasslands.

5. Necessary management and conservation measures

5.1. General measures

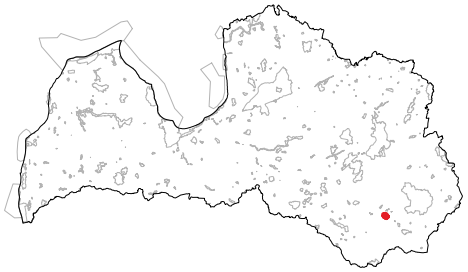
- Development of Nature management plan, including evaluation of the necessary infrastructure for the management of the flow of visitors. Further development of tourism infrastructure around the lake must be evaluated depending on the permissible recreational load in the particular part of the coast (counting two coastal meters per one holidaymaker).
- To facilitate the water exchange, the overgrowth with aquatic plants must be decreased in the bottleneck area in the southern part of the lake as well in place of its connection to Lake Nirka.
- Creating of open littoral zone on the eastern shore of Lake Cārmaņa in order to attract ducks.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	13.7	2.6	Poor.	Non-intervention.		13.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.1	<1	Bad.	Restoration. Maintenance.	1.1	1.1
3150	Natural eutrophic lakes	214	40.4	Poor.	Mowing of aquatic plants in the bottleneck areas of the lake in its southern part and in the place of its connection to Lake Nirka.	0.5–1.0	

Cirīša ezers | *Nature Park (LV0301500)*

1. Brief description



YEAR OF FOUNDATION: 1977.

LOCATION: Aglona municipality Aglona rural territory.

AREA: 1260 ha.

NATURE MANAGEMENT PLAN: 2002 (2003–2013).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 94 of 24 February 2012, Regulation on Individual Protection and Use of the Cirīša Ezers Nature Park.

Cirīša ezers Nature Park includes Cirītis lake with islands, and Lake Ruskuļu, as well as the forests, grasslands and transition mires around the lakes. Lake Ruskuļu is shallow and overgrown, with paludified surroundings. It has reached the final stage of the development, and 80-90% of its open surface is covered with aquatic macrophytes. According to the management plan of the Daugava river basin district, Lake Cirītis is classified as a lake in the group of medium-sized and medium-deep lakes, and its water quality is estimated as medium. There is a large diversity of habitats in the nature park area - there are seven EU protected habitat types. There are eight islands in Lake Cirītis which are rich in plant species that are especially valuable.

Although the grassland area is small (20 hectares), however, it is ecologically important as part of a distribution zone of semi-natural grasslands, extending from Dagda hillock in the direction from Sīvers and Dridzis Lakes to Rušona and Freimaņi lakes in Freimaņu hillock, and is obviously associated to this line of subglacial lakes.

In total there are 19 protected and rare plant species in the nature park. For example, *Liparis loeselii, Malaxis monophyllos* and *Betula humilis* grow in transition mires; *Pulmonaria angustifolia Dicranum viride* (EU protected moss species) grow in forests. *Hydrilla verticillata* is found in Lake Cirītis.

In Upursala, Island in Lake Cirītis, there is a historical castle mound called Upurkalns.

2. Threats to habitat and species conservation

- There is a significant load of biogene pollution from point and non-point sources – large volumes of wastewater from residential areas along the shores of lake.
- There is a large production of organic substances in Lake Cirītis and it is not fully consumed. Organic substances in the bottom of the lake form muddy sediments, resulting in a decrease in the depth of the lake. The impact of the catchment area on the lake ensures high productivity, and eutrophication takes place not only in littoral area but in the entire lake.
- Lake littoral part overgrows with emergent vegetation (*Phragmites australis, Schoenoplectus lacustris*), floating-leaf and submerged plants (*Nuphar lutea, Nymphaea* spp., *Potamogeton* spp.).
- Short-term high recreation loads (unauthorized camps of anglers and tourists) have a negative impact on the islands of the Cirītis lake (Upursala).
- Overgrowth of grasslands due to lack of management.
- Dam of Jaunaglona which is in a critical condition is a potential threat to the whole territory of nature reserve.

3. Existing management of the protected habitats and its assessment

- Previous management measures have been indirect and separate, such as reopening of littoral part, creation of bathing sites and free access to the lake. Such measures improve fish resources and bird breeding.
- According to Rural Support Service, in 2014 45 % of the grasslands were managed in the scope of Rural Development Programme measure „Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest, mire and freshwater habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Slowdown of eutrophication processes in Lake Cirītis, by promoting the removal of nutrients accumulated in organic sediment and aquatic plants from the lake.
- Grassland restoration and management.

5. Necessary management and conservation measures

5.1. General measures

- Improve the collection process of residential wastewater and rainwater before it enters Lake Cirītis. In Aglona, rainwater collection system is necessary.
- Connect households to wastewater collection systems or establish local biological treatment plants.
- Develop management plan for Lake Cirītis. Organize management of visitor flow by planning permitted recreational loads on the lake shores and lake islands, as well as use of watercraft.
- Demolish shacks of anglers and other unauthorized infrastructure.
- Management to slowdown eutrophication and ageing of Lake Ruskuļi– mowing of aquatic plants, sludge removal and establishment of infrastructure on their shores.
- Mapping of permanent grasslands, evaluation of the possibilities of creating EU protected grassland habitats in areas of perennial grasslands.
- Restoration of Jaunaglona Dam.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	5.7	<1	Favourable.	Non-intervention.		5.7
9080*	Fennoscandian deciduous swamp woods	5.5	<1	Poor.	Non-intervention.		5.5
9020*	Broad-leaved deciduous forests	16.6	1.3	Bad.	Non-intervention.		16.6
9010*	Western Taïga	4.3	<1	Bad.	Non-intervention.		4.3
7140	Transition mires and quaking bogs	24.6	1.9	Favourable.	Non-intervention.		24.6
6210	Semi-natural dry calcareous grasslands	3.1	<1	Bad.	Restoration. Maintenance.	3.1	3.1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	17.5	1.4	Poor.	Restoration. Maintenance.	8.6	17.5
3150	Natural eutrophic lakes	566.9	45.0	Poor, bad.	Ciriša Lake: mowing of aquatic plants; creation of corridors (including bathing sites). Once per 2-3 years.	10.0	

Daugavas ieleja | *Nature Park (LV0300100)*

1. Brief description

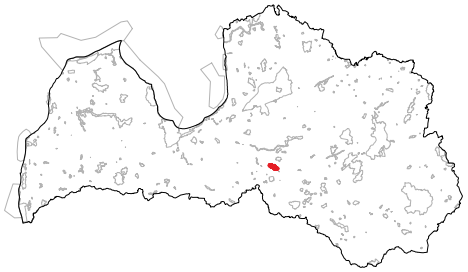
YEAR OF FOUNDATION: 1987.

LOCATION: Skrīveri municipality; Aizkraukle municipality Aizkraukle rural territory; Jaunjelgava municipality Sērene rural territory.

AREA: 1091 ha.

NATURE MANAGEMENT PLAN: 2014. gadā (2014–2026).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Daugavas Ieleja Nature Park was established for the protection of a characteristic section of Daugava river valley, which has remained almost unmodified after the construction of Pļaviņas Hydro Power Plant (HPP). It is located between Jaunjelgava and Aizkraukle towns, and it includes both shores of the river. The territory is long-influenced, and most of its habitats are developed or influenced by people. There is a large proportion of agricultural land – more than 75 %.

The main value of the nature park is the bank of ancient valley up to the inflow of Dīvaja river, and the steep slopes with broadleaved and slope forests. Large areas are occupied by botanically very valuable semi-natural dry grasslands on calcareous substrates and lowland hay meadows. Dolomite outcrops and spring discharges are located closer to Aizkraukle town.

The nature park is the most important territory in Latvia for the conservation of habitat type 6110* *Rupicolous calcareous or basophilic grasslands of the* Alysso-Sedion albi (more than 50 % of the total habitat area in protected nature areas), and it includes more than 5 % of habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) areas in protected territories. There are 11 habitats of EU importance.

The most valuable forests are located on slopes of Daugava ancient valley and on steep slopes of its small tributaries. Grassland habitats are distributed in a mosaic, mainly on terraces and on slopes. The territory is very important for the maintenance of Daugava river valley as a species distribution corridor.

The nature park is important as a habitat for rare species and as a foraging site for bats. In total, 39 protected plant species have been found, including 18 protected vascular plant species, such as *Circaea lutetiana, Helianthemum nummularium, Anemone sylvestris, Pulsatilla patens*, and others. There are 14 rare and protected invertebrate species (eight snail species), for example, *Osmoderma barnabita, Lasius fuliginosus*. The nature park is very important for the protection of dormouse *Glis glis*.

2. Threats to habitat and species conservation

- Building construction; expansion of residential areas in nature park and its direct vicinity.
- Pļaviņas HPP; unforeseen consequences of its operation.
- Inadequate or absent grassland management; intensification of agriculture; grubbing up of grasslands.
- Potential expansion of gravel quarries; more intense use of the existing quarries.
- Habitat type 6110* *Rupicolous calcareous or basophilic grasslands of the* Alysso-Sedion albi is threatened due to Daugava shore erosion and by trampling.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in 2014 grasslands were partly managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Part of perennial grasslands which are not defined as EU protected grassland habitats or bird habitats are managed.

4. Priorities of management and conservation

- Increase of grassland landscape-ecological connectivity by restoration of historical grasslands which are overgrown with expansive species, forest or shrubs, or grubbed up; development of semi-natural grasslands in abandoned fallow lands and perennial grasslands. At least 56 hectares of grasslands must be restored in order to conserve species diversity of grasslands.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Optimization of the borders of nature park: exclusion of the part of the territory around Kraukļakmens; inclusion of the area between Dīvaja and Daugava rivers (Annex 1 in nature management plan).
- Limitation of the spread of invasive and potentially invasive plant species; especially in the surrounding of Totēni Landfill (*Acer negundo, Solidago canadensis, Heracleum sosnowskyi*).
- Development of grassland restoration plan; evaluation of a possible increase of landscape-ecological connectivity by restoration of overgrown grasslands and by creation of EU protected grassland habitats in abandoned perennial grasslands and fallow-lands; evaluation of priorities; identification of possible funding.
- Evaluation of a possible expansion of Natura 2000 territory, and its merging with Daugava pie Kaibalas Nature Reserve. There are EU protected grassland habitats between these two territories. The isolation of both Natura 2000 territories will increase and the role of Daugava valley as ecological corridor will decrease in case if these grasslands will not be conserved.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	129.1	11.8	Favourable (outstanding).	Non-intervention.		129.1
8210	Calcareous rocky slopes	0.1	<1	Favourable.	Non-intervention.		0.1
7220*	Petrifying springs	0.2	<1	Favourable.	Non-intervention.		0.2
7160	Fennoscandian mineral-rich springs and springfens	0.2	<1	Favourable.	Non-intervention.		0.2
6510	Lowland hay meadows	9.2	<1	Favourable.	Restoration. Maintenance.	0.0	9.2
6430	Hydrophilous tall herb fringe communities	2.7	<1	Favourable.	Restoration. Maintenance.	0.0	2.7
6210	Semi-natural dry calcareous grasslands	25.1	2.3	Poor.	Restoration. Maintenance.	Up to 75.0	Up to 100

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6120*	Xeric sand calcareous grasslands	0.7	<1	Poor.	Restoration. Maintenance.	0.0	0.74
6110*	Rupicolous calcareous or basophilic grasslands	0.7	<1	Bad.	Restoration. Maintenance.	0.0	0.74
6000	Grasslands to be restored	56.0	4.6	-	Restoration. Maintenance.	56.0	56.0
3260	Natural river reaches and river riffles	207.7	19.0	Poor.	Daugava – non-intervention. Karikste river – removal of large woody debris. On necessity.	0.1	207.7

Detailed grassland management and restoration recommendations are described in nature management plan, 2014. However, plan does not provide recommendations for restorations of grasslands which have been EU protected grassland habitats but are overgrown during the last 20 years, and do not correspond to criteria of EU protected habitats (about 56 hectares). Their restoration must be evaluated during the development of grassland restoration programme, and they must be restored.
Annual grassland management measures for EU protected grassland habitats in an area of 43 hectares are provided in nature management plan. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Dolessala | *Nature Park (LV0301900)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Salaspils municipality.

AREA: 1055 ha.

NATURE MANAGEMENT PLAN: 2009 (2009–2019).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 735 of 27 September 2011, Regulation on Individual Protection and Use of Dolessala Nature Park.

INCLUDES OTHER PROTECTED NATURE AREAS: Dolesmuižas atsegums Geological and Geological Nature Monument.

Dolessala Nature Park includes a part of Dolessala Island which has remained after the establishment of Rīga hydro-electric power plant (HPP) reservoir. It is the largest island in Daugava River. Multi-layered and peculiar landscape has developed in result of long-term economic activities of people. There are dry pine (*Pinus sylvestris*) and deciduous woodlands in the central part of the island, and alluvial grasslands and fluvial terraces above floodplains are located on its edges. The values of the territory are the peculiar landscape of the island, its nature and cultural history. There has always been anthropogenic influence – due to buildings and the fact that this is a popular recreation area near Rīga City and Salaspils town.

The territory is relatively rich in nature values – there are 38 rare and protected species of plants, animals, invertebrates. Because of the easy access, the area has been studied for a long time. There are early reports on very rare plant species such as *Trifolium alpestre, Gagea erubescens, Arctium nemorosum*, and others. Several rare plant species were found also during the development of nature management plan – for example, *Pulsatilla patens, Corynephorus canescens, Saxifraga tridactylites, Dianthus arenarius* ssp. arenarius. The most studied invertebrates are beetles, for example, *Aromia moschata, Osmoderma barnabita*, and other rare species. Aquatic habitats surrounding Dolessala Island are important foraging and living sites for several bird species, and it is also an important wintering site for mute swan *Cygnus olor*. In 2008, a micro-reserve for the protection of *Bubo bubo* was established. *Dendrocopus medius* is breeding in old trees of Doles Manor. Of the protected habitats, dolomite outcrop is of particular importance. Such outcrops were characteristic for Daugava River previously, but now are very rare in Latvia, after the establishment of several Hydro Power Plants (HPPs) on Daugava River and flooding of river banks. The outcrop overgrows with trees and shrubs due to lack of disturbances caused by ice movement which were characteristic before the construction of HPPs. The area of grassland habitats of EU importance is not large, but they are significant as habitats for rare plant and animal species and for the provision of species distribution corridor in lower reaches of Daugava River.

2. Threats to habitat and species conservation

- Protected habitats and species may be adversely affected by changes in the hydrological regime caused by the operation of the Rīga HPP.
- Inappropriate grassland management; lack of grassland management.
- Quality of woodland habitats and habitats available for invertebrates are deteriorated due to illegal felling of growing and dead trees and removal of dead wood.
- Eutrophication of forests and their overgrowth with invasive plant species. In some areas, there is a dense understory of *Amelanchier spicata*.
- Expansion of residential areas; influence of recreation.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Restriction of spread of invasive plant species *Amelanchier spicata* and *Heracleum sosnowskyi*; reduction of their occupied areas.
- Restoration and maintenance of grassland habitats.

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of dolomite outcrop in optimal condition.

5. Necessary management and conservation measures

5.1. General measures

Development of grassland restoration and management plan, including the evaluation of the potential of agricultural lands for their development to grasslands of EU importance. Currently, the information on the distribution of semi-natural grasslands in the nature reserve is contradictory. In nature data management system of Nature Conservation Agency, in year 2007 information was supplied on four EU protected grassland habitat types in an area of 13 hectares. In nature management plan of 2009, only one EU protected grassland habitat type was mentioned (6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels*), but information of the previously identified habitats of EU importance (6450, 6510 and 6120*) was absent.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	19.2	1.8	Bad.	Restriction of spread of *Amelanchier spicata*; reduction of their occupied area, also outside the area of protected habitat.	19.2	
2180	Wooded dunes	285.8	27.1	Bad.	Restriction of invasive species.	285.8	
8210*	Calcareous rocky slopes	0.4	<1	Poor.	Removal of excessive vegetation from the dolomite outcrop.	0.1	
6430	Hydrophilous tall herb fringe communities	3.1	<1	Poor.	Restoration. Maintenance. Restriction of spread of *Heracleum sosnowskyi*.	0.0	 3.1 3.1
6120*	Xeric sand calcareous grasslands	2.9	<1	Bad.	Restoration. Maintenance.	2.9	 2.9
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	5.9	<1	Bad.	Restoration. Maintenance.	5.9	 5.9
6450	Northern boreal alluvial meadows	5.4	<1	Bad.	Restoration. Maintenance.	5.4	 5.4

Dridža ezers | *Nature Park (LV0300900)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Krāslava municipality, Krāslava, Kombuļi and Skaista rural territories.

AREA: 2627 ha.

NATURE MANAGEMENT PLAN: 2008 (2009–2019).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Dridža ezers Nature Park is located in a hilly landscape characteristic to the southern part of Latgale Upland. There are several archaeological monuments in the surrounding areas. The most important value of the nature park is Lake Dridzis which is the deepest lake in Baltic countries, as well as seven other naturally eutrophic lakes (Dubiņa, Sauleskalna, Solnas, Saules, Mazā Āžukņa and Nameņa lakes), located in its surroundings. The total area of the lakes is 938 ha – 36.8% of the area of the nature park. Dridzis is a public lake. According to the management plan of Daugava river drainage basin, the ecological water quality of Lake Dridzis is evaluated as good.

So far, only 2.5 hectares of EU protected grassland habitats are known in the nature park. However, the total proportion of perennial grasslands and old fallow-lands (potential semi-natural grasslands) is substantial. From landscape-ecological point of view, this territory is a part of species dispersal corridor which is important in Eastern Europe. It consists of a series of uplands located in the north-south-west direction – Otepää and Haanja Uplands in Estonia, Latgale and Augšzeme Uplands in Latvia, Aukštaitija, Dzūkija and Sūduva Uplands in Lithuania, Suwałki Upland in Poland.

There are 55 protected and rare species. In the lakes, protected plant species such as *Hydrilla verticillata, Littorella uniflora, Myriophyllum alterniflorum, Subularia aquatica, Scolochloa festucacea* can be found. There are rare fish species - *Cobitis taenia, Coregonus albula,* and *Cottus gobio*. Lakes are important foraging places for bats, with seven bat species found. The diversity of water birds in lakes is not high, the most important values of bird fauna is associated with woodlands. The territory is an important habitat and foraging site for *Haliaeetus albicilla, Aquila pomarina, Falco tinnunculus, Dendrocopos leucotos, Crex crex*. Warted spindle tree *Euonymus verrucosus* grows in forests.

2. Threats to habitat and species conservation

- The existence of the protected habitats may be adversely affected by changes in the hydrological regime. Lakes of the nature park, especially the largest of them, Dridzis and Ots, are adversely affected by the ill-advised construction of channel connecting these two lakes. The channel was created in 1920s. Also the establishment of unreasonable hydrotechnical structures and new connecting channels or ditches as well as deepening of existing drainage watercourses is possible in the future. This may result in water level changes in lakes, which would lead to degradation of sand-bottom habitats in the littoral zone and the disappearance of protected plant species *Littorella uniflora*.
- Promotion of shore erosion in vulnerable slopes in the surrounding areas of Dubiņa, Sauleskalna, Solna, and Saules lakes.
- Existing tourism load (annually 23,000 tourists visit Sauleskalns sports and leisure complex).
- Intense building construction on the lake coast. There are 16 existing and six planned construction objects in the protective belt of Lake Dridzis.
- Pollution from household wastewater from guest houses in the coastal zone.
- Thinning of the trees on the lake shore as well as clear-felling can cause erosion on the very sensitive hill slopes and on the shores of Lake Dridzis subglacial valley, in the eastern and western part of the nature park.
- Eutrophication is increased due to agricultural drainage water flowing into the lake.
- Semi-natural grasslands are threatened by management cessation which causes overgrowth with trees and shrubs, as well as grubbing up and change of land-use type.
- The fragmentation of grassland habitats in a wider region can be increased by overgrowth, grubbing up and building construction in perennial grasslands and fallow-lands which decreases the possibility to increase the area of EU protected grasslands in the nature park.
- Bats are threatened by the rebuilding and repair of summer residences during the time when bat mothers and their pups stay here.

3. Existing management of the protected habitats and its assessment

- Mowing and removal of emergent macrophytes, mainly *Phragmites australis*, in littoral zone has been carried out at some guest houses and farmsteads, with an aim to create bathing sites and boat docks. Mowing was organised by local landowners. This activity is assessed as positive as the formation of continuous monodominant reed beds is reduced, and the preservation and recovery of the biodiversity of littoral zone is promoted.
- In 2016, operation rules for fishery were developed for Lake Dridzis. The rules provide recommendations for the release of juvenile fish into the lake.

4. Priorities of management and conservation

- Provision of hydrochemical and hydrobiological parameters corresponding to good ecological quality in Lake Dridzis.
- Preservation of lake coastal ecosystems in the nature park, ensuring the protection of the landscape and the protected freshwater habitat, as well as favourable living environment for protected species of birds, invertebrates, mammals and fish living in lakes.
- Implementation of measures for the prevention of biogene input into the lake would prevent the deterioration of the quality of protected freshwater habitats.
- Restoration and creation of grassland habitats of EU importance in the area of at least 300 hectares, in sites of overgrown semi-natural grasslands, perennial grasslands and fallow-lands (the total area of agricultural lands is approximately 950 ha, out of which up to 60% are perennial grasslands and fallow-land), in order to ensure the landscape-ecological corridor for species of semi-natural grasslands, to preserve and increase value of landscape and to decrease the influence of eutrophication on lakes (because there is no significant runoff from the properly managed semi-natural grasslands, unlike fertilized grasslands and agricultural land).

5. Necessary management and conservation measures

5.1. General measures

- Extension of the area on nature park "Dridža ezers" by including a territory of 746 hectares with Lake Ārdava and its surrounding areas, in accordance to expert opinion (*Suško U. 2013. Ārdava ezera un tā apkārtējās teritorijas dabas vērtību raksturojums saistībā ar smalkās najādas Najas tenuissima populācijas saglabāšanu tagad un nākotnē. Atzinums. Rīga*).
- Development of Individual regulations on protection and use which should limit the building construction on lake shores, as well as building construction which does not ensure the collection of municipal wastewater and rainwater. Prohibition of the emission of untreated sewage and sewage sludge into surface water or into the environment, as well as into the rainwater drainage system.
- Measures to prevent biogene input into lakes. Establishment of sewage storage tanks in guest houses and recreation complexes in accordance with the Daugava River Basin Management Plan.
- Maintenance of well-equipped bathing areas – provision of container-based toilets, dressing sites and waste containers; loosening of upper layer of sand in bathing sites; timely removal of waste; easy access to water.
- Reduction or prevention of nitrate pollution caused by agricultural activities in accordance with the requirements of regulatory enactments.
- Minimal necessary vegetation in the autumn and winter period must be ensured – at least 50% of the total agricultural land (in the particularly sensitive area).
- Development of grassland restoration and management plan. In the Nature management plan of 2009, a reasoned assessment of the minimal natural grassland area for their long-term conservation is not provided. The high level of fragmentation indicates that the current area can not ensure a favorable conservation status for grassland habitats in the long run. To increase the landscape-ecological connectivity of grasslands, the establishment of grasslands in their historical area must be assessed, and also instead of cultivated grasslands and fallow-lands.
- Investigation of the hydrology and the system of existing channels of Dridzis and Sīvers lakes, as well as evaluation of the potential impacts of establishment of new channel systems.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	2.3	<1	Bad.	Restoration. Maintenance.	2.3	2.3
6210	Semi-natural dry calcareous grasslands	0.3	<1	Bad.	Restoration. Maintenance.	0.3	0.3
6000	Grasslands to be restored	300.0	11.4	-	Restoration. Maintenance.	300.0	300.0
3150	Natural eutrophic lakes	141.8	5.4	Poor.	Mowing of macrophytes and removal of their roots in places of increased sedimentation as well as in sandy littoral zone, which overgrow increasingly. Creation of corridors free of macrophytes perpendicularly to the shore, to ensure the water exchange between the shallow and deep-water zones. Improvement of lake functionality (aeration, waves) by macrophyte mowing in the coastal areas facing the prevailing winds. Creation of wind corridors by felling shrubs and creating small openings on the lakeshore, for the improvement of aeration.	2.0 2.0 1.0 2.0	
3130	*Lobelia-Isoetes* lakes	753.2	28.7	Poor.	Mowing of emergent vegetation; creation of open mineral-bottom areas in the littoral zone, as well as creation of belts of semi-natural grasslands and sandbanks in areas directly adjoining the coastline. Exceptions: particularly sensitive hill slopes, shores of subglacial valley and coastal areas affected by erosion. Mowing of reeds and *Potamogeton* spp. for the maintenance of *Littorella uniflora* locality in sites specified in the Nature management plan. Mowing of littoral macrophytes and removal of their roots in areas of increased accumulation of organic debris as well as in sandy littoral zone, which overgrow increasingly. Creation of corridors free of macrophytes perpendicularly to the shore, to ensure the water exchange between the shallow and deep-water zones.	2.0 0.5 4.0	

Driksnas sils | *Nature Park (LV0303700)*

1. Brief description

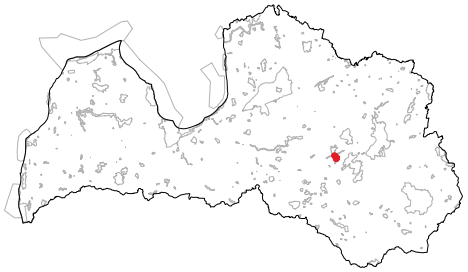
YEAR OF FOUNDATION: 1990.

LOCATION: Madona municipality Ļaudona rural territory.

AREA: 676 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2014), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 687 of 09 October 2007, Regulation on Individual Protection and Use of Driksnas Sils Nature Park.



Driksnas sils Nature Park is located in the middle part of Madona-Trepe ice-marginal ridge, at the Aiviekste river, in a wooded area near Teiči Mire. Three shallow and muddy lakes are located in the territory: Driksnis (37.6 ha), Pārkārtnis (1.6 ha) and Raudītis (0.3 ha). Sāvienas pilskalns Archaeological Monument ("Sāviena castle mound") corresponds to the criteria of protected woodland habitat.

Woodlands cover the most part of the territory (90.12 %). Before the establishment of nature park, forests were rather intensively managed, therefore there is a lack of old-growth woodlands; structures characteristic to biodiverse forests (large trees, dead wood, snags, etc.) are found in low volumes. The territory is particularly important for the protection of dry pine forests on eskers (9060 *Coniferous forests on, or connected to, glaciofluvial eskers*).

In total, 34 rare and protected species have been found in the nature park: 16 species of vascular plants, three moss, two lichen, six invertebrate, and seven bat species. Protected plant species can be found in esker-characteristic plant communities – *Pulsatilla patens, Gypsophila fastigiata, Arenaria procera, Dracocephalum ruyschiana, Pulmonaria angustifolia, Dianthus arenarius*. An abundant locality of *Thesium ebracteatum* is found in the nature park; this is one of the six known localities of this protected plant species in Latvia. At the lakes, protected invertebrate species *Leucorrhinia albifrons, Cordulegaster annulata, Pedicia rivosa* and others have been found.

2. Threats to habitat and species conservation

- Habitats of light-loving herbaceous species are threatened by development of spruce (*Picea abies*) advance growth in dry pine (*Pinus sylvestris*) forests.
- Volumes of dead wood and proportion of mature, biologically-old or large-dimension trees in woodlands have decreased due to forestry activities.
- Lake water level lowering and elevations in Driksnītis lake due to management of fish pond.

3. Existing management of the protected habitats and its assessment

- Management measures according to the nature management plan (the first step according to the management plan) were carried out in 2006: felling of spruces in advance growth and subcanopy at Sāviena castle mound and at Ļaudona-Beļava motorway. Felling residues were gathered in piles, and it was planned to burn them the next winter. In spring 2007, unplanned burning occurred, causing groundfloor fire in Sāviena castle mound. As a result, insolation conditions were improved, and habitat-characteristic vascular plant species can be found.
- In landscape-protection zone of the nature park, removal of trees damaged by snow-breaks in winter 2010/2011 and storms of August 2010 (mainly pines with broken tops and uprooted spruces) was carried out. All trees were removed in two small clear-fellings (area of continuous wind-throws). Felling residues were left on forest management roads or dispersed on site. Large-scale natural disturbances and felling that followed resulted in improved insolation conditions in woodlands, therefore management specified in Nature management plan (the second step) was not continued. The influence of implemented felling techniques on the condition of light-lowing species has not been evaluated.
- In two sites, management of habitat type 9060 was carried out – felling of undesirable trees. The work was organised in accordance to expert recommendations and after the forest monitoring in transects.
- At Driksna lake, visitor infrastructure was constructed in two bathing sites (sheds, information board, fireplaces, footbridges, toilets) which must be maintained, repaired or restored.

4. Priorities of management and conservation

- Improvement of insolation and decrease of groundfloor layer thickness in dry pine forests for the conservation of light-loving species *Pulsatilla patens, Arenaria procera, Thesium ebracteatum, Gypsophila fastigiata, Dracocephalum ruyschiana, Pulmonaria angustifolia*.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of optimal hydrological regime in Driksnas lake and its adjacent small mire. Lowering of lake water level for the management of fish pond during the fish spawning and low-water periods in summertime can not be allowed.
- Provision of suitable conditions for rare and protected aquatic species; prevention of their shading and overgrowth by emergent vegetation.

5. Necessary management and conservation measures

5.1. General measures

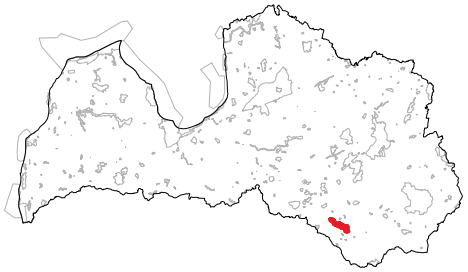
- Mapping of habitats.
- Evaluation of influence of selective felling on condition of protected habitats.
- Monitoring of areas of selective felling in order to evaluate the influence on conservation of light-lowing species.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	56.6	8.4	Poor.	Non-intervention.		56.6
9060	Coniferous esker forests	121.7	18.0	Favourable. Poor.	Reduction of groundcover thickness (prescribed burning).	35.0	
9010*	Western Taïga	5.8	<1	Poor.	Non-intervention.		5.8
7140	Transition mires and quaking bogs	9.0	<1	Bad.	Non-intervention.		9.0
7110*	Active raised bogs	0.7	<1	Bad.	Non-intervention.		0.7
3150	Natural eutrophic lakes	42.3	6.3	Poor.	Driksnītis lake. Mowing of littoral emergent vegetation; extension of open littoral areas with mineral-ground at the footbridge and in other places. Mowing of aquatic vegetation in the bottleneck area along the island, to ensure water exchange. Pakārtnītis lake. Removal of logs fallen into lake. Raudītis lake. Non-intervention.	0.2 0.1	0,1 0,5

Dvietes paliene | *Nature Park (LV0302900)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Ilūkste municipality Bebrene, Dviete, Pilskalne rural territories; Jēkabpils municipality Rubene rural territory.

AREA: 4989 ha.

NATURE MANAGEMENT PLAN: 2005 (2006–2015), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 274 of 24 April 2007, Regulation on Individual Protection and Use of Dviete Nature Park.

Dvietes paliene Nature Park is located in the ancient valley of river Dviete. It includes Dviete and Ilūkste rivers at their inflow in river Daugava, grasslands in their floodplains, and lakes Skuķu and Dvietes with surrounding territories. This is the most extensive floodplain along the river Daugava, and one of the largest territories of alluvial grasslands in Latvia. It is a benchmark-territory as a functioning floodplain and almost unaffected, semi-natural grasslands at a national and possibly also at EU level.

The nature park is very important for the protection of regularly flooded alluvial grasslands. The territory is one of most biodiverse and richest bird breeding and gathering areas in Latvia. This is one of the best breeding sites for *Porzana porzana, Crex crex*, and *Gallinago media* in Latvia, as well as a gathering site for migratory water birds in springtime. Every year, several thousands of ducks and goose are staging here.

Six protected habitats of EU importance have been found here, as well as more than 40 bird species protected in Latvia and EU, eight protected plant, eight invertebrate, two amphibian, two mammal species. The most important protected species in the territory are birds *Gallinago media, Crex crex, Circus pygargus, Porzana parva, Sterna albifrons, Chlidonias niger, invertebrate Osmoderma barnabita,* plants *Gladiolus imbricatus, Cnidium dubium, Iris sibirica, Viola persicifolia,* and others.

At a national scale, the territory is important for the protection of the great snipe *Gallinago media* and grassland-breeding waders. It is the most important territory in Latvia for the conservation of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* and the second most important for 6450 *Northern boreal alluvial meadows* (12 % and 16 % of the total area of habitat in Natura 2000 territories). It is important as a compact area of grasslands with high landscape-ecological connectivity (its Median of Proximity index is the fourth best of Natura 2000 territories in river valleys) and also as a territory which ensures landscape-ecological connectivity of grasslands in south-eastern Latvia.

2. Threats to habitat and species conservation

- The area size of lakes and their open littoral zones decreases due to overgrowth of lakes. Consequently, suitability of the territory for migratory and breeding birds and also aquatic organisms is decreasing.
- Areas of grasslands and their species' habitats (including nesting areas for birds) are decreasing due to overgrowth, grubbing up and unsuitable management (overgrazing on some sites and insufficient in other ones, typical for "natural grazing").
- High risk of repeated grassland abandonment due to difficult nature conditions (long and unpredictable flooding, wet soils) and socio-economic conditions (small land properties, many landowners, shared responsibilities of operators and owners, rural support inadequate for nature conditions).

3. Existing management of the protected habitats and its assessment

- The management of Dviete Floodplain includes the use of meadows in agriculture, as well as the previous drainage of rivers and lakes. Due to frequent flooding of Daugava, until the middle of the 20th century the floodplain was used mainly for haymaking and pasturing. The hydrological regime of Dviete river is determined by the Daugava river; the water level in Dviete downstream can rise more than 6 m when water from Daugava flows into Dviete during floods. In 20th century, Dviete floodplain was repeatedly drained, river channel was straightened. In 1930s, water level was lowered in Lakes Dvietes and Skuķu,

causing their rapid overgrowth with shrubs and reeds. Later, part of grasslands were not managed and overgrew with trees and shrubs, others were grubbed up and used for crop cultivation. At the end of 20th century, a large part of the Dviete floodplain was no longer managed.

- In 2003, grassland restoration measures were started – shrubs were felled in small areas. In 2004, LIFE programme project "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198) was started; grasslands were restored in an area of more than 160 hectares.
- One more LIFE programme project "Restoration of Corncrake habitats in Dviete floodplain Natura 2000 site" (LIFE09 NAT/LV/000237) was implemented from 2010 to 2015. During this project, another 113 hectares of grasslands were restored. Measures included rewetting (re-meandering of a small section of Dviete river), shrub felling, root shredding, mowing and establishment of pastures. Now, large majority of grasslands are managed as year-round pastures with semi-feral grazing animals. Project included the re-meandering of Dviete river and its visual naturalization. The changes of aquatic species composition before and after the re-meandering have not been studied and can not be assessed.
- According to Rural Support Service, in 2014 80 % of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". The nature park is one of the few Natura 2000 areas where grasslands have been restored and are managed in such a large area. However, the existing management can not be considered as fully suitable for long-term conservation of all grasslands and species of this territory. Some parts of the territory are still overgrowing. In other parts, plant and animal species populations potentially can be adversely affected by the current management as the management success is not being monitored, and grazing pressure is not regulated. Regulation of grazing pressure is necessary in order to ensure the optimal condition for conservation of habitats and species.

4. Priorities of management and conservation

- The amount and diversity of grassland habitats and species is very high, therefore the priorities in the territory are both the conservation of habitats and rare and protected species, and their maintenance in favourable conservation status.
- The increase of landscape-ecological connectivity of grasslands of the nature park by restoration of all historical areas of grasslands.

5. Necessary management and conservation measures

5.1. General measures

- Monitoring of the most important protected plant and bird species of the nature park, in order to adjust management measures for the conservation of these species.
- Development of framework of financial support, adjusted for the nature and socio-economical conditions of the nature park, supported by state or by EC (for example, measures of Rural Development Programme), for the conservation of EU protected habitats and protected species.
- Mapping of potential restoration territories; evaluation of their restoration potential.
- For the optimal protection of grassland-breeding waders, it is recommended to improve or completely restore the hydrological regime by elimination of drainage ditches. However, this recommendation needs to be considered together with management options.
- Monitoring of the restoration success in the re-meandered section of Dviete river: re-colonization of aquatic organisms; hydrological regime in adjoining floodplains; birds.
- Development and implementation of a project for restoration and for eutrophication slowdown in Lakes Skuķu and Dvietes.
- Adjustments of the nature park borders. Inclusion of Ilūkste river floodplain between Doļnaja-Kazimirišķi Road and Ilūkste Town.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	16.93	⟨1	Poor.	Restoration. Maintenance.	Up to 16.9	16.9
6450	Northern boreal alluvial meadows	1582.7	31.7	Poor.	Restoration. Maintenance.	Unknown.	1582.7
6430	Hydrophilous tall herb fringe communities	Not known.		Poor.	Restoration. Maintenance.	Unknown.	483.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	483.7	9.7	Poor.	Restoration. Maintenance.	Unknown.	
3260	Natural river reaches and river riffles	24.0	⟨1	Poor.	Mowing of aquatic macrophytes if the overgrowth exceeds 30 % of the river surface. Mowing of aquatic macrophytes in mouth of river Dviete, before its inflow in Lake Skuķu (once per 2-3 years).	0.2	
3150	Natural eutrophic lakes	22.7	⟨1	Bad.	Thinning of dense belts of emergent vegetation by creation or extension of open littoral belts and zones (suitable for ducks, waders, fish spawning, juvenile fish). Once per year, changing the mown sites.		0.2

One-time grassland restoration measures are necessary but the total area is unknown because data in nature management plan are outdated (two large-scale LIFE projects have been implemented in the territory after the development of nature management plan; also land use changes have occurred, such as repeated abandonment and grubbing up). Grassland management measures include: felling of trees and shrubs, milling of roots, restorative mowing and grazing, as well as adjustment of hydrological regime in order to facilitate grassland management also after the wetting of territory.
Annual grassland management measures are necessary in an area of at least 2083 hectares. For restoration methods and management specific for habitats and grassland bird species, please see Rūsiņa (ed.) 2017.

Embūte | *Nature Park (LV0301200)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Vaiņode municipality, Embūte rural territory.

AREA: 481 ha.

NATURE MANAGEMENT PLAN: developed in 2007, valid until 2017.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 448 of 19 May 2009, Regulation on Individual Protection and Use of Embūte Nature Park.

INCLUDES OTHER PROTECTED NATURE AREAS: Embūtes gravas Geomorphological and Geomorphological Nature monument.

Embūte Nature Park is located in the highest part of Rietumkursa Upland. It includes outstanding forests on slopes with springs (in southern direction, they are found also outside the nature park), Lanka and Kuiļupe rivers with side-ravines and alluvial grasslands, as well as archaeological sites. Seven EU protected habitat types have been found in the nature park, there are three micro-reserves for the protection of woodland habitats, as well as 26 rare and protected species of plants, animals and invertebrates. Protected plant species include *Hordelymus europaeus* (only two localities in Latvia), *Trifolium dubium, Pimpinella major, Corydalis intermedia*, and others.

The territory is important for several rare bat species, for *Lutra lutra*, as well as for protected bird species such as *Ciconia nigra, Dendrocopus leucotos, Aquila pomarina, Crex crex*. Biologically-old trees and logs are habitats for rare beetles – *Liocola marmorata* and *Dorcus parallelopipedus*. European tree frog *Hyla arborea* has been successfully reintroduced in the territory.

The nature park is located in a region where natural grasslands are highly fragmented, therefore their conservation is important for preserving the biodiversity of the region and the nature park (in the Kurzeme region this is the third most important territory for the conservation of habitat type 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis).

2. Threats to habitat and species conservation

- Increase in number of visitors – uncontrolled movement, establishment of network of trails, vegetation trampling.
- Abandonment and overgrowth of grasslands, increased fragmentation, paludification due to activities of beavers (*Castor fiber*) and overgrowth of ditches.
- Forestry activities, particularly removal of dead wood and felling of biologically-old trees.
- Fragmentation of broadleaved forests is increased and the condition of their associated species is deteriorated due to plantation of spruces in areas of former broadleaved woodlands, including on slopes.
- Diversity of aquatic organisms, particularly of protected dragonflies, in small-scale fish ponds is decreasing due to discontinuation of their management which cause disappearance of open surface, overgrowth with emergent vegetation, trees and shrubs, as well as decrease of their volumes due to filling with sediments, decayed plants and leaf and twig litter.
- Beavers (*Castor fiber*) create dams and promote paludification in areas near shores.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage mire, aquatic and woodland habitats.
- According to Rural Support Service, in 2014 64 % of 6510 *Lowland hay meadows* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Other grasslands were not managed.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of fragmentation of broadleaved forests by increasing the proportion of broadleaved trees in spruce plantations.

- Reduction of semi-natural grassland fragmentation; restoration and regular management.
- Cleaning of former ponds and increasing their open water surface areas. Restoration of fully shaded ditches for the increase of biodiversity of aquatic organisms.
- Maintenance of free water flow by removal of beaver dams, in order to avoid the increase of paludification of areas near shores.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps.
- Development of grassland restoration and management plan. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered (especially in Lanka river valley and adjoining territory). Restoration of grasslands which were assessed as EU protected habitats in early 2000s but currently are overgrown and do not correspond to criteria of EU protected habitats is the priority. The necessity of rewetting in Lanka floodplain for the restoration and management of grassland habitats must be evaluated.
- Evaluation of the grasslands next to the nature reserve, their role in the conservation of biodiversity, and their potential incorporation in Natura 2000 territory (in particular, at farmsteads "Druvas" and "Avotiņi").
- Cleaning of Pils and Cepļupe Ponds by mowing emergent vegetation and removal of accumulated sediments.
- In former fish ponds – in cases when waterbody is completely shaded by shrubs, their felling at the coast is permissible, in order to improve habitats for *Leucorrhinia caudalis* and *Leucorrhinia pectoralis*.

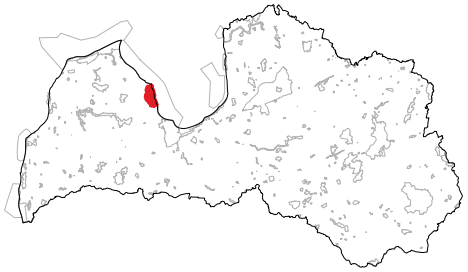
5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180	Slope forests	193.7	40.3	Favourable.	Non-intervention.		193.7
9000	Potential Protected woodland habitat (9020 and 9180)	26.1	5.4	-	Development of spruce plantations into mixed forests by promotion of proportion of broadleaf trees.	26.1	
7220*	Petrifying springs	0.03	<1	Favourable.	Non-intervention.		0.03
7160	Fennoscandian mineral-rich springs and springfens	0.7	<1	Favourable.	Non-intervention.		0.7
6510	Lowland hay meadows	8.2	1.7	Poor.	Restoration. Maintenance.	3.0	8.2
6450	Northern boreal alluvial meadows	33.6	7.0	Bad.	Restoration. Maintenance.	33.6	33.6
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	6.0	1.2	Bad.	Restoration. Maintenance.	6.0	6.0
6000	Grasslands to be restored	50.0	10.4	-	Restoration. Maintenance.	50.0	50.0
3260	Natural river reaches and river riffles	1.5	<1	Poor.	Removal (once per year) of beaver dams in Lanka and Kuiļupe rivers, in order to maintain water discharge and avoid paludification of riverbanks.		0.5

One-time grassland restoration measures are necessary in an area of at least 43 ha, and semi-natural grasslands must be restored in sites where they existed in the middle of 20th century. These areas are not currently known but potentially could cover about 50 ha (restoration sites must be clarified during the preparation of grassland restoration and management plan).

Engures ezers | *Nature Park (LV0302800)*

1. Brief description



YEAR OF FOUNDATION: 1957.

LOCATION: Engure municipality Engure rural territory; Tukums municipality Zentene rural territory; Mērsrags municipality Mērsrags rural territory; Talsi municipality Ķūļciems rural territory.

AREA: 19 992 ha.

NATURE MANAGEMENT PLAN: first developed in 2000; the latest version: in 2010 (2011-2025).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 596 of 28 August 2012, Regulation on Individual Protection and Use of Engures ezers Nature Park.

Engures ezers Nature Park includes Lake Engure, the coast of the Gulf of Rīga from Mērsrags village to Engure town, and forests between the lake and the sea. The territory is established for the protection of migratory birds, as well as for the protection of unique landscape of lagoon-type lake, and the biodiversity of the surroundings of lake. There are 24 protected habitats of EU importance – various habitat types of mires, forests, coastal and aquatic habitats. Since the lowering of lake water level, habitats rich in plant species have developed – transition mires and quaking bogs, alkaline fens.

The nature park is significant at a national scale for the protection of EU protected grassland habitat types. It is among the first five to ten Natura 2000 territories for the protection of habitat types 1630* *Boreal baltic coastal meadows* (15 % of total area of habitat type in protected nature territories), 5130 Juniperus communis *formations on heaths or calcareous grasslands* (31 %), *6120* Xeric sand calcareous grasslands* (4 %), 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) (3.5 %).

Several micro-reserves for the protection of rare plant and bird species, and habitat types have been established in the nature park. In total, 186 species of birds are breeding here, *Circus pygargus, Ciconia nigra, Haliaeetus albicilla, Philomachus pugnax, Porzana parva, Pernis apivorus* are among the most important bird species. There are 24 rare and protected invertebrate species in the nature park, such as *Leucorrhinia pectoralis, Vertigo angustior, Vertigo genesii, Vertigo geyeri, Graphoderus bilineatus*. Four rare and protected species of amphibians and reptiles have been found in the nature park.

Also 84 protected and rare vascular plant species have been found in the nature reserve, including *Dianthus arenarius ssp. arenarius, Atriplex calotheca,* 21 species of orchids, for example, *Liparis loeselii, Dactylorhiza cruenta, Dactylorhiza ochroleuca, Ophrys insectifera,* and others. Seven charophyte species have been found in Lake Engure, as well as rare species *Najas marina*.

2. Threats to habitat and species conservation

- The most significant threat is the changes in economic activities since the late 20th century – from fishing and agriculture to tourism and recreation, without assessing the importance of previous economic activity and significance of its continuation for the sustainable development of the territory.
- Ecological condition of the lake is negatively affected by lake overgrowth with reeds.
- Grasslands are fragmented and their characteristic species may disappear due to overgrowth or too intense use (including establishment of lawns).
- Fragmentation of grassland habitats is promoted by the lack of linear elements in the landscape (which could serve as species dispersal corridors).
- Unstable support system for the management of grassland habitats which partly correspond to criteria of EU protected habitat types (dry and wet grasslands, juniper formations) from Rural Support Service. This reduces the possibility of their further sustainable management.
- Bird breeding success is influenced negatively by the increasing numbers of small carnivores (raccoon dog *Nyctereutes procyonoides* and American mink *Neovison vison*).
- Recreation and unorganized tourism in coastal habitats and excessive vehicle use cause mechanical damage to vegetation, and negatively affects species and natural processes.
- The quality and diversity of grey dunes, white and embryonic dunes are decreased due to their overgrowth with trees and shrubs in a course of succession.

- Areas of lichen-rich dry pine forests (type *sils*) decrease due to lack of natural disturbances; these forests are a habitat for *Dianthus arenarius* ssp. *arenarius* and other rare species.
- The development of drift lines and their characteristic plant communities are impeded by lack of management of coastal grasslands and the expansion of reedbeds at the sea coast.

3. Existing management of the protected habitats and its assessment

- Historically, semi-natural grasslands were used for collective pasturing; animals grazed in forest, fens, grasslands in coast, therefore promoting the dispersal of species in the landscape. This management was completely discontinued in 1970s-80s.
- Within the framework of the LIFE project "Implementation of management plan for the Lake Engure Nature Park", LIFE00/NAT/LV/7134, in the beginning of the 21st century, large areas of grasslands (especially *Molinia* meadows and Boreal Baltic coastal grasslands) (in total, more than 125 ha) were restored, and their further management was ensured. Management included mowing of reeds, burning of reed swamps and grazing of lake coastal part. Management resulted in fragmentation of reedbeds and development of open landscapes and open littoral part.
- Grasslands were restored also within the framework of the EC LIFE program COASTLAKE – "Restoration of Bittern habitats in two coastal lakes in Latvia" (LIFE12 NAT/LV/000118).
- Coastal grasslands at Bērzciems village are managed fragmentary. In some areas, grasslands are annually mown and grass is removed. In other parts, grasslands overgrow with extensive reedbeds. In some places, grasslands and adjoining dunes are mown several timer per season, and semi-natural grasslands are transformed to lawns and well-maintained recreation areas. In Mērsrags, grasslands are regularly mown, but the size of the management area is insufficient, and reedbed expansion continues.
- Management of grasslands is supported by Rural Support Service, Rural Development Programme measure "Maintaining biodiversity in grasslands". However, a large part of grasslands is not included in land parcels and do not receive this support.
- Extensive grazing occurs in alkaline fens in the vicinity of the Orchid Trail. In some places, the results are positive (decreased proportion of shrubs and reeds). In future, this measure should be continued in larger areas, in order to prevent the overgrowth of fens with forest.
- Fixed coastal dunes with herbaceous vegetation (grey dunes) were previously grazed or used for fishing-related work. Currently, grey dunes are not purposefully managed. In some places, recreation infrastructure is established.

4. Priorities of management and conservation

- Maintenance of the mosaic of natural and semi-natural habitats which are dependent on human activity.
- Prevention of lake overgrowth with reeds and accumulation of organic matter in the lake; prevention of formation of continuous reedbeds in the lake.
- Maximal restoration and maintenance of semi-natural grasslands and fens in the entire territory of nature park, in order to reduce the negative impact of fragmentation.
- Restoration and management of grey dunes in good quality, ensuring the conservation of *Dianthus arenarius* ssp. *arenarius* population.
- Restoration and management of coastal grasslands in their whole diversity, focusing on the conservation of species of brackish habitats.
- Conservation of annual vegetation on drift lines, especially the conservation of plant communities of *Atriplex calotheca*.
- Restoration and maintenance of grasslands on lake's coast and on islands (in order to increase bird breeding success) – removal of shrubs, mowing of reeds.
- Provision of habitats suitable for breeding of birds – establishment of mosaic of deepened channels and swamps of emergent vegetation in lake, mainly in its northern part.

5. Necessary management and conservation measures

5.1. General measures

- Development of a programme of integrated use and conservation of the nature park is necessary. It must include restoration, maintenance and conservation of semi-natural habitats, in context of preservation of cultural history heritage, and the use of sea coast from Bērzciems to Mērsrags. Most of the natural and semi-natural habitats in the nature park (particularly of coastal habitats, fens and grasslands) have developed in close interaction with human economic activities – fishing and agriculture. This included also the lowering of lake water level and the management (collective pasturing) of the acquired territory.

- An update of habitat maps is necessary, as significant habitat restoration tasks have been carried out after the last habitat mapping. Mapping and complex evaluation of habitats is necessary, and it is necessary to clarify the areas where restoration is necessary, to ensure the sustainable landscape-ecological existence of natural and semi-natural habitats (coastal habitats, fens, grasslands).
- Evaluation of the inclusion of EU protected grasslands adjacent to the border of nature park; restoration of these grasslands to favorable conservation status.
- Evaluation of the establishment of semi-natural grasslands in a massif of agricultural lands located between the Bērzciems village and the lake; establishment of grassland habitats in former arable lands; implementation of management which promotes the development of semi-natural grasslands.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	43.0	<1	Poor.	Non-intervention.		43.0
9080*	Fennoscandian deciduous swamp woods	45.4	<1	Favourable.	Non-intervention.		45.4
9010*	Western Taïga	312.7	1.6	Favourable.	Non-intervention.		312.7
91E0*	Alluvial forests	65.4	<1	Poor.	Non-intervention.		65.4
7230	Alkaline fens	352.2	1.8	Poor, bad.	Deforestation, maintenance of an open, extensively grazed landscape; mowing. Maintenance of Orchid Trail – redirection of visitors to trail and prevention of trampling.		351.2
7210*	*Cladium mariscus* fens	97.95	<1	Poor, bad.	Felling of trees and shrubs in order to maintain open landscape in fens; mowing of *Cladium mariscus* in some places. Felling of pines and shrubs; mowing of regrowth in the following years twice a year; enlargement of extensive pastures.		30
6510	Lowland hay meadows	5.16	<1	Poor.	Inventory, evaluation of necessary activities at a detailed scale.	1.7	5.16

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6410	Molinia meadows	29.81	<1	Poor.	Restoration. Maintenance.	5.0	28.8
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	5.05	<1	Poor.	Restoration. Maintenance.	5.05	5.05
6210	Semi-natural dry calcareous grasslands	0.9	<1	Bad.	Restoration. Maintenance.	0.9	0.9
6000	Grasslands to be restored	40.0	<1	-	Restoration. Maintenance.	40.0	40.0
5130	*Juniperus communis* formations on heaths or calcareous grasslands	18.37	<1	Poor.	Restoration. Maintenance.	9.0	18.37
3150	Natural eutrophic lakes	19.8	<1	Poor.	Fragmentation of continuous reedbeds.		19.8
3140	Charophyte lakes	2951.7	14.8	Bad.	Creation on nesting sites for *Botaurus stellaris*. Creation of fish migration routes and wintering holes.	25	
2180	Wooded dunes	420.9	2.1	Favourable.	Non-intervention.		420.9
2130*	Grey dunes	20	<1	Poor.	Restoration of grey dunes – felling of trees and shrubs, abatement of invasive plant species. Once per 3 – 5 years.		
2120	White dunes	9.8	<1	Poor.	In some places – restoration of visitor infrastructure (picnic sites etc.) which directly influence the habitat. Once per 3 – 5 years.		
2110	Embryonic dunes	3.8	<1	Favourable.	Non-intervention.		3.8

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
1640	Sandy beaches with perennial vegetation	1.8	<1	Favourable.	Evaluation of the influence of invasive species in some areas, and management necessity (felling of shrubs, mowing of reeds). Once per 3 – 5 years (depends on coastal processes and other factors).		
1630*	Coastal meadows	44.3	<1	Poor.	Grasslands must be restored and maintained in complex with *Annual vegetation on drift lines*. Felling of trees and shrubs, mowing of old reeds. Mowing, grazing, eradication of invasive species.	22.5	44.3
1310	Annuals colonising mud and sand	0.2	<1	Favourable.	Non-intervention.		0.2
1220	Perennial vegetation of stony banks	32.8	<1	Favourable.			
1210	Annual vegetation of drift lines	1	<1	Favourable.	Non-intervention.		
1170	Reefs	4.3	<1	Favourable.	Management in complex with Coastal meadows.		
1150*	Coastal lagoons	2.0	<1	Poor.		2.0	

Istras pauguraine | *Nature Park (LV0301300)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Ludza municipality Istra rural territory.

AREA: 861 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Istras pauguraine Nature Park includes a diverse area at Lake Šķaune. A peculiar terrain with moraine hills, hilly massifs and ridges is characteristic for the territory. There is a mosaic of moraine hills and slopes which are covered by dry pine (*Pinus sylvestris*), spruce (*Picea abies*) and mixed forests, and *Alnus glutinosa* swamp woods and transitional mires in interhill depressions. The northern part of the nature park is dominated by woodlands. Open landscapes are characteristic for the central part. In the southern part there are also wet habitats.

There are eight protected habitat types of EU importance in the nature park. The territory is important for the fragmentation reduction of habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia). Together with Istras ezers Nature Reserve, the territory is important for the protection of the Eastern-Latvian variant of this habitat type, and this is the eleventh largest Natura 2000 site for the protection of this habitat type in Latvia. Together with grasslands which are located outside the protected nature areas, both territories are important aggregation sites of semi-natural grasslands in the eastern part of Latgale Upland.

Protected plant species *Pulsatilla patens* grows in forests. In grasslands, rare plant species such as *Gentiana cruciata, Botrychium multifidum* and *Botrychium matricariifolium* can be found. *Coeloglossum viride* grows in wet habitats. There is a large diversity of birds; *Bonasa bonasia, Ciconia nigra, Pernis apivorus, Tetrao tetrix* can be found.

2. Threats to habitat and species conservation

- The quality of forest habitats is reduced due to forestry activities such as removal of dead wood, mature or large trees, dead standing trees.
- Overgrowth of semi-natural grasslands due to lack of management; their degradation due to inappropriate management (grass shredding, leaving on site, late mowing); the reduction of their area size and quality.
- Fragmentation of semi-natural grasslands.

3. Existing management of the protected habitats and its assessment

- So far no habitat conservation and management measures have been taken.
- According to Rural Support Service, in 2014 60 % of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 17-23 % of habitat types 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) were managed in scope of this programme.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Restoration and maintenance of semi-natural grasslands in favourable conservation status.
- Increase of area and connectivity of semi-natural grasslands.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps in accordance to the newest methods.
- Development of nature management plan and Individual regulations on protection and use, setting a prohibition on forestry operations in protected woodland habitats.
- Restoration and maintenance of semi-natural grasslands in their historical areas which currently are overgrown with forests (so far, not mapped as EU protected grassland habitats).

- Incorporation of grasslands adjoining the nature reserve, in order to ensure their favourable conservation status.
- Evaluation of the possibility of expanding the nature park by including grasslands which are located between Istras pauguraine Nature Park and Istras ezers nature reserve (or merging both territories in a single protected nature area). This will promote a unified approach to the grassland restoration and management planning in both territories. These grasslands are important for the reduction of fragmentation and provision of landscape-ecological integrity.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	21.9	2.5	Poor.	Non-intervention.		21,9
9080*	Fennoscandian deciduous swamp woods	7.5	<1	Poor.	Non-intervention.		7,5
9010*	Western Taïga	180.0	20.9	Favourable.	Non-intervention.		180,0
91E0*	Alluvial forests	61.0	7.1		Non-intervention.		61,0
7140	Transition mires and quaking bogs	2.9	<1	Favourable.	Non-intervention.		2,9
6430	Hydrophilous tall herb fringe communities	2.1	<1	Poor.	Non-intervention.		2,1
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	42.8	5.0	Bad.	Restoration. Maintenance.	20,0	42,8
6510	Lowland hay meadows	6.5	<1	Bad.	Restoration. Maintenance.	5,0	6,5
6210	Semi-natural dry calcareous grasslands	23.0	2.7	Bad.	Restoration. Maintenance.	18,0	23,0
6000	Grasslands to be restored	60.0	7.4	-	Restoration. Maintenance.	60,0	60,0

Kuja | *Nature Park (LV0304200)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Madona municipality Praulienа and Sarkaņu rural territories; Lubāna municipality Indrāni rural territory.

AREA: 10 788 ha.

NATURE MANAGEMENT PLAN: 2008. (2008–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Kuja Nature Park includes the River Kuja with its floodplains, the mosaic-like landscape of surrounding agricultural lands and woodlands, as well as the forest massif in the east. There are protected forest, freshwater and grassland habitats. The mosaic-like landscape of the territory, with agricultural lands, woodlands and clusters of separate large trees, determines the great diversity of bird, invertebrate and plant species.

There are five EU priority protected forest habitat types, three priority grassland types and one priority freshwater habitat type found in the area. Forests cover more than 60% of the territory. Aggregation areas of the old and protected forests are very important, especially for old broadleaf forests; the complex of moist broadleaf forest is one of the greatest values of the nature park.

This is the second most important Natura 2000 site for the habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*, the fourth most important habitat for 6450 *Northern boreal alluvial meadows*, and the seventh most important habitat for 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) in Latvia (8.1%, 4.8% and 4.1% of the total habitat area in Natura 2000 sites). The area is also valuable for the conservation of habitat type 6530* *Fennoscandian wooded meadows* as this is one of the fifteen areas where this habitat type is found in Latvia.

In Latvia, this territory is of priority for the protection of great snipe *Gallinago media*. It is important as a compact grassland area with high landscape-ecological connectivity (Median of proximity index is the twelfth best of Natura 2000 sites which are located in river valleys). There is an exceptional diversity of bird species in the territory. The nesting density of the lesser spotted eagle *Aquila pomarina* is the highest not only in Latvia, but throughout its distribution area. A number of micro-reserves in the nature park area have been established for the protection of birds. Moist deciduous and mixed forests as well as solitary oaks and their groups in the open landscape create suitable foraging and breeding conditions for both *Aquila pomarina,* and several species of woodpeckers, owls, and other bird species. There are 29 protected bird species in the nature park, including *Ciconia nigra, Gallinago media*, and *Crex crex*. Previously, there were large Tetrao tetrix leks but their number has significantly decreased due to overgrowth of sparse areas.

There are nine protected mammalian species in the nature park. The diverse landscape is also home to a large number of invertebrate species, nine of which are protected, including the EU protected species *Coenonympha hero* and *Euphydryas aurinia*; *Osmoderma barnabita* can be found in solitary growing wide-crowned trees.

Also 10 protected vascular plant species are found in the nature park, including *Allium ursinum, Gladiolus imbricatus, Orchis mascula*, and *Carex atherodes*, five protected moss species and 14 protected lichen species.

Floodplains of River Kuja and its tributaries are drained, but they are abandoned in many places and restore themselves naturally. River Kuja provides favorable conditions and development for the populations of *Ophiogomphus cecilia* and *Semblis phalaenoides*. River rapids are suitable for *Unio crassus* and *Ancylus fluviatilis*.

2. Threats to habitat and species conservation

- Nature values on the territory have been negatively affected by the establishment of drainage systems and the river straightening. Valuable freshwater habitats have been destroyed, the landscape value of the site has been reduced, and the hydrological regime has been changed, significantly reducing biodiversity.
- Logging, destroying valuable forest habitats and places suitable for bird breeding.
- Sosnowsky's hogweed *Heracleum sosnowskyi* is spreading in forests and grasslands, suppressing and outcompeting other species in the area.

- Change of the type of economic activity. As a result of intensive farming, the grazing, haymaking and management of small arable lands has decreased. Cessation of grassland management causes accumulation of dead grass layer, soil eutrophication, development of high sward, and overgrowth with shrubs. The diversity of plant and invertebrate species in semi-natural grasslands decreases, and grassland bird species are negatively affected. Also the feed base for predators decreases.
- Inappropriate grassland management, with grass shredding and leaving on site.
- Freshwater habitats and species are potentially threatened by riverbed cleaning, without following environmentally friendly drainage techniques. Part of the rivers in the nature park is watercourses of state significance, and their riverbed cleaning is legally permissible.

3. Existing management of the protected habitats and its assessment

- Hunters have occasionally removed the small logs and beaver dams from the river rapids. This activity is evaluated as positive, as the sediment accumulation in river rapids was decreased, thus preventing the decrease of their quality and functionality.
- In semi-natural grasslands, grass was mainly shredded, which has a negative impact on the conservation status of habitats. According to Rural Support Service, in 2014 80-90 % of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Exceptions were habitat types 6530* *Fennoscandian wooded meadows* and 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) which were managed in a very small area within this measure (9% and 28%, respectively). The impact of management on grassland quality has not been evaluated. Small area of semi-natural grasslands was drained by deepening the drainage ditch, with the aim of creating moisture conditions that allow mechanized mowing of grassland. Vegetation monitoring is not carried out there, therefore the impact of drainage can not be assessed.
- For the protection of hermit beetle *Osmoderma barnabita* in the territory, a project financed by the European Commission's LIFE program "Eremita meadows - Management of Fennoscandian wooded meadows (6530*) and two priority beetle species: planning, public participation, innovation" was implemented by the Institute of Life Sciences and Technology of Daugavpils University.

4. Priorities of management and conservation

- Preserve the current nesting density of *Aquila pomarina* (at least 2 nesting pairs to 100 km2).
- Ensure the undisturbed course of natural processes in forest, as well as in habitats of species that need undisturbed natural environment.
- Conservation of protected habitats; conservation and increase of protected habitat areas; stable populations of protected species.
- Reduction of forest habitat fragmentation and increase of area and integrity of protected habitats: non-intervention in woodlands that have not yet reached the quality of protected habitats, or reduction of proportion of spruces in planted, middle-aged forests. Their further development towards habitat types 9020 *Fennoscandian hemiboreal natural old broad-leaved deciduous forest* and 91E0 *Alluvial forests with Alnus glutinosa and Fraxinus excelsior* is expected.
- The habitat diversity and the number of species is very high in semi-natural grasslands, therefore priority is both the conservation of habitats and species (plants and birds) habitats in a favourable conservation status, with particular attention to conservation of *Gallinago media* population.
- To preserve and improve the quality of freshwater habitats, including the promotion of natural restoration in watercourses affected by drainage.

5. Necessary management and conservation measures

5.1. General measures

- To approve the Individual regulations on protection and use and Zoning. Protection must be set for the complex of woodland key habitats which must be included in the zone of regulated regime of the nature park.
- To restrict the spread of the invasive plant *Heracleum sosnowskyi* by regular mowing.
- Restrict building construction, to maintain the proportion of natural and undisturbed habitats.
- To prevent the water pollution; create sewage treatment plants in Lūza and Biksēre villages.
- Measures for the protection of semi-natural grasslands:
- Development and implementation of semi-natural grassland restoration and protection plan. The plan should integrate the current grassland mapping and inventory. It must include the evaluation of the restoration of local drainage systems as well

as possibilities to prevent the negative influences from restoration of deep ditches on the grassland habitats and bird species. Grassland creation in their historical areas, in areas of perennial grasslands and fallow-lands should be evaluated. Restoration of the existing grasslands is the priority.

- To increase the landscape connectivity, it must be considered to include the drained grasslands of Kuja river floodplain (at the northern border of nature park, from Sūla river mouth to Apiņupīte river mouth) in the nature park.
- Permanent co-operation and communication between the Nature Conservation Agency, Latvian Rural Advisory and Training Centre, Rural Support Service, and landowners and operators of the grasslands will promote the knowledge-based grassland preservation and provision of ecosystem services.

5.2. Specific measures

5.2.1. Species

- *Unio crassus*. Construction of wastewater treatment plant in Lūza and Biksēre villages.
- *Osmoderma barnabita*. Felling of trees and shrubs around the old oaks.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	0.031	<1	Poor.	Non-intervention.		0.031
91E0*	Alluvial forests	7.0	<1	Favourable.	Non-intervention.		7.0
9080*	Fennoscandian deciduous swamp woods	17.0	<1	Favourable.	Non-intervention.		17.0
9020*	Broad-leaved deciduous forests	131.0	1.2	Favourable.	Non-intervention.		131.0
9010*	Western Taïga	57	<1	Poor.	Non-intervention.		57
9000	Potential Protected woodland habitat	95.0	<1	-	Non-intervention. Specialised thinning in spruce plantations.	15.0	80.0
6530*	Fennoscandian wooded meadows	3.9	<1	Bad.	Restoration. Maintenance.	3.9	3.9
6450	Northern boreal alluvial meadows	482.5	4.5	Poor.	Restoration. Maintenance.	39.0	482.5
6430	Hydrophilous tall herb fringe communities	190.9	1.8	Poor.	Restoration. Maintenance.	Up to 1.8	1.8

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6210	Semi-natural dry calcareous grasslands	0.6	<1	Bad.	Restoration. Maintenance.	0.6	0.6
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	318.5	3	Poor.	Restoration. Maintenance.	38.0	318.5
6510	Lowland hay meadows	19.5	<1	Poor.	Restoration. Maintenance.	2.6	19.5
6410	*Molinia* meadows	31.7	<1	Poor.	Restoration. Maintenance.	6.2	31.7
6000	Grasslands to be restored	70.0	0.6	-	Restoration. Maintenance.	70.0	70.0
3260	Natural river reaches and river riffles	1.0	<1	Poor.	Restore the flow of the Lisa river in its old bed at its mouth. Ensure water flow rate. Remove beaver dams and fallen logs, or reduce them in sites with shore erosion, with riverbed with gravel, pebbles or boulders (indication of river rapids of high quality; habitat suitable for *Unio crassus* and *Lampetra planeri*). Use of environmentally friendly drainage elements for the cleaning of riverbeds is strictly necessary.	On necessity.	
3150	Natural eutrophic lakes	2.5	<1	Poor.	Non-intervention.		2.5

One-time grassland restoration measures are necessary but the total area to be restored is unknown as the information of nature conservation plan is outdated. Semi-natural grasslands must be restored in their maximum possible area, including EU protected habitat types which are currently not managed (approximately 90 ha), and including areas of historical grasslands which currently are transformed to scrublands and new forests (these areas must be clarified during the development of grassland management plan). Restoration measures include: felling of trees and shrubs; milling of their roots and stumps; restorative mowing and/or grazing; regulation of hydrological regime; improvement of light conditions for the wide-crowned trees in wooded grasslands.
Annual grassland management measures must be carried out in the whole current area of EU protected grassland habitat types (1048 ha), and will have to be carried out in the restored grassland area. For the methods of restoration and management specific for habitats and species: see Rūsiņa (ed.) 2017.

Kurjanovas ezers | *Nature Park (LV0304400)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Cibla municipality Līdumnieki rural territory.

AREA: 263 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Kurjanovas Ezers Nature Park includes Lake Kurjanovas, and small areas of woodlands and agricultural lands in its shores. On the north side of the lake, there are woodlands; terrain is hilly, with steep slopes. Perennial grasslands are located on the southern and eastern shore, separated from lake with a narrow belt of trees. There is one island in the lake.

Three EU protected habitat types have been found in the territory: 3140 *Hard oligo-mesotrophic waters with benthic vegetation of* Chara spp., 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia), and 91D0* *Bog woodland.*

The territory is important as a charophyte lake. There are colonies of *Najas* spp. (*Najas flexilis* and *Najas minor* which are very rare in Latvia) and *Nuphar pumila*. Lakebed of boulders, sand and pebbles is characteristic for lake shores. Other important protected plant species is *Hydrilla verticillata*. *Liparis loeselii* grows on shores. Lake is a foraging site for bat *Myotis dasycneme*.

2. Threats to habitat and species conservation

- Lake eutrophication and lake shore degradation is caused by the increase in number of visitors in a territory which is not maintained for this purpose.
- Taking into account the sensitivity of *Najas* spp and *Hydrilla verticillata* to eutrophication and mechanical damage, the uncontrolled use of motorized water vehicles is a significant threat to these species.
- *Liparis loeselii* can be found in quaking bogs on the western coast of lake. The small mire overgrows with reeds and shrubs which suppress the *Liparis loeselii*.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Long-term conservation of lake habitats in favourable conservation status; maintenance of conditions suitable for rare aquatic species; provision of functionality of the protective belt; management of visitor flow.
- Maintenance of *Liparis loeselii* locality in optimal condition by prevention of its overgrowth (quaking bog on the western shore).

5. Necessary management and conservation measures

5.1. General measures

- Provision of functionality of protective belts. Prevention of increased biogene input into lake using various methods:
  - Management of protective belts: promotion of maintenance of open coastal areas as grasslands, in cooperation with local residents.
  - Directing and concentrating visitors to the existing recreation sites by improvement of infrastructure – provision of toilets and waste bins.
  - Limitation of beaver activities in the river outflowing from the lake; prevention of creation of dams which can cause lake water level elevation.
- Update of habitat maps according to the newest methods.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7140	Transition mires and quaking bogs	2.4	<1	Poor.	Felling of shrubs, mowing of reeds (regularly, at least once per five years).		2.4
3260	Natural river reaches and river riffles	0.2	<1	Bad.	Demolition of beaver dams in the rivers outflowing from lake (on necessity). Sediment removal from naturally developed small-sized depressions in drainage ditches inflowing into lake; prevention of drainage water inflow into lake. Every year.	0.1	
3140	Charophyte lakes	126.2	48.0	Favourable.	Removal of trees bent over the lake or fallen into the lake (taking into account the landscape aspects). Felling of belt of shrubs, in order to reduce leaf and twig litter falling into the lake (once per 3-5 years). Regular removal of reeds from littoral zone in NW and E coast, once per 2-3 years, in order to prevent suppression of *Najas* spp and *Hydrilla verticillata* by emergent vegetation and burial of their habitats with decayed plant mass.	0.2 0.2	

Laukezers | *Nature Park (LV0304000)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Krustpils municipality, Kūkas rural territory.

AREA: 327 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2016), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 805 of 29 September 2008, Regulation on Individual Protection and Use of the Laukezers Nature Park.

Laukezers Nature Park is located in the SW part of the Madona-Trepe ice-marginal ridge. It includes Laukezers, Baltiņu and Ildzenieku Lakes, their surrounding raised bog, transition mires and quaking bogs, as well as forest habitats. The particular value of the territory is the mesotrophic Lake Laukezers; in its littoral part, *Isoëtes lacustris* can be found scattered between the reeds. In the southern part of the territory, there are also residential areas and agricultural lands. North of Laukezers, on eskerine south-faced slopes of interlobate heights, rare plant communities with *Geranium sanguineum* and *Pulsatilla patens* can be found.

Seven EU protected habitat types, 21 protected plant species and 11 protected bird species have been found in the nature park. Territory is one of the three localities of *Cladium mariscus* in Eastern Latvia. The springs inflowing in Baltiņa Lake ensure conditions suitable for charophytes. Usually, charophyte lakes develop in lagoons at the sea. Suitable conditions inland are formed by specific geological conditions. In swamp in the fen at Baltiņa Lake, very rare moss species *Hamatocaulis vernicosus* can be found. In the SW part of Ildzenieku Lake, there is small transition mire with *Liparis loeselii*. Here, in 2016 a new mushroom species for Latvia was found - *Clavaria sphagnicola*.

2. Threats to habitat and species conservation

- Excessive recreational load in Laukezers and Ildzenieku Lakes (holidaymakers, bathing areas, diving, summer cottages near Ildzenieku Lake, illegal use of jet skies) negatively influences habitat quality and habitats of rare plant species.
- Further improvement of recreation possibilities and enlargement of car parks at Lake Laukezers can lead to significant increase in anthropogenic load and can cause irreversible deterioration of lake quality.
- The pollution of domestic sewage from the territory of summer cottages at Ildzenieki Lake has a negative impact on the quality of habitats.
- The territory has been important for the conservation of one of the five localities of *Thesium ebracteatum* in Latvia. Currently, species has disappeared, probably, in result of regular mowing (an information board is established near to the locality).
- Sparse, well-insolated pine forests overgrow with spruces.
- Reeds are mown with the aim to establish new areas suitable for *Isoëtes* sp. However such mown areas later are spontaneously used as bathing sites, especially in NE-E coast of the Laukezers Lake, in the immediate vicinity of the Ildzenieku summer cottage complex.
- Uncontrolled driving with quadricycles threatens the quality of coniferous forests.

3. Existing management of the protected habitats and its assessment

- Littoral part of the lake has been cleaned, and the volume of un-decayed leaves was reduced.
- In 2011, the measures specified in Nature management plan were carried out in the nature conservation zone of the nature park: spruces (*Picea abies*) were removed from canopy, subcanopy and advance growth layers; spruces in subcanopy were left only in the ravine. Felling residues were removed. After improvement of lighting conditions, several new species appeared in the woodland, including protected species. In October and November 2016, tree felling was repeated, most of the undergrowth was removed in 8.4 hectares, felling residues were burned. In 10.5 hectares large area subcanopy layer and advance growth were felled, felling residues were left on site. Management measure is considered as positive and must be repeated.

- In Laukezers and Ildzenieku Lakes reeds were mown in winter. Two approaches were used – mown reeds were either a) removed from the lake or b) left on ice. Later, when the ice melted, reeds left on ice were dispersed by wind and stayed in reed belt in the form of individual clusters which were hard to remove; here they decomposed and also promoted the biogene pollution. This method is not permissible in the future.
- Reed removal promoted the preservation of open mineral bottom in the lake and established conditions suitable for *Isoëtes* complex.
- The belt of trees on Lake Laukezers shore was thinned and shrubs were felled – with the aim to reduce the volumes of organic nutrients associated with leaf litter into the lake.

4. Priorities of management and conservation

- Conservation of habitats of Laukezers and Baltiņu Lakes in a good condition.
- Restoration of mesotrophic habitat in Ildzenieku Lake.
- Conservation of transition mires and quaking bogs on shore of Ildzenieku Lake.
- Maintenance of habitat type 9060 *Coniferous forests on, or connected to, glaciofluvial eskers* in an optimal quality and suitable for *Pulsatilla patens*.
- Undisturbed course of natural processes in forest habitats which are slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Amendments in Regulation on individual protection and use are necessary, prohibiting the land ploughing perpendicular to the coastline on the NW slope of Lake Laukezers.
- Prevention of the establishment of new illegal bathing areas in lakes.
- Agreement on public use of the private bathing area on the northern coast of Ildzenieki Lake.

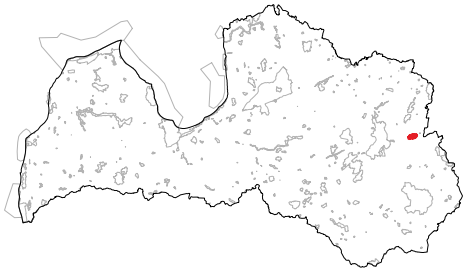
5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9060	Coniferous esker forests	10.2	3.1	Bad.	Cutting of shrub layer. Decrease of moss layer for the protection of *Pulsatilla patens*.	According to expert evaluation.	
9010*	Western Taïga	3.1	0.9	Bad.	Non-intervention.		3.1
7160	Fennoscandian mineral-rich springs and springfens	0.6	<1	Favourable.	Non-intervention (including avoidance of logging in the direct vicinity of springs).		0.6
7140	Transition mires and quaking bogs	4.6	1.4	Poor.	Ensure optimal water level and natural processes. Maintain the existing water level in lakes. Brush cutting in transition mire at Ildzenieku Lake.		4.6 4.6
7110*	Active raised bogs	6.5	2.0	Poor.	Non-intervention.		6.5

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	26.8	8.2	Bad.	Establishment of publicly available and well maintained bathing area.	0.1	
3140	Charophyte lakes	14.0	4.3	Poor.	Non-intervention.		14.0
3130	*Lobelia-Isoetes* lakes	78.8	24.1	Poor.	Establishment of grassland belts on the coast; deployment of toilets with hermetically sealed tanks at the bathing areas.		0.2
					Reed mowing by leaving 10m wide uncut belts that make it harder to access lake.	0.01	
					Reducing the cover of trees on the shore of Laukezers Lake; cutting and removal of shrubs (in wet, complicated conditions) along the southern coast. Every 10 years.	0.5	
					Prevention of the inflow of drainage water and, possibly, also water of Ildzenieku Lake, into the SE part of Lake Laukezers .	0.1	

Numernes valnis | *Nature Park (LV0303000)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Kārsava municipality Salnava rural territory; Baltinava municipality Baltinava rural territory.

AREA: 978 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2014), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 333 of 22 May 2007, Regulation on Individual Protection and Use of the Numernes Nature Park.

Numernes Valnis Nature Reserve is one of the largest complexes of eskerines in Latvia, and the nature park is important for the conservation of rare terrain forms and habitats. There are four lakes in the nature park – Numernes, Lielais Kugru, Mazais Kugru and Karšusalas (Karšulas) Lakes. Two micro-reserves for the protection of rare species have been established in the territory – for *Cypripedium calceolus* and for *Ena montana*.

The development of habitats and plant communities has been promoted by specific terrain conditions which are rare in Latgale Region. There are 10 EU protected habitat types in the territory. There are dry pine forests with *Geranium sanguineum* and *Pulsatilla patens* located on hilltops and slopes. For *Pulsatilla patens*, this is one of the most abundant localities in Latvia. Bog woodlands, swamp woods, calcareous fens with *Cladium mariscus*, raised bogs, transition mires and quaking bogs, and natural eutrophic lakes are located at the base of esker.

Grasslands occupy a small area in the nature park. However, they are important for the conservation of semi-natural grasslands on a regional scale. From the landscape ecology point of view, they are stepping stones facilitatinxg dispersal in the south-eastern part of the north-eastern Geobotanical District. In this region, the protection of semi-natural grasslands is insufficient as protected nature areas include only a small part of the total area of semi-natural grasslands (the closest Natura 2000 areas with semi-natural grasslands are 20 km away).

There is a large diversity of flora in the territory. On Numernes Ridge, species characteristic to the south-eastern part of Latvia can be found; in terrain depressions and mires there are relict localities of species with oceanic distribution and orchid species. In the nature park there are 44 rare and protected vascular plant species such as *Dracocephalum ruyschiana, Onobrychis arenaria, Arenaria stenophylla, Cladium mariscus* un *Saxifraga hirculus, Liparis loeselii, Corallorhiza trifida*. At the base of eskerine ridge, calcareous soils with one of the most abundant localities of *Cypripedium calceolus* have developed. Localities of *Najas marina* and *Scolochloa festucacea* can be found in Numernes Lake. Out of twelve protected invertebrate species, the most important ones are *Vertigo geyeri* and *Ena montana*. There are 28 protected bird species, including *Strix uralensis, Picoides tridactylus, Bonasa bonasia, Ciconia nigra, Pernis apivorus, Tetrao urogallus.*

2. Threats to habitat and species conservation

- Natural eutrophication processes in dry pine forests. In the absence of wildfires, spruce subcanopy and advance growth develop which change the light and soil conditions characteristic to the habitat.
- The removal of old, mature trees and dead wood impairs the quality of forest habitats.
- Fragmentation of forest habitats caused by clear-felling.
- The possible extraction of gyttja in the western part of Numernes Lake can influence the part of lake which is the most important for birds.
- Semi-natural grasslands and their species are negatively affected by management cessation and overgrowth with trees and shrubs which further promote the fragmentation and decrease the size and quality of species habitats. Grass shredding promotes eutrophication and negatively affects the biodiversity of grasslands.

3. Existing management of the protected habitats and its assessment

- Forest thinning with removal of trees broken by snow, and burning of felling residues was carried out in the territory. The result can be assessed as

positive - insolation was improved, proportion of spruces decreased, open soil patches developed.
- According to Rural Support Service, in 2014 grasslands were not managed in the scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Part of grasslands were mown and grass was shredded which has promoted the eutrophication and the spread of expansive species.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of viable localities of rare and protected species in dry pine forests on the eskerine ridge.
- Restoration of semi-natural grasslands at their maximum possible area and maintenance in a favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

- The inventory of semi-natural grasslands and the development of grassland restoration plan is necessary. Grassland maps are outdated and do not show the present situation. Nature management plan was developed in 2005 and it does not provide sufficient evaluation on the minimal grassland area which is necessary for their sustainable preservation. Currently, grasslands are highly fragmented, and their long-term conservation can not be ensured in the current area. To increase their landscape-ecological connectivity, the establishment of grasslands in their historical areas must be evaluated. The restoration of the remained grasslands is the priority.
- Semi-natural grasslands adjacent to the north-eastern border of the nature park (with a total area of at least 60 ha) should be maintained in a favourable conservation status, and their inclusion in the nature park area must be considered.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	123.6	12.7	Poor.	Non-intervention.		123.6
9080*	Fennoscandian deciduous swamp woods	28.9	3.0	Poor.	Non-intervention.		28.9
9060	Coniferous esker forests	268.2	27.4	Poor.	Decrease of proportion of young *Picea abies*; prescribed burning. Non-intervention.	20.0	 268.2
9010*	Western Taïga	0.6	<1	Poor.	Non-intervention.		0.6
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	4.46	<1	Bad.	Restoration. Maintenance.	4.46	 4.46
6210	Semi-natural dry calcareous grasslands	2.72	<1	Poor.	Restoration. Maintenance.	2.72	 2.72

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	0.54	<1	Bad.	Restoration. Maintenance.	0.54	0.54
6000	Grasslands to be restored	17.46	1.8	-	Restoration. Maintenance.	17.46	17.46
7210*	*Cladium mariscus* fens	0.8	<1	Favourable.	Non-intervention.		0.8
7160	Fennoscandian mineral-rich springs and springfens	0.009	<1	Favourable.	Non-intervention.		0.009
7140	Transition mires and quaking bogs	22.5	2.3	Poor.	Non-intervention.		22.5
7110*	Active raised bogs	0.6	<1	Poor.	Non-intervention.		0.6
3260	Natural river reaches and river riffles	0.6	<1	Poor.	Removal of large woody debris; restriction of the activities of beavers; cleaning of bed of Aukupīte River mouth. Every five years. Non-intervention.	0.1	0.5
3150	Natural eutrophic lakes	78.0	8.0	Poor.	Thinning of dense emergent vegetation at the residential areas and in existing bathing sites in Numernes Lake, in order to create open areas for nesting and access to the water for ducks and waders. Non-intervention.		0.1 77.9

Semi-natural grasslands must be restored in their maximum possible area - at least 25 hectares, including historical grasslands which currently are overgrown with shrubs and new forests. These areas are currently not identified (they need to be identified when developing a grassland restoration plan). Restoration measures include: shrub and tree felling, rooting and stump milling, restorative mowing and/or grazing, decrease of eutrophication caused by grass shredding.
Annual management measures must be carried out in all the area of EU protected grassland habitats (7.7 ha) and will be necessary in areas of restored grasslands. For restoration methods and management which is specific for habitats and species: see Rūsiņa (ed.) 2017.

Ogres ieleja | *Nature Park (LV0304500)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ērgļi municipality Ērgļi and Susēja rural territories; Ogre municipality Mazozoli, Taurupe, Meņģele, Madliena, Ogresgals, Krape rural territories; Lielvārde municipality Lēdmane rural territory; Ķegums municipality Rembate rural territory.

AREA: 7516 ha.

NATURE MANAGEMENT PLAN: 2008 (2008–2018).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE TERRITORIES:

- Vērenes gobu un vīksnu audze Nature Reserve,
- Brāžu krāces un Akmeņupītes ūdenskritums, Kalnrēžu dolomītsmilšakmens atsegums, Līčupes atsegums Geological and Geomorphological Nature Monuments.

Ogres Ieleja Nature Park includes a visually expressive, unregulated part of Ogre river, river valley and adjacent diverse habitats. Several micro-reserves are established for the protection of woodland, spring and river riffle habitats. A little more than half of the territory is occupied by forests; almost 10% are aquatic habitats, mostly Ogre river. The Ogre River bed is mostly narrow and deep, especially in the upper reaches, with a distinct valley with steep slopes. In some places on the banks, there are outcrops, landslides occur, dolomite barriers can be found in riverbed. Līčupe river outcrop is about 120 m long and 10 m high Quaternary sediment outcrop. Kalnrēžu dolomite-sandstone outcrops are the largest and, possibly, the only outcrops of Ogre suite dolomite-sandstone outcrops in Latvia. The Ogre River has a great potential for tourism. For example, the Brāži Rapids is one of the most excellent river rapid tourism routes in Latvia. There is Vecogre Hydroelectric power plant (HPP) in the territory of nature park.

There are 18 EU protected habitat types in the territory. The most important are forests of slopes, riparian mixed forests along the great rivers, petrifying springs with tufa formation, mineral-rich springs and springfens, grasslands, river riffles.

The nature park is among the ten most important Natura 2000 sites in Latvia for the conservation of several semi-natural grassland habitats: 6120* *Xeric sand calcareous grasslands* (3.5 % of their total area in Natura 2000 territories), 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) (2.6 %), 6270* (3,5 %), 6410 (0,8 %), 6510 (3,3 %). *Wooded grasslands* (6530*) are particularly important; the territory is the fifth most important in the country for the conservation of this habitat type (1.7 %). The territory is important for the maintenance of landscape-ecological connectivity; it is a species distribution corridor which connects two geobotanical districts – Central Latvia and Central Vidzeme. It is part of the most important landscape-ecological corridor in Latvia – Daugava river valley.

The nature reserve is rich in protected species – there are 15 protected species of mammals, 22 bird, two reptile, two fish, one cyclostome, four invertebrate, six lichen, two mushroom, 16 protected vascular plant species. Ogre river is an important concentration site for bats – seven species are found in nature reserve. Important vascular plants include *Delphinium elatum, Gentiana cruciata, Orobanche elatior, Carex ornithopoda* (these species grow mostly in semi-natural grasslands in the park), *Lithospermum officinale, Polygonatum verticillatum, Dentaria bulbifera, Lunaria rediviva, Carex rhizina*. Important bird species are *Bonasa bonasia, Lanius collurio, Mergus merganser, Alcedo atthis, Bucephala clangula, Ciconia nigra*. Rivers are a habitat for *Lutra lutra, Unio crassus* and *Ancylus fluviatilis*. Invertebrates *Ena montana, Clausilia dubia* and *Stenocorus meridianus* can be found in forests.

2. Threats to habitat and species conservation

- Forestry activities, especially clear-felling, influence nature values in forests, promote fragmentation and development of landslides in river banks.
- Uncontrolled operation of local sewage treatment plants.
- Fish migration is restricted due to operation of small HPPs which are located upstream and downstream

of nature park and are not equipped with fish ladders (Ogre, Ērgļi, Vecogre HPP).
- Semi-natural grasslands and their species are adversely affected by management cessation, building houses or too intense management (fertilization, admixture sowing) which promote fragmentation and reduce the size and quality of habitat.
- Uncontrolled gathering of *Allium ursinum*.
- The extensive building construction at Ogre river banks may promote the development of landslides, influence river ecosystem and shore habitats.
- Habitats of rare fish and invertebrate species are reduced due to eutrophication and overgrowth with aquatic macrophytes.

3. Existing management of the protected habitats and its assessment

- Irregular maintenance of river riffles in various reaches of Ogre river and demolition of beaver dams in Ogre and its tributaries have been carried out with the involvement of local fishermen and hunter associations. The measure can be evaluated as positive as it ensures the conservation and extension of habitats suitable for fish and for aquatic invertebrates.
- According to Rural Support Service, in 2014 a little more than a half (60-78%) of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Management influence on grassland habitats has not been evaluated.

4. Priorities of management and conservation

- Undisturbed course of natural processes in habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat.
- Restoration of grassland habitats in their maximum possible area (at least 350 ha) and maintenance in favourable protection status, ensuring also suitable habitats for grassland-breeding waders. Areas for restoration include also historical grassland areas which are overgrown with forest, and extensively managed perennial grasslands and fallow-lands which include grasslands which are important for birds.
- In nature management plan (2008) it is recommended to conserve grasslands in an area of 71.7 hectares (the known area of EU protected grasslands which was recorded in 2008). However, this is considered outdated as the area of semi-natural grasslands in the park is much larger, and it must be extended, in order to ensure sustainable conservation of semi-natural grasslands.
- Conservation of a united nature complex (river valley), avoiding fragmentation of the territory.

5. Necessary management and conservation measures

5.1. General measures

- Development and approval of Individual regulations on protection and use.
- Update of habitat maps according to newest methods.
- Implementation of measures listed in River basin management plan; evaluation of possibilities of restoration of fish ladders (Ogre river upstream of Vecogre HPP)
- Inventory of semi-natural grasslands; development of grassland restoration and management plan. The currently available grassland maps are outdated and do not show the current situation. The assessment of a minimal grassland area for their sustainable conservation is not provided in nature management plan of 2008. The high level of habitat fragmentation indicates that the current area can not ensure grassland favourable conservation status in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas (mainly in Ogre river valley) and in extensively managed perennial grasslands and fallow-lands (mainly outside the Ogre river valley) must be considered. Restoration of the currently remained grasslands is the priority.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91F0	Riparian mixed forests	284.5	3.8	Favourable.	Non-intervention.		284.5
91E0*	Alluvial forests	2.8	<1	Favourable.	Non-intervention.		2.8
91D0*	Bog woodland	3.0	<1	Poor.	Non-intervention.		3.0
9180*	Slope forests	382.3	5.1	Favourable.	Non-intervention.		382.3
9080*	Fennoscandian deciduous swamp woods	5.5	<1	Poor.	Non-intervention.		5.5
9000	Potential Protected woodland habitat	180.0	2.4	-	Non-intervention.	35.0	145.0
9010*	Western Taïga	63.9	<1	Poor.	Non-intervention. Targeted thinning of *Alnus incana* woodlands, in order to increase proportion of broadleaved trees.		63.9
8210	Calcareous rocky slopes	0.3	<1	Favourable.	Non-intervention.	0.2	
7220*	Petrifying springs	0.2	<1	Favourable.	Removal of shrubs (while preserving large trees).		
7160	Fennoscandian mineral-rich springs and springfens	0.8	<1	Favourable.	Prohibition of forestry activities on slopes with springfens.		
6530*	Fennoscandian wooded meadows	8.2	<1	Bad.	Prohibition of forestry activities on slopes with springfens.	8.0	8.2
6510	Lowland hay meadows	63.5	<1	Poor.	Restoration. Maintenance.	21.7	63.5
6450	Northern boreal alluvial meadows	5.9	<1	Poor.	Restoration. Maintenance.	1.7	5.9
6410	*Molinia* meadows	6.4	<1	Poor.	Restoration. Maintenance.	2.6	6.4

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	136.6	1.8	Poor.	Restoration. Maintenance.	55.6	136.6
6230*	Species-rich Nardus grasslands	0.1	<1	Bad.	Restoration. Maintenance.	0.1	0.1
6210	Semi-natural dry calcareous grasslands	47.9	<1	Favourable.	Restoration. Maintenance.	13.4	47.9
6120*	Xeric sand calcareous grasslands	13.9	<1	Favourable.	Restoration. Maintenance.	3.0	13.9
6000	Grasslands to be restored	60.0	<1	-	Restoration. Maintenance.	60.0	60.0
3260	Natural river reaches and river riffles	48.7	<1	Poor.	Maintenance of water flow. Reduction of aquatic macrophyte cover to 30% in river riffle areas. Removal or reduction of large woody debris, removal of beaver dams in sites where riverbed with boulders or pebbles indicate on river riffles of high quality (suitable for *Lampetra planeri* spawning).	3.0	2.0 1.0

Semi-natural grasslands must be restored in maximum possible area which is at least 106 hectares of the currently known EU protected grassland habitats, about 60 hectares of historical grasslands which are overgrown with forest, and extensively managed perennial grasslands and fallow lands – birds habitats. Restoration areas must be clarified during the development of grassland restoration plan.
Annual grassland management measures are necessary in the entire area of the currently known EU protected grassland habitats, as well as in restored grasslands. For restoration methods and management specific for habitats and species, please see Rūsiņa (ed.) 2017.

Ogres Zilie kalni | *Nature Park (LV0305200)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ogre municipality, Ikšķile rural territory.

AREA: 312 ha.

NATURE MANAGEMENT PLAN: developed in 2011 (2011–2021).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Ogres Zilie kalni Nature Park is important for the protection of rare terrain form in Latvia – assemblage of eskers, with its characteristic complex of species and habitats. Territory includes the Ogre Kangaru assemblage of eskers and its central part – Ogres Zilie Kalni which is characterized by a peculiar landscape with dry pine forests. Territory borders with urbanised area of Ogre town, therefore nature park is also very important for recreation of residents of Ogre and surrounding areas. In the Dubkalns quarry, a water body is created after the finishing of gravel extraction in year 2003.

Throughout the territory there is an expressive and diverse terrain, consisting of the esker hills, steep and gentle slopes, depressions, and undulated terrain in the western part of the park. Woodlands cover ~ 93% of the territory. Forests on eskers consist of several different, even contrasting landscape types. There are sunny, well-exposed pine forests on southern slopes. On the northern slopes, mostly in the eastern part of the park, there are shaded, quite dense pine-spruce and pine forests. On the eastern part of the park, in the territory of Ogre town, the forest landscape is different. Due to the prolonged anthropogenic pressure, forest partly looks like a park, with solitary wide-crowned pines; dense cover of shrubs is characteristic for the undergrowth, in some places there are also invasive species.

There are four EU protected habitat types, and the most important is *Coniferous forests on, or connected to, glaciofluvial eskers*. Rare and protected animal species include 12 species of invertebrates and six species of birds. Vegetation is rich, and there are 18 rare and protected vascular plant species. *Onobrychis arenaria, Pulmonaria angustifolia, Dracocephalum ruyschiana, Pulsatilla pratensis, Arenaria procera* can be found in coniferous forests on eskers. *Betula nana* grows in small mire in southern part of the nature park. The territory is also an important habitat for *Bonasa bonasia* and many invertebrate species, such as *Oxyporus mannerheimii* and *Laphria gibbosa*.

2. Threats to habitat and species conservation

- The most important threats are the direct or indirect anthropogenic influences causing degradation of the ground cover due to trampling and vehicle use, promoting eutrophication and distribution of synanthropic species, disappearance of rare species localities, and others. The reasons for this are the high visitor load caused by the proximity of the town and also the popularity of the territory among the residents of surrounding towns and Rīga. Although in recent years many infrastructure objects have been constructed to restrict the anthropogenic load, and measures have been taken to restrict the movement of motor vehicles, this can not completely eliminate the negative effects of recreation on the territory. Some of the objects even promote it, for example, rope paths among trees in the eastern site if the territory, in Ogre town. Also the territory is fragmented by the wide network of roads and trails.
- As a result of eutrophication and succession, as well as in the absence of natural fire disturbance, the density of undergrowth and advance growth in dry pine forests is increasing, causing increased shade and changes in soil and in the groundfloor species composition. Such processes threaten the existence of several rare plant species.

3. Existing management of the protected habitats and its assessment

From 2016 to 2017, the association "Zilo kalnu aģentūra" organized felling of undergrowth and spruce advance growth in the habitat type 9060 *Coniferous forests on, or connected to, glaciofluvial eskers* (forest block 142., compartments 2 and 3), including the removal of felling residues.

4. Priorities of management and conservation

- Conservation of assemblage of eskers and complex of its characteristic habitats and species, ensuring its sustainable existence, preventing the negative effects of increasing anthropogenic load.
- Undisturbed course of natural processes in habitats, as well as in habitats of species that need undisturbed, natural environment.
- Multifunctional use of the territory for nature education, recreation and sport, balancing the requirements of nature conservation and recreation.

5. Necessary management and conservation measures

5.1. General measures

- Development and approval of the Individual regulations on protection and use of the territory.
- Improvement of the network of trails; widening of existing trails and creating new tourism attraction objects in the area of protected habitats should be avoided.
- Elaboration of a long-term plan for the development and maintenance of recreational infrastructure, evaluating the impact of all perspective objects on the nature values, and their cumulative impact on the nature park ecosystem.
- In order to preserve pine forests characteristic to eskers, pine regeneration should be promoted, at the same time restricting the increase of spruces, deciduous trees, shrubs.
- In order to preserve species composition characteristic to forests on eskers and avoid synanthropisation, the distribution of invasive species (*Amelanchier spicata, Sambucus racemosa, Cotoneaster* spp., *Acer negundo* and others) must be restricted.
- Trail supervision to prevent ground cover damage by vehicles.
- Waste management (controlling placement of mobile toilets, maintenance of stationary toilets, waste bins, including dog waste bins).

5.2. Specific measures

5.2.1. Species

- *Dracocephalum ruyschiana*. There are two localities within the territory of the nature park. Threats are: damage by vehicles, overgrowth, and flower picking. Specific conservation and management measures include maintaining the open area by felling of trees and shrubs along the stairs on the forest block road between blocks 142 and 147. It must be ensured that visitors walk along the trail (between forest blocks 147 and 148) and not beside the trail. Shrubs and new trees along the trail must be thinned.
- *Pulmonaria angustifolia*. Maintaining the open area by felling of undergrowth.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	4.8	1.5	Bad.	Non-intervention		1.6
9060	Coniferous esker forests	123.7	39.6	Poor.	Felling of young and subcanopy spruces; brush cutting. Felling residue removal or burning on site. Non-intervention.	39.0	 50.0
9010*	Western Taïga	26.8	8.6	Poor.	Non-intervention. Restriction of invasive woody species.	According to expert recommendations.	26.8
7120	Degraded raised bogs	3.7	1.2	Poor.	Non-intervention.		3.7

Pape | *Nature Park (LV0303500)*

1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Nīca municipality Nīca rural territory, Rucava municipality Rucava rural territory.

AREA: 10 853 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2018).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 706 of 20 September 2011, Regulation on Individual Protection and Use of the Pape Nature Park.

Pape Nature Park is located in the southwest of Latvia, occupying a 5 to 20 km wide and 70 km long belt along the Baltic Sea coast. Along the seashore the nature park borders with Nida-Pērkone Protected Marine Area. Nida Mire together with Lake Pape is a Wetland of International Importance (Ramsar site).

The nature park is important for the protection of the lake, coastal dunes, grasslands and forests. There is a wide variety of flora and fauna, and it is also a significant concentration site of breeding and migratory birds. The most important habitats are grey dunes, alkaline fens, various habitats of semi-natural grasslands, embryonic shifting dunes, active raised bogs, transition mires and quaking bogs, western Taïga and bog woodlands. Lake Pape is a shallow lagoon-type lake and one of the largest localities of *Cladium mariscus* in Latvia.

Nature park is the sixth most important Natura 2000 site for the protection of habitat type 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae), the twelfth most significant for protection of 6120* *Xeric sand calcareous grasslands* and 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* (respectively 4.7%, 2.1% and 1.6% of total area in Natura 2000 territories). In the southern part of the Coastal Geobotanical District, Pape Nature Park is the most important Natura 2000 site for ensuring grassland landscape-ecological connectivity. It is the core area for the abovementioned grasslands, and an important part of Eastern-Baltic species distribution corridor along the Sea coast. Grasslands provide habitats for several protected butterfly species.

A large number of rare and protected species has been found in the nature park, including 62 species of vascular plants, 10 species of mosses, 84 bird, 17 mammal, 16 invertebrate species. The most important plant species in the nature park are *Trichophorum cespitosum, Myrica gale, Drosera intermedia, Carex heleonastes, Liparis loeselii, Sanguisorba officinalis, Carex buxbaumii, Glaux maritima, Juncus gerardii, Hedera helix* L. var. *baltica, Taxus baccata, Linaria loeselii, Silene borysthenica* and *Alyssum gmelinii*.

The coastal zone of the nature park is a particularly important part of the Baltic – White Sea migration route for bats and *Passeriformes* birds. The narrow belt between the Lake Pape and the sea is a "bottleneck site" – a gathering site for animals which are migrating along the sea coast to the south. All 16 bat species found in Latvia have been observed in the territory. The number of migratory birds during the bird migration reaches more than one million. Since 1966, there is a Pape Ornithological Station, used for gathering of valuable scientific information. Pape Nature Park is considered also as one of the most important breeding sites for *Botaurus stellaris, Circus aeruginosus* and *Porzana parva in Latvia. Also Crex crex, Ixobrychus minutus, Milvus migrans, Haliaetus albicilla, Circaetus gallicus* are breeding here. In Lake Pape, there is still a possibility to see *Acrocephalus paludicola*, a globally threatened bird species.

There are several important invertebrate species, such as *Necydalis major, Osmoderma barnabita, Parnassius mnemosyne*. Due to relatively mild climatic conditions, rich flora and diverse habitats, there is a unique butterfly fauna. Also four protected amphibian and reptile species, as well as three protected fish species have been found in the territory.

2. Threats to habitat and species conservation

- Quality, species diversity and area of coastal dune habitats are threatened by spread of invasive and expansive species.
- Invasive moss species *Campylopus introflexus* is spreading in the part of Nida Mire where peat extraction is finished. This species is particularly

dangerous if it establishes in dune biotopes where it completely outcompetes natural vegetation.

- Lake Pape which is a shallow lagoon-type lake is overgrowing due to secondary eutrophication; eutrophication and overgrowth are promoted by development of aquatic macrophytes, their decay and the accumulation of the decayed mass.
- This deteriorates the conditions of breeding and foraging of waterbirds including the protected species *Botaurus stellaris*. Also protected habitats are threatened such as *Hard oligo-mesotrophic waters with benthic vegetation of* Chara spp. and *Calcareous fens with* Cladium mariscus *and species of the* Caricion davallianae. Eutrophication is increased due to operation of Pape Polder and the input of Rucava village wastewater via Paurupe river. Lake degradation is promoted also by operation of Līgupe-Paurupe canal which discharges water of Līgupe river directly into the sea instead of discharging water in Lake Pape. This reduces lake water volume and circulation and promotes lake overgrowth and degradation.
- The condition of Pape canal floodgates causes a contradiction between supporting lake fish resources and the optimal humidity of lake coastal areas, including ensuring suitable conditions for Taurus, aurochs and semi-feral horses. It is necessary to reach agreement on the optimal lake water level with all operators of the lake.
- Nature values of Nida Mire are threatened by drainage (ditches around the mire and inside of it) and by peat extraction in its northern part which influences its hydrological regime and promotes the overgrowth with trees.
- An excessive anthropogenic load on the sea coast promotes degradation of the vegetation, eutrophication, threatens dune natural structure and species composition. Also the illegal construction of buildings is a significant threat.
- Semi-natural grassland habitats are degraded due to insufficient management; their area and diversity is decreasing due to overgrowth of trees and shrubs. It is particularly common in Pape and Kalnišķi villages and in vicinity of Nida village. In residential areas, grasslands are threatened also by establishment of lawns and by construction of buildings.
- Artificial modification of lake water level due to the operation of floodgates.
- Values of forest habitats are threatened by logging, particularly in private forests. Flora of forest habitats, especially mosses, are affected negatively by the current regime of forest management, especially in private forests.

3. Existing management of the protected habitats and its assessment

- Grassland management was carried out in 2014, 2015 and 2016 with the support of the Environmental Protection Fund, implementing the priority measures of the nature management plan. In 1999, pastures of semi-feral animals were created with the support of World Wildlife Fund, and ´Konik´ horses were introduced to the area. In 2004, also Taurus cattle and aurochs were introduced. In 2017, the fenced area was about 420 ha. Semi-feral animals stay in an enclosure all year-round, this is a type of natural grazing, however with a more intensive human intervention through additional feeding in winter. Grazing has resulted in creation of open landscape, open littoral zone of lake, more natural structure of grasslands (mostly, fallow-lands and cultivated drained grasslands were included in pastures) (http://www.pdf-pape.lv/lv/projekti/2017).
- With the funding of Rural Support Service, ditches of Pape Polder were cleaned. It increased the direct discharge of water from agricultural lands into Lake Pape (via Tuklera canal and pumping station of Pape Polder).
- The felling of invasive species *Rosa rugosa* was carried out in coastal dunes within the framework of several LIFE projects (2004-2006, 2014-2015). However, the measure is evaluated as insufficient and further eradication of this species is necessary.
- According to Rural Support Service, in 2014 most of the grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 67–80% of habitat types 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* and 6230* *Species-rich* Nardus grasslands, *on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* received the support. Of other grassland habitat types (6510, 6450, 6410, 6210, 6120*) only up to 15 % of their total area was managed. The influence of management on the conservation status of grasslands has not been evaluated.
- Within the framework of the EC LIFE program "Restoration of Bittern habitats in two coastal lakes in Latvia", 2013-2017, LIFE12 NAT/LV/000118, the discharge was restored in canals in the total length of 5 km.
- The purpose of canal discharge restoration was to restore the water exchange in the lake, improve conditions of fish spawning and wintering, and improve conditions for waterbirds staying in the lake. 300 hectares of reedbeds were mown. This measure promoted the creation of open water

areas, attracted migrating and breeding birds, improved fish spawning and migration in lake. At the same time, the conditions necessary for the great bittern *Botaurus stellaris* were improved. Species management plan for *Botaurus stellaris* in Lake Pape was developed, and it includes complex management measures in the lake (http://www.pdf-pape.lv/files/pasakumu_plans_lielais_dumpis_papes_ezera.pdf).

- Reed mowing for thatching. The volume of this activity is economically significant. It takes place in areas where management activities are agreed upon by the Nature Conservation Agency and representatives of local governments. The activity is evaluated as positive as biogenes are removed from the lake ecosystem, and restored open areas are potentially once again available for economic activity.

4. Priorities of management and conservation

- Conservation and restoration of Lake Pape biodiversity – reduction of eutrophication, establishment of hydrological regime which is optimal for the existence of lake fauna (birds, fish, amphibians, mammals) and existence of protected habitats.
- Providing conditions which are favorable for fish migration and bird breeding; improving the breeding success of ducks and gulls.
- Stabilization of the natural hydrological regime in the Nida Mire.
- Conservation of open dune habitats – reduction of degradation caused by anthropogenic load, preventing overgrowth with forest and spread of invasive species.
- Restoration and maintenance in favorable conservation status of semi-natural grasslands, in at least 900 hectares. Restoration of habitat types 6230* *Species-rich* Nardus grasslands, *on siliceous substrates in mountain areas (and submountain areas, in Continental Europe),* 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae), 6120* *Xeric sand calcareous grasslands* is the priority.
- Preservation and extension of year-round grazing areas by maintenance and creation of pasture landscapes and their typical biodiversity (including conservation of population of diurnal birds of prey).
- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Establishment and functioning of the Consultative Board of the nature park.
- Critical analysis and improvement of functional zoning of the park.
- Organization of the flow of holidaymakers; establishment of infrastructure for the prevention of degradation of dune habitats. Establishment of a seasonal zone of special regime in Pape and Nida villages, regulated in the planning of the municipality of Rucava. Priority areas - between the Pape Canal and Priediengalciems village, in front of recreational campsites and guest houses.
- Preservation of existing uses of agricultural lands within the borders of Pape and Nida villages, including appropriate conditions in spatial planning.
- Investigation of Lake Pape hydrological regime; development and implementation of a construction project for rewetting. Measure includes: improvement of water discharge between reedbed ponds (open water areas in reedbeds) and southern and northern part of the lake; reconstruction of Pape canal dam (with creation of fishway); maintenance of the inflow of restored Paurupe and Līgupe rivers into Lake Pape, maintenance of their riverbeds (including restoration of old bed of Līgupe river); blocking of Līgupe-Paurupe canal; other measures for the restoration of hydrological regime.
- Research of hydrology of Nida Mire; development of building project; construction of dams for the stabilization of hydrological regime; prevention of the influence of peat extraction fields.
- Establishment of wetland which is suitable for waders and *Grus grus*, in the northern part of Pape Polder. The measure can be implemented in case if state re-purchases the lands of the polder.
- Inventory of semi-natural grasslands; determination of the minimum conservation area. The current maps of grasslands are outdated. In nature management plan of 2007, the grassland area indicated for conservation is 900 hectares large. However, a well-grounded assessment of the minimal area of semi-natural grasslands for their sustainable conservation is lacking.
- Development and implementation of a restoration and conservation plan for semi-natural grasslands and habitats for birds. Plan must include innovative solutions for grassland management and use – since development of conventional agricultural activities and agricultural use of grasslands are not expected

both in the areas of year-round grazing and also in the rest of territory.
- Evaluation of the influence of year-round grazing on protected grassland habitats. Development of a plan for grassland maintenance in optimal condition in year-round grazing areas.
- To increase landscape-ecological connectivity of grasslands, it is necessary to restore grassland habitats in their historical areas (including grasslands which currently are degraded or overgrown with expansive species), in cultivated grasslands and fallow-land in an area of at least 300 ha.

5.2. Specific measures

5.2.1. Species

The population of the great bittern *Botaurus stellaris* in Pape Nature Park consists of 15 pairs, population status is considered as poor. During the development of *Botaurus stellaris* population and habitat conservation plan, the research of bird fauna of Lake Pape was carried out, which also specified the necessary management measures (mainly aimed at waterbirds). Management measures would also ensure the improvement of habitats of other water birds. Primarily, it is necessary to improve the biodiversity of Lake Pape by restoring or creating habitats which are concentrated around the outer edges of islands, canals, bays and ponds, and by fragmentation of reedbeds. Measures include the restoration and maintenance of shallow ponds and swamps – mowing of submerged plants, creation of water circulation and migration channels with smoothed bank slopes to improve conditions for aquatic organisms, maintenance of reedbed pond edges, and restoration of water discharge in lake. Also fragmentation of reedbeds is necessary – mowing of reeds, shrubs in reedbeds and on islets. Detailed summary of measures: http://www.pdf-pape.lv/files/pasakumu_plans_lielais_dumpis_papes_ezera.pdf

5.2.2. Habitats

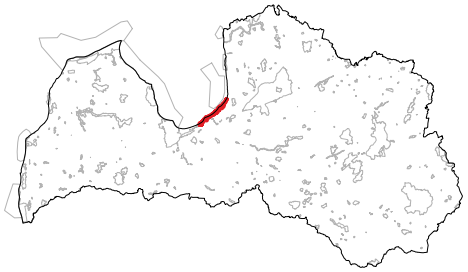
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	134.5	1.2	Poor.	Evaluation of possible rewetting (in complex with mires).	134.5	
9160	Oak forests	6.7	<1	Poor.	Improvement of species composition by selective felling of spruces. Felling of shrubs in 0.8 ha, continued by regular felling of regrowth. Evaluation of possible grazing.	0.8	
9080*	Fennoscandian deciduous swamp woods	14.7	<1	Poor.	Non-intervention.		14.7
9020*	Broad-leaved deciduous forests	0.9	<1	Poor.	Non-intervention.		0.9
9010*	Western Taïga	77.6	<1	Poor.	Non-intervention.		77.6
7210*	*Cladium mariscus* fens	31.5	<1	Favourable.	Maintenance of optimal water level. Mowing of reeds.	31.5	

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7230	Alkaline fens	137.9	1.3	Poor.	Non-intervention.		137.9
7140	Transition mires and quaking bogs	18.0	<1	Poor.			18.0
7120	Degraded raised bogs	65.3	<1	Bad.	Research of hydrological regime. Development of a building project; hydrological regime stabilization in Nida Mire. Ditch blocking or filling. Prevention of the influence of the current peat extraction sites (waterproof sheeting between the peat extraction fields and the bog etc.). Development of a recultivation plan; implementation of recultivation including flooding of peat milling fields after the peat extraction is finished (re-naturalization).		65.3
7110*	Active raised bogs	1081.8	10.0	Poor.	Hydrological research; development of a construction project; hydrological regime stabilization in Nida Mire; ditch blocking or filling). After that – non-intervention.	1081.8	
6510	Lowland hay meadows	5.19	<1	Bad.	Restoration. Maintenance.	5.2	5.2
6450	Northern boreal alluvial meadows	8.28	<1	Bad.	Restoration. Maintenance.	7.0	8.3
6410	*Molinia* meadows	36.45	<1	Poor.	Restoration. Maintenance.	31.0	36.5
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	19.21	<1	Poor.	Restoration. Maintenance.	6.2	19.2

One-time grassland restoration measures are necessary but the total area which must be restored is unknown as data of nature management plan are outdated – extensive grassland management projects have been implemented since its development, and also land use changes have occurred, such as repeated abandonment or building construction. The total area which must be restored is planned to be in the range of 300 to 800 ha, depending on the current condition of the grassland. It is expected that recent inventory will find that part of extensively managed cultivated grasslands, for example, territories of year-round grazing, already meet the criteria of EU protected grassland habitats.

Piejūra | *Nature Park (LV0301700)*

1. Brief description



YEAR OF FOUNDATION: 1962.

LOCATION: Rīga City, Carnikava municipality, Saulkrasti municipality.

AREA: 4315 ha.

NATURE MANAGEMENT PLAN: 2004 (2004–2015), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 204 of 14 March 2006, Regulation on Individual Protection and Use of Piejūra Nature Park.

Piejūra Nature Park is located on the coast of Gulf of Rīga, occupying about 7 % of the total length of the Latvian coastline - a 36 km long and 0.5 - 2 km wide belt from Vakarbulli to Inčupe, and includes mouths of three large rivers - Lielupe, Daugava and Gauja. The territory is important for the protection of rare coastal habitats – coastal meadows, embryonic shifting dunes, white dunes, grey dunes, wooded dunes, coastal lagoons, rivers, and mesotrophic lakes. The coastal landscape is dynamic, with visually impressive dune terrain and multi-aged pine woodlands with trees which are buried in sand in some places. Forests are very diverse – from new plantations to old, biologically very valuable woodlands. Protected forest habitats occupy 10% of the territory of nature park. White dunes (Shifting dunes along the shoreline with *Ammophila arenaria*) with one of the broadest width in Latvia are located in the territory. Sand pink *Dianthus arenarius* can be found in grey dunes and wooded dunes.

Nature park is the third most important Natura 2000 territory in Latvia for the conservation of habitat type 1630* *Boreal baltic coastal meadows* (this habitat type is found only in six Natura 2000 sites in Latvia). Coastal meadows are an important habitat for protected plant species such as *Trifolium fragiferum*, *Glaux maritima, Taraxacum palustre, Armeria maritima*, and others. This is also one of the few localities of *Angelica palustris* in Latvia. In general, nature park is the most important Natura 2000 territory for the provision of landscape-ecological connectivity for grasslands and coastal habitats, as an important part of the Eastern Baltic species distribution corridor along the Baltic Sea coast.

There are 27 protected plant species found in the nature park. *Lobelia dortmanna* and *Isoëtes* spp. grow in Lake Ummis, which is one of the most outstanding *Lobelia-Isoëtes* lakes in Latvia and the Baltic states. Several rare bat species have been observed at Lake Garezers. Bird species which are typical for open and wooded coastal dunes can be found in the nature park, such as *Anthus campestris* and *Lullula arborea*, as well as *Sterna albifrons*. Daugavgrīva Island, Lielupe river mouth and grasslands of the left bank of Gauja river, as well as oxbow lakes, are the most important sites for birds as they provide suitable conditions for rare species of waterbirds and waders. In total, 15 bird species are found in the nature park that are protected in Latvia. There are also 36 protected invertebrate species, the most important are *Ergates faber, Nothorina punctata, Chalcophora mariana, Bembix rostrata,* and *Leucorrhinia albifrons*.

2. Threats to habitat and species conservation

- Anthropogenic load caused by vacationers and tourists is the main threat to the biodiversity of the sensitive coastal habitats. Too high anthropogenic load, including excessive vehicle use, causes the depletion of living groundcover, eutrophication, threatens natural structure and species composition of open dunes.
- Lakes (Ummis and Garezeri) of the nature park are particularly adversely affected by anthropogenic load which promotes nutrient runoff, development of algae and emergent vegetation, and the overall deterioration of quality of lakes.
- Grassland habitats degrade, overgrow with trees, shrubs or reeds (*Phragmites australis*) due to management cessation.
- Semi-natural grasslands are threatened by establishment of lawns or building construction in their territories.
- Diversity of grey and wooded dunes, lagoons and coastal grasslands is threatened by the spread of invasive plant species.
- Bird diversity is adversely affected by the overgrowing of grasslands, the “cleaning” of forest habitats by removal of dead wood, as well as by direct disturbance caused by humans (including their unleashed dogs) during the breeding and staging.

- Biodiversity and structure of woodlands is threatened by removal of dead wood, gradual logging of old forests, as well as ground vegetation damage by vehicles, trampling, and waste disposal.
- Areas of natural habitats decrease and become fragmented due to building construction.

3. Existing management of the protected habitats and its assessment

- From 2002 until 2006 in the framework of EC LIFE programme project "Protection and Management of Coastal Habitats in Latvia" (LIFE02NAT/LV/008498) grasslands were restored in an area of 86 hectares by mowing and grazing. The abatement of *Rosa rugosa* and *Amelanchier spicata* was carried out. Infrastructure elements (car parks, picnic sites, boardwalks, stairs, barriers) were constructed. The management was beneficial for the provision of habitats for coastal species and for the vitality of their populations. The grazing in Daugavgrīva is still continued in year 2017.
- Since 2010, the Rīga City Council is supporting the management of grasslands in Buļļi Island in an area of 37 hectares (by mowing, pasturing, in some sites also by felling of shrubs and by elimination of invasive plant species).
- From 2016 until 2020 in framework of EC LIFE programme project "Coastal Habitat Conservation in Nature Park "Piejūra"" (LIFE15 NAT/LV/000900) the restoration of coastal habitats (coastal grasslands, grey dunes, lagoons, etc.) will be carried out; the distribution of invasive species will be restricted. Nature management plan and visitor movement management plan will be developed. Infrastructure objects for the reduction of anthropogenic pressure will be established.
- According to Rural Support Service, in 2014 grasslands in the nature park were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Conservation of area, quality and diversity of natural habitats. Conservation of lakes (Ummis, Garezeri), undisturbed forests, white dunes, grey dunes and coastal grasslands is a priority.
- Reduction of the influence of anthropogenic load (caused by the large amount of visitors) on the sensitive coastal ecosystems by creation of the appropriate infrastructure.
- Conservation of diversity of grey dunes, lagoons and coastal grasslands by abatement of invasive species.
- Maintenance and restoration of the area and quality of semi-natural grassland habitats by providing the necessary management.

5. Necessary management and conservation measures

5.1. General measures

- Development of a new nature management plan and Individual regulations on protection and use for the territory.
- Repurchasing of land properties which are the most important for habitat and species conservation.
- Establishment and maintenance of infrastructure elements (boardwalks, toilets, waste bins, restricting barriers, picnic sites, car parks) for the reduction of anthropogenic load – for the reduction of groundfloor degradation, eutrophication, for the conservation of natural structure and species composition in coastal forests and open dunes. The most urgent territories - Buļļu Island, Vecāķi, Kalngale, Mežciems, Carnikava, Lilaste, Inčupe.
- Development and implementation of management plans for lakes Ummis and Garezeri.
- Redirection of vacationers from lakes Ummis and Garezeri by maintenance of access and infrastructure to water bodies located outside the nature park.
- Implementation of flood management plan for river mouths and flooded areas, balancing and, at the same time, preserving the natural values.
- Habitat mapping for the assessment of *Lobelia – Isoëtes* complex. In Lake Ummis – evaluation of the necessity and possible influences of mowing of emergent macrophytes.
- Improvement of the spatial planning documents of Rīga, Carnikava and Saulkrasti municipalities for a purposeful conservation of the nature park.
- Inventory of semi-natural grasslands according to the newest methods. It is expected that the area of habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels* is smaller, and part of it corresponds to criteria of alluvial grasslands. Particular attention should be paid to identification of habitat type 6120* *Xeric sand calcareous grasslands* because the previous inventory was based on outdated methods and this habitat type was often included in other habitat types.
- Restoration of semi-natural grasslands in maximum possible area, and maintenance in favourable conservation status. Restoration of habitat types 1630* *Boreal baltic coastal meadows,* 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe),* 6210 *Semi-natural dry grasslands and scrubland facies*

on calcareous substrates (Festuco-Brometalia), and 6120* *Xeric sand calcareous grasslands* is the priority.

- Development and implementation of grassland restoration and management plan. Plan should include also innovative solutions for grassland management and use, as the development of conventional agriculture in the territory is not expected. The high level of habitat fragmentation indicates that the current area can not ensure favourable conservation status for grasslands in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas (including areas overgrown with reeds) must be considered. Restoration of currently remained grasslands is the priority.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	65.7	1.5	Poor.	Non-intervention.		65.7
9080*	Fennoscandian deciduous swamp woods	54.5	1.3	Favourable.	Non-intervention.		54.5
7140	Transition mires and quaking bogs	5.0	<1	Poor.	Non-intervention.		5
7110*	Active raised bogs	0.7	<1	Bad.	Non-intervention.		0.7
6000	Grasslands to be restored	25.0	<1	-	Restoration. Maintenance.	25.0	25.0
6510	Lowland hay meadows	1.27	<1	Bad.	Restoration. Maintenance.	1.27	1.27
6450	Northern boreal alluvial meadows	5.13	<1	Bad.	Restoration. Maintenance.	5.13	5.13
6430	Hydrophilous tall herb fringe communities	10.93	<1	Poor.	Restoration. Maintenance.	10.93	10.93
6230*	Species-rich *Nardus* grasslands	1.14	<1	Bad.	Restoration. Maintenance.	1.14	1.14
6210	Semi-natural dry calcareous grasslands	8.44	<1	Bad.	Restoration. Maintenance.	8.44	8.44
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.03	<1	Bad.	Restoration. Maintenance.	0.03	0.03
3260	Natural river reaches and river riffles	25.0	<1	Poor.	Implementation of Langa river cleaning project (in order to decrease flood risk).	2.0	

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	26.0	<1	Poor.	Mowing of emergent macrophytes; restoration of shallow littoral zones in some lagoon lakes (for the attraction of migratory waders at mouths of Daugava and Gauja rivers). Cleaning of an ancient lake bed in Vakarbuļļi.	5.0	
3130	*Lobelia-Isoetes* lakes	25.0	<1	Poor.	Avoiding the establishment of new recreation places or extension of existing ones. Redirection of visitors to other lakes outside the nature park.	25.0	
2320	Dry heaths	4.0	<1	Favourable.	Non-intervention.		4
1310	Annuals colonising mud and sand	3.0	<1	Favourable.	Non-intervention.		3
91E0*	Alluvial forests	20.1	<1	Poor.	Restriction of invasive plant species.		3
2180	Wooded dunes	3022.9	70.1	Poor to favourable.	Improvement of stand structure (primarily in new plantations) – establishment of groups, openings, canopy gaps, preserving of large trees.	100	
2130*	Grey dunes	153.0	3.5	Bad to poor.	Felling of trees. Restriction of invasive species.	30	
2120	White dunes	193.0	4.5	Poor to favourable.	Strengthening. Limitation of coastal erosion (rows of woven branches and willow (*Salix* spp.) plantings. In some places – felling of shrubs.	10 10 10	
2110	Embryonic dunes	42.0	1.0	Poor.	Erosion prevention (fences, woven branches, etc.).	2	
1630*	Coastal meadows	22.08	<1	Bad.	Restoration. Maintenance.	22.08	22.08

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
1210	*Salicornia* and other annuals colonising mud and sand	0.3	<1	Poor.	Non-intervention.		0.3
1150*	Coastal lagoons	13.0	<1	Poor.	Cleaning; reduction of overgrowth (reed mowing). Abatement of invasive species.	3	

Semi-natural grasslands must be restored in maximum possible area – at least 74 hectares, including historical areas of grasslands, currently overgrown with shrubs, new forests, or reedbeds (in moist sites). Potential restoration sites are indicated in nature management plan of 2004. However, the plan is outdated, therefore restoration sites must be clarified during the development of grassland restoration and management plan. It is important for this plan to evaluate the restriction of invasive species (*Amelanchier spicata, Rosa rugosa*), and the restoration of local drainage systems (shallow ditches) in order to ensure management.

Pinku ezers | *Nature Park (LV0303800)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Kuldīga municipality Ēdole rural territory.

AREA: 161 ha.

NATURE MANAGEMENT PLAN: 2004 (2004–2014).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 810 of 27 November 2012, Regulation on Individual Protection and Use of the Pinku Ezers Nature Park.

Pinku ezers Nature Park includes a range of lakes with adjoining agricultural lands and forests. The largest one of them is Pinku Lake (Piņķezers), and the smallest are Bezdibenis and Veprezers Lakes. Bezdibenis Lake can be considered as an overgrowing part of Pinku Lake. In the Soviet times, a pig shed was built on the bank of the Veprezers Lake. There are three artificial water bodies in the territory, which are located in the terrain depressions at the old manor. The largest one of them, Šarlote Pond, receives water from the nearby mire.

The area is important from the geomorphological point of view as lakes are located in one of the few subglacial valleys in Western Kurzeme Upland. There are visually impressive abrasion cliffs in the northern part of it.

Five EU protected habitat types have been found in the nature park. The territory is important for the protection of natural eutrophic lake with rare plant communities. Pinku Lake is one of the three *Lobelia-Isoëtes* lakes in Western Latvia and one of the few lakes with localities of protected species *Myriophyllum alterniflorum* and *Littorelletea uniflorae*.

Ponds of the nature park are one of the most abundant localities of *Ricciocarpos natans* in Latvia. *Ciconia nigra* is foraging at Šarlote Pond. Moss, lichen and mushroom species characteristic for woodland key habitats are found in the old conifer forests of the territory.

2. Threats to habitat and species conservation

- Eutrophication of lakes, promoted by nutrient inflow from Šarlote Pond, as well as by waste water from holiday houses and saunas on the shore of the lake, and by agriculture with use of mineral fertilizers and pesticides on the southern coast of Pinku lake.
- Municipal waste, unorganised flow of holidaymakers, especially on the north-east coast of Pinku Lake.
- Further upgrading of the level of visitor infrastructure and parking capacity near the Pinku Lake can lead to significant increase in anthropogenic load and can cause irreversible deterioration of the quality of the lake.
- Intense fish farming with feeding in Pinku Lake.
- Forestry activities that result in the removal of old trees and dead wood.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- The tourism concept development and establishment of infrastructure for organizing the flow of visitors with aim to maximally decrease the inflow of nutrients in Pinku Lake and its deterioration.
- Undisturbed natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Ensure toilets with hermetically sealed tanks at picnic sites on the shores of Pinku Lake.
- Eliminate intensive fish farming with feeding (can be allowed only in Veprezers Lake).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	25.5	15.8	Poor.	Non-intervention.		25.5
91D0*	Bog woodland	1.5	<1	Favourable.	Non-intervention.		1.5
3160	Natural dystrophic lakes and ponds	0.6	<1	Poor.	Bezdibenis Lake. Non-intervention.		0.6
3150	Natural eutrophic lakes	3.0	1.9	Poor.	Veprezers Lake – removal of fallen logs. Šarlote Pond – removal of fallen logs; cleaning; establishment of sedimentation pond or straw filters downstream of the water flow regulator of Šarlote Pond, with aim to accumulate organic nutrients coming from the pond. Nabagu Pond – non-intervention.	3.0	
3130	Lobelia-Isoetes lakes	28.7	17.8	Poor.	Organize bathing sites and recreation flows. Avoid letting *Carassius carassius* in the pond and feeding. Remove trees bent over the Pinku Lake; randomly remove shrubs on the shore, with the aim of reducing the amount of organic nutrients associated with leaf and twig litter entering the Pinku Lake. Maintain optimal water level in Pinku Lake.		0.1

Ragakāpa | *Nature Park (LV0303300)*

1. Brief description

YEAR OF FOUNDATION: 1962.

LOCATION: Jūrmala Town.

AREA: 150 ha.

NATURE MANAGEMENT PLAN: developed in 2004 (2004–2010), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 702 of 10 August 2004, Regulation on Individual Protection and Use of Ragakāpa Nature Park.

Ragakāpa Nature Park includes the southern part of the Gulf of Rīga coast, with one of the highest tertiary dunes in Latvia – Ragakāpa Dune (height 12-17 m) which is covered with old pine (*Pinus sylvestris*) forest. There is a variety of coastal habitats – wooded dunes, embryonic shifting dunes, shifting dunes along the shoreline with *Ammophila arenari*a (white dunes), *Salicornia* and other annuals colonising mud and sand, and a very rare habitat for sandy beaches - annual vegetation of drift lines.

Protected plant species in the nature park include *Dianthus arenarius* ssp. *arenarius, Atriplex calotheca, Botrychium matricariifolium, Platanthera bifolia, Platanthera chlorantha, Pulsatilla pratensis*, and others. Protected mushroom species *Phallus hadriani* can be found in dune sands. The territory is important for several bird species, for example, *Columba oenas, Dryocopus martius, Lullula arborea, Anthus campestris*. The old pines are suitable habitats for rare and protected invertebrate species - *Nothorhina punctata, Ergates faber, Tragosoma depsarium, Prionus coriarius*. Two noble trees (large trees whose size meet the criteria set in Regulation of the Cabinet of Ministers) grow in the northern slope of Ragakāpa Dune – Pine King and Pine Queen. These trees are a potential habitat for rare invertebrate species. The nature park has a high value of nature conservation and recreation.

2. Threats to habitat and species conservation

- The large number of inhabitants in the surrounding area and vacationers creates an excessive anthropogenic load on dune habitats and species, causing groundfloor trampling and erosion.
- Beach habitats are destroyed and their area is significantly decreased due to gathering and removal of sea drifts, as well as bulldozing of sands.
- Eutrophication of wooded dunes, caused by several factors, including:
  - relocation of sand and drifts from beach to wooded dunes;
  - contamination with municipal waste.
- Expansion of shrubs in wooded dunes. Shrub species include both local and invasive species such as *Amelanchier spicata, Cotoneaster lucidus, Rosa rugosa, Elaeagnus commutata*.

3. Existing management of the protected habitats and its assessment

- Invasive species have been felled in nature park in a small area; the measure must be continued with larger intensity.
- In order to reduce anthropogenic load on habitats, the visitor infrastructure in territory has been constructed and maintained – boardwalks, trails, observation platforms, barriers, information signs.
- Formerly, willows (*Salix daphnoides*) have been planted in the white dunes, in order to decrease wind erosion and sand blowing. The developed dune ridge acts as a barrier, and it slightly changes the shape of accumulative coast – wind blown sand is stopped in front of the obstacle, and the dune is protected from wind erosion.

4. Priorities of management and conservation

- More intense abatement of invasive species in wooded dunes.
- Strengthening of slopes against erosion.
- Non-intervention in coastal processes: bulldozing of beach, gathering and removal of drifts and transformation of beach terrain must be discontinued.
- Undisturbed course of natural processes in forest, open dune and beach habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Regular removal of municipal waste in order to reduce eutrophication; dumping of sea drifts and litter in dunes can not be allowed. Toilets and garbage bins must be established at car parks as specified in nature management plan.
- Update the functional zoning of the nature park in order to integrate it into the regulations for the management, hygiene and establishment of bathing sites in Jūrmala Town.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
2180	Wooded dunes	107.28	71.5	Poor.	Restriction of invasive species (felling, digging out). Felling of understory (in three steps). Strengthening part of dune slope with woven pine or spruce twigs. Creation of canopy gaps in new forests.	Area must be specified on site.	
2120	White dunes	13.9	9.3	Bad.	Cutting of willows at a height of 40-60 cm; every 5 years and depending of their regrowth rate. Removal of drifts bulldozed in foredunes.	Area of row of willows.	
2110	Embryonic dunes	7.4	4.9	Favourable to poor.	Non-intervention.		7.4
1310	Annuals colonising mud and sand	4.9	3.0	Poor.	Non-intervention.		4.9
1210	Annual vegetation of drift lines	0.3	<1	Bad.	Non-intervention.		0.3

Riežupe | *Nature Park (LV0301100)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Kuldīga municipality Rumba rural territory.

AREA: 452 ha.

NATURE MANAGEMENT PLAN: developed in 1997; not updated.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE AREAS: Riežupes Smilšalas Geological and Geomorphological Nature Monument.

Riežupe Nature Park includes a valley of Riežupe river and its side-ravines, with forests on slopes, small areas of alluvial forests in the floodplain, river riffles, and semi-natural dry calcareous grasslands. There are Riežupe Smilšalas - sand caves which are the longest artificial caves in Latvia, with a total length of 460 m. They are excavated in sandstone and are important hibernation site for bats in Kurzeme Region. During the monitoring of hibernating bats, the most recorded species is *Myotis daubentoni*. Also *Myotis dasycneme* and *Plecotus auritus* are hibernating here.

Forests on slopes are rich in protected plant species – *Bromopsis benekenii, Cardamine flexuosa, Arctium nemorosum, Corydalis cava, Dentaria bulbifera* and others. *Gymnadenia conopsea, Crepis praemorsa, Iris sibirica* can be found in grasslands. There is a large variety of rare species of birds, including *Bonasa bonasia* and four species of woodpeckers. Riežupe river is an important habitat for *Lutra lutra, Unio crassus, Cottus gobio* and *Lampetra planeri*. It is also a spawning site for *Salmo trutta* and *Lampetra fluviatilis*. For *Lampetra planeri* it is intended to develop a species conservation plan.

Semi-natural grasslands cover a very small area, but they play an important role as stepping stones for species dispersal, species propagation areas, improving the functioning of the Venta river valley as a landscape-ecological corridor.

In the nature park there are large, solitary growing oaks (*Quercus robur*) in the size of noble trees (trees whose size meet the criteria set in Regulation of the Cabinet of Ministers). They are potential habitats for rare and protected species of invertebrates, such as *Osmoderma barnabita*.

2. Threats to habitat and species conservation

- For early wintering bat species entering hibernation state, visitor presence in Smilšalas Caves can be dangerous from the beginning of October till the end of April.
- The walls of Smilšalas Caves are unstable and can collapse if they are not strengthened. Visitors mechanically rub the walls when large groups of people enter the caves in summer.
- Sandstone outcrops are small and unstable. Natural erosion prevents the development of carpet of mosses and lichens.
- Protected woodland habitats, the abundance and diversity of their associated structures decrease due to forestry operations. As a result, the fragmentation of boreal forests in the region is promoted.
- Discontinuation of management of grasslands. They rapidly degrade and may disappear within the next 10-15 years.
- Water quality in river is negatively affected by beavers (*Castor fiber*) causing the degradation of populations of *Unio crassus* and *Lampetra* spp.
- Nature park is located in the immediate vicinity of Kuldīga town. Riežupe river coasts and woodland habitats are threatened by anthropogenic load due to development of picnic sites and cycling paths.

3. Existing management of the protected habitats and its assessment

- Fallen logs have been removed from river riffle areas, in order to prevent sedimentation and to restore potential spawning grounds for salmonids, and to increase a mosaic of micro-habitats.
- Strengthening of entrance and walls has been carried out in Smilšalas Caves. The last major tasks were carried out until 2010 when the wall was strengthened on both sides of the entrance. Caves where fast destruction can be observed are limited to visitors. This has reduced the wall erosion and disturbances in this part. Caves are closed, and visits are possible only with the permission of the owner. In recent years there are no visits in the winter, which has reduced the disturbance of hibernating bats and has contributed to the increase in their amount.

- According to Rural Support Service, in 2014 47 % of the currently known area of semi-natural grasslands was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Maintenance of Smilšalas Caves in a condition which is suitable for hibernation of bats.
- Undisturbed course of natural processes in slope forests which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Establishment of future habitats in plantations of coniferous trees.
- Restoration of semi-natural grassland habitats in their maximum historical area (middle of the 20th century); their maintenance in favorable conservation status.
- Provision of migration and spawning possibilities for salmonids and lampreys, and habitats suitable for *Unio crassus*.

5. Necessary management and conservation measures

5.1. General measures

- Closure of caves with no visitors allowed from October to May, except for the research and monitoring of hibernating bats. Maintenance of cave entrances and walls in a condition which maximally protect them from collapse, in order to provide hibernation site for bats in a long term.
- Inventory of currently known semi-natural grasslands and historical grassland areas which currently are overgrown with shrubs and forest. Development of grassland restoration and maintenance plan.
- Development of Nature management plan, which must include the evaluation of anthropogenic load on protected habitats, and the assessment of the maximum allowable load.

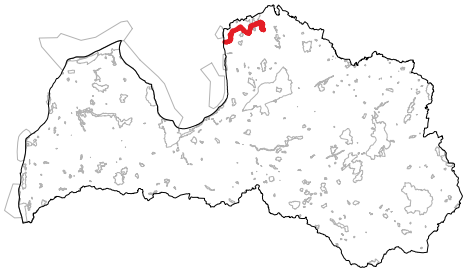
5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	36	8.0	Poor.	Non-intervention.		36
9010*	Western Taïga	11.8	2.6	Bad.	Non-intervention. Planning of fragmentation reduction measures.		11.8
9000	Potential Protected woodland habitat	100.0	22.1	-	Non-intervention. Selective felling for the creation of future habitats, improvement of structure – creation of dead wood if trees in the woodland are large enough.	20.0	80.0
8310	Caves not open to the public	0.03	<1	Poor.	Strengthening of walls and entrance of caves in order to conserve hibernation place for bats. Allowing no visitors in caves from early October to late April.		0.03

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
8220	Siliceous rocky slopes	0.13	<1	Favourable.	Non-intervention.		0.13
7220*	Petrifying springs	0.13	<1	Favourable.	Non-intervention.		0.13
7160	Fennoscandian mineral-rich springs and springfens	0.2	<1	Favourable.	Non-intervention.		0.2
6210	Semi-natural dry calcareous grasslands	15.3	3.4	Bad.	Maintenance. Restoration.	8.1	15.3
3260	Natural river reaches and river riffles	0.5	<1	Poor.	Removal of large woody debris and restoration of salmonid migration possibilities at "Mežvalde – Ķūķciems" road bridge over the Riežupe. Removal or reduction of large woody debris created by beavers in sites were they promote coastal erosion or in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality		0.5
91E0*	Alluvial forests	2.8	1	Favourable.	Non-intervention.		2.8

Salacas ieleja | *Nature Park (LV0302200)*

1. Brief description



YEAR OF FOUNDATION: 1977.

LOCATION: Salacgrīva municipality Salacgrīva town with rural territory and Ainaži town with rural territory; Aloja municipality Staicele town with rural territory; Mazsalaca municipality Ramata and Skaņkalne rural territories and Mazsalaca town with rural territory.

AREA: 6251.5 ha.

NATURE MANAGEMENT PLANS HAVE BEEN DEVELOPED SEPARATELY FOR THREE PARTS OF THE TERRITORY:

- 2005 „Mazsalaca – Staicele" and „Salacgrīva" (2005–2019).
- 2005 „Staicele – Rozēni" (2005–2019).
- 2005 „Rozēni - Mērnieki" (2005–2014); validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 228 of 10 May 2009, Regulation on Individual Protection and Use of the Salacas Ieleja Nature Park.

Salacas Ieleja Nature Park includes the Salaca River with its valley and slopes, as well as the adjacent bedrock coast territories, bringing together natural and landscape values, as well as and cultural and historical values. In the river section from Mazsalaca town to Staicele town, the valley is less transformed by economic activities, and its slopes are covered by forest. In the rest of the territory a landscape mosaic is characteristic, open landscapes in river valley and surroundings are alternating with larger and smaller woodlands. Valley section from Staicele to Rozēni includes expressed river bends with steep banks in some places and gently sloping in others. In the nature park there are mostly dry pine (*Pinus sylvestris*) and spruce (*Picea abies*) forests, and also mixed deciduous forests in some areas.

On terraces and gentle slopes of Salaca valley there are semi-natural grasslands which have been mown or grazed for a long time. Although the grasslands are small in size, they are diverse and form a mosaic of various habitats in one area. The most common ones are lowland species-rich dry to mesic grasslands, lowland hay meadows and dry grasslands on calcareous substrates. In some areas, features of former wooded grasslands can be observed. There are rows of old trees along the banks of Salaca, as well as solitary wide-crowned broadleaved trees.

The territory is the second most important for the protection of habitat type 6230* *Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* (includes 8 % of the habitat area in Natura 2000 network) in Latvia. It is among the 15 most important Natura 2000 sites for the protection of habitat types 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) and 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*, according to their proportion in Natura 2000 network. The territory is one of the most important areas in the North-Vidzeme Geobotanical District for the provision of landscape-ecological integrity, as a core area and species migration corridor.

Important nature values are associated to old alleys and parks; they serve as habitats of several rare and protected species. Many of the river reaches have an outstanding landscape value, especially in the surroundings of Mazsalaca at Skaņaiskalns, downstream of Staicele, Mērnieku riffles and Sarkanās Klintis (The red cliffs). The territory is also important from a geological point of view (Pietraga Sarkanās Klintis, Dauģēnu rocks and caves, Neļķu Klintis and caves, Silmači rock and caves, Dzelveskalns outcrops and caves, etc.).

There are 18 EU protected habitat types in the nature park. The most important habitats are sandstone outcrops (*Siliceous rocky slopes with chasmophytic vegetation*), caves not open to public, forests of slopes, mineral-rich springs and springfens, river riffle areas, and dry grasslands on calcareous substrates.

The territory is important for many protected species: there are 18 protected species of plants, 20 bird, 38 invertebrate, 16 mammal, four amphibian and 12 fish species.

The most important plant species in the territory are *Gymnocarpium robertianum, Primula farinosa, Dactylorhiza baltica, Allium ursinum, Lunaria rediviva*. The following bird species should be mentioned: *Bonasa bonasia, Ciconia nigra, Tetrao urogallus, Alcedo atthis, Crex crex, Lullula arborea, Lanius collurio, Dendrocopos medius, Picus canus*. Of invertebrates, important species are *Osmoderma barnabita, Unio crassus, Liocola marmorata, Ancylus fluviatilis, Leucorrhinia pectoralis, Ophiogomphus cecilia*.

For the spawning of Atlantic salmon *Salmo salar*, Salaca is the most important river in the entire Eastern-Baltic area. It is also important for spawning of *Salmo trutta m. trutta, Vimba vimba* and *Lampetra fluviatilis*. Also *Lutra lutra* is living in the territory.

Caves in Dauģēni Rock outcrops are among the most important natural bat wintering places in Latvia. The most important one is "The Great X" cave where the highest number of bats is observed. *Myotis dasycneme* and other species are hibernating here. However, the number of observed species is decreasing which may be due to the increased availability of the cave and microclimate changes promoted by the excavation of so called "dry" entrance. Therefore, the protection of bat populations is a priority in Mazsalaca-Staicele sector of the nature park.

2. Threats to habitat and species conservation

- Decrease of quality of western Taïga (old boreal forests) as a result of human activities – removal of dead wood, old, damaged and infested trees.
- Cessation of grassland management; overgrowth; increase of fragmentation.
- The basal part of the former Staicele paper mill dam is a mechanical obstacle for fish migration.
- Eutrophication of rivers and the overgrowth of river rapids with aquatic macrophytes causing the reduction of species diversity in the river and the area of fish spawning grounds. Water quality in river is influenced by the inflow of turbid water of Lake Burtnieks.
- Excessive and insufficiently organised tourism is threatening the sensitive habitats and species.
- "The Great X" cave, the main bat hibernation site, used to be accessible only from the river side, and the entrance was partly flooded. Recently, another entrance was excavated, and now the cave is accessible in any season from the terrestrial side. This so called "dry" entrance not only creates the possibility of disturbance during bat hibernation, but also makes the microclimate in the cave worse. If the temperature is lowered, cave is not suitable for bat hibernation. Moreover, cave is subjected to frost erosion.
- The population of *Osmoderma barnabita* in Salaca valley is most threatened by the development of shrubs around the old oaks. As a result, tree stems do not receive the amount of sunlight which is necessary for the development of larvae.
- Spread of invasive plant species *Heracleum sosnowskyi*.
- Spread of invasive invertebrates *Pacifastacus leniusculus* and *Eriocheir sinensis* in the lower reaches of Salaca.
- In the surroundings of Skaņaiskalns cliff, the site is managed and transformed for tourism needs, creating a potential threat to the nature values.

3. Existing management of the protected habitats and its assessment

- Within the scope of several projects, the restoration and maintenance in an area of ~ 30 ha was organised:
- 2007, "Biodiversity Protection in North Vidzeme Biosphere reserve", financed by United Nations Development Program and Latvian Environmental Protection Fund; 4 ha;
- 2009, project "Wetlivonia"; 30 ha;
- 2015, EC LIFE project "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371); 4 ha.
- However, the input of biogenes and sediments continues, and the beneficial effect of improvements disappears within 1-2 years.
- In 2012, wrapping of trunks of biologically valuable trees with a metal mesh was carried out in alluvial forests, in order to protect individual trees from beavers. This measure has a neutral effect on a habitat.
- According to Rural Support Service, in 2014 most of the grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 40% of the total area of habitat types 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) received the support. Only 16 – 20 % of 6450 *Northern boreal alluvial meadows*, 6230* *Species-rich* Nardus grasslands, *on siliceous substrates in mountain areas (and submountain areas, in Continental Europe),* and 6120* *Xeric sand calcareous grasslands* were managed in scope of this measure. Only the habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* was managed in a slightly larger area – 52 % of its total area in the nature park.
- Since 2015, with the support of the Salacgrīva City Council, the mowing of macrophytes in Salaca river was carried out in the area of 3 hectares. This area is assessed as insufficient. Also the applied method does not ensure the prevention of river overgrowth.

- In years 2014 and 2015, the outcrop of Dauģēni rocks was cleaned of shrubs and fallen logs (8220 *Siliceous rocky slopes with chasmophytic vegetation*).
- The trail in Dauģēni rocks was improved, cave ceilings were strengthened. Excess vegetation from sandstone outcrops was partly removed and insolation was improved. The established visitor infrastructure contributes to the increase in the number of visitors and may have a negative impact on habitats.

4. Priorities of management and conservation

- Mowing in riffle areas of Salaca river; restoration of fish spawning sites; improvement of conditions for migration. Area: 35 ha.
- Restoration of grasslands in their maximum possible area (including historical grasslands which are overgrown with *Alnus incana* in the river floodplain). Their maintenance in favourable conservation status. Restoration of habitat type 6230* *Species-rich* Nardus grasslands, *on siliceous substrates in mountain areas (and submountain areas, in Continental Europe*) is the priority.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Increase of proportion of broadleaved trees (especially *Ulmus glabra*) and decrease of proportion of *Alnus incana* in alluvial forests.
- Maintenance and potential increase of *Osmoderma barnabita* population by biotechnical measures (park and alley at Mazsalaca secondary school).
- Construction of infrastructure in sites where it is necessary for the safety of visitors and for the protection of sandstone outcrops.
- Reduction of visitor impact at Dauģēni rocks, by closing the main entrance to the cave.
- Removal of shrubs and fallen logs on sandstone outcrops.

5. Necessary management and conservation measures

5.1. General measures

- Amendments in the Individual regulations on protection and use providing non-intervention (including prohibition on sanitary felling and removal of dead wood) in EU protected forest habitat types – alluvial and riparian forests, forests on slopes, western Taïga.
- Inventory of grasslands; development of grassland restoration and management plan. The high level of habitat fragmentation indicates that the current area can not ensure grassland favourable conservation status in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered. Restoration of grasslands which were assessed as EU protected habitats in 2000s but currently are overgrown and does not correspond to criteria of EU protected habitats is the priority.
- Construction of the necessary infrastructure – barriers, trails, stairs, waste bins – in accordance to expert recommendations.
- Development of recommendations for the conservation of bat population in the long term, including recommendations on the necessary management measures in the nature park and microhabitats of species.
- Licensed catching in order to reduce the invasive species – *Pacifastacus leniusculus*. Its population has reached more than 16 000 individuals and is increasing.

5.2. Specific measures

5.2.1. Species

- For the conservation of *Osmoderma barnabita* – felling of shrubs around the inhabited and potentially inhabited trees (on necessity). Inventory of the potential habitats in nature park.
- The conservation status of *Salmo salar* is considered as poor, its polation size is about ~30 000 smolts. Necessary conservation measures include maintenance of spawning grounds.
- The conservation status of *Lampetra fluviatilis* is considered as poor. Necessary conservation measures include maintenance and restoration of spawning grounds.
- Measures for the conservation of outcrops, caves and bats at Dauģēnu cliffs, consulting the expert before the measures:
  - Filling of the recently excavated entrance, leaving only the entrance from the side of river (it is possible to enter cave via this entrance only during the dry season). It is necessary in order to provide suitable hibernation conditions for bats. For blocking the entrance, such method must be chosen which would reduce the possibility of excavating it again. It must also serve for thermal insulation. The construction of lockable doors or other unauthorized easily dismantled restrictions are not suitable as the rock is very loose and the breaking of doors may cause major damage to the outcrop and cave.

- Construction of a barrier on bedrock coast of the slope, limiting access to "The Great X" cave, at the same time also minimising erosion of the outcrop.
- At the base of the slope, at the cave entrance from the side of river, it is necessary to install information board, informing on the object and on the protection status of its species, as well as explaining the allowed behaviour in the cave. It is not recommended to block this entrance because the rock is loose. Moreover, the cave is almost inaccessible during the bat wintering because it is located under water.
- Installation of barriers at the roads leading to the forest, on the bedrock coast above the Daugēnu cliffs.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91F0	Riparian mixed forests	12.2	<1	Poor.	Non-intervention, except felling of *Alnus incana* in certain places for the increase of proportion of *Ulmus glabra*.		12.2
91D0*	Bog woodland	3.0	<1	Poor.	Non-intervention.		3.0
9180*	Slope forests	28.4	<1	Favourable.	Non-intervention.		28.4
9010*	Western Taïga	162.1	2.6	Bad.	Non-intervention.		162.1
91E0*	Alluvial forests	196.4	3.1	Favourable.	Non-intervention.		196.4
9000	Potential Protected woodland habitat	253.8		-	Non-intervention. Reduction of *Alnus incana* proportion by selective thinning in alluvial forests.	55.8	108.0
8310	Caves not open to the public	0.28	<1	Poor.	Non-intervention. Establishment of the necessary infrastructure elements on necessity, according to expert recommendations.		0.28
8220	Siliceous rocky slopes	0.5	<1	Favourable.	Establishment of the necessary infrastructure elements. Removal of fallen logs on outcrops.	On necessity, according to expert recommendations.	
7220*	Petrifying springs	0.03	<1	Favourable.	Non-intervention.		0.03
7160	Fennoscandian mineral-rich springs and springfens	10.2	<1	Favourable.	Non-intervention.		10.2

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6510	Lowland hay meadows	29.1	<1	Bad.	Restoration. Maintenance.	At least 18.0	29.1
6450	Northern boreal alluvial meadows	7.3	<1	Bad.	Restoration. Maintenance.	At least 6.1	7.3
6430	Hydrophilous tall herb fringe communities	1.4	<1	Bad.	Restoration. Maintenance.	0.0	0.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	89.8	1.4	Poor.	Restoration. Maintenance.	At least 43.3	89.8
6230*	Species-rich *Nardus* grasslands	12.2	<1	Bad.	Restoration. Maintenance.	At least 9.0	12.2
6210	Semi-natural dry calcareous grasslands	15.9	<1	Bad.	Restoration. Maintenance.	At least 10.0	15.9
6120*	Xeric sand calcareous grasslands	2.6	<1	Bad.	Restoration. Maintenance.	At least 2.1	2.6
6000	Grasslands to be restored	100.0	1.6	-	Restoration. Maintenance.	100.0	100.0
3260	Natural river reaches and river riffles	310	5.0	Poor.	Removal of large woody debris and beaver dams in tributaries of Salaca river (Korģe, Norēnupīte, Melnupe, Pužupe, Glāžupe, Iģe, Ramata, Ēkupe, Ķirele rivers) within the nature park. Mowing of macrophytes and removal of their roots in Salaca. Demolition of former Staicele dam or establishment of fishway for the restoration of salmonid migration to spawning sites upstream of Staicele, in Salaca and its tributaries.	3.0 35.0 (once per 2 – 5 years)	

There is detailed information on grassland restoration sites in the Nature management plan of 2005. However, grassland maps are outdated and do not provide information on the actual situation, and sites of restoration must be clarified during the new inventory of semi-natural grasslands. According to maps, there are large areas of grasslands in the territory which are not evaluated as EU protected grassland habitats but where restoration to semi-natural grasslands would be necessary for the decrease of fragmentation.

Sauka | *Nature Park (LV0300800)*

1. Brief description

YEAR OF FOUNDATION: 1987.

LOCATION: Viesīte municipality Elkšņi, Rite, Sauka rural territories.

AREA: 5603 ha.

NATURE MANAGEMENT PLAN: 2010 (2011–2021).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 547 of 16 September 2010, Regulation on Individual Protection and Use of Sauka Nature Park.

Sauka Nature Park includes Lake Sauka and its surroundings, with a characteristic terrain of Sēlija (Selonia) interlobate heights. Its highest point is Ormaņkalns Hill (165 meters above sea level). Nature park is one of the most scenically impressive territories in Latvia. Its main attraction is Lake Sauka, as well as the mosaic of woodlands and agricultural lands in a hilly landscape. There is also Lake Klauce and Klauce river which connects Sauka and Klauce lakes. Dry woodlands on hill tops and hill slopes occupy the most part of nature reserve. Natural wet and drained woodlands are located in interhill depressions. Large areas are covered by agricultural lands overgrown with *Alnus incana,* and by *Betula* spp., *Picea abies* and mixed woodlands. Young woodlands occupy large proportion of forest, and mature and old woodlands are rare.

There are 14 EU protected habitat types. The most important is Lake Sauka – natural eutrophic lake with *Magnopotamion* or *Hydrocharition* - type vegetation. Protected woodlands are small and fragmented, located in surroundings of Lake Sauka. Slope forests are found in small areas in surrounding of Ormaņkalns Hill. Grasslands of various types can be found in the nature park. The most important ones are 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* (22 % of the total area of habitat in Natura 2000 territories in Latvia) and 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) (1.5 %).

The territory is important for the conservation of grasslands in Central Latvia Geobotanical District, where protected nature territories with semi-natural grasslands are rare. Semi-natural grasslands are important for the preservation of characteristic landscape of the nature park. From landscape-ecological point of view, this territory is a part of species distribution corridor which is important in the eastern part of Europe. It consists of a series of uplands located in the north-south-west direction – Otepää and Haanja Uplands in Estonia, Latgale and Augšzeme Uplands in Latvia, Aukštaitija, Dzūkija and Sūduva Uplands in Lithuania, Suwałki Upland in Poland. Other important habitats in the territory are river riffles (water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation), Fennoscandian mineral-rich springs and springfens.

There are 42 rare and protected species including 11 species of plants, 13 bird, 14 invertebrate, four amphibian species. Protected plant species include *Agrimonia pilosa, Orchis mascula, Platanthera bifolia, Platanthera chlorantha, Dactylorhiza baltica, Trifolium dubium*. Of protected bird species, the most important ones are *Pernis apivorus, Tetrao tetrix, Aquila pomarina, Crex crex, Caprimulgus europaeus, Botaurus stellaris, Lanius collurio.* Protected invertebrates are, for example, *Osmoderma barnabita, Dorcus parallelopipedus, Liocola marmorata, Hirudo medicinalis*. The rarest amphibian species is *Triturus cristatus.*

2. Threats to habitat and species conservation

- Semi-natural grasslands and their species are adversely affected by discontinuation of management which promotes fragmentation and reduces the size and quality of species habitats.
- Spread of invasive plant species *Heracleum sosnowskyi.*
- *Osmoderma barnabita* population is threatened due to a possible lack of suitable habitats (large old trees) in the long-term.
- Due to terrain features and drainage system established in 20th century, water from large surrounding areas (mainly from agricultural lands) flow into Lake Sauka. Lake habitat quality is worsened by inflow of untreated or partially treated wastewater. Also there is no well-maintained bathing site at the lake.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in 2014 80-90 % of habitat types 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Habitat types 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) and 6450 *Northern boreal alluvial meadows* were not applied for the support. Management influence to grassland protection status has not been evaluated.
- Emergent aquatic macrophytes have been mown for the maintenance of bathing sites and boat tracks at some farmsteads and guest houses. Currently, a negative effect of these measures is not observed. After mowing, an open littoral zone is established which is beneficial for aquatic invertebrates, juvenile fish, and ducks.

4. Priorities of management and conservation

- Conservation of semi-natural grasslands in a favourable conservation status in an area of at least 122 hectares. Restoration of grasslands in at least 200 hectares, in order to promote landscape-ecological connectivity of habitats.
- Restriction and elimination of *Heracleum sosnowskyi* colonies.
- Development of microhabitats suitable for *Osmoderma eremita* by preserving large (at least 50 cm in diameter) broadleaved trees and cavity trees.
- Maintenance and extension of an open shallow-water zone, in order to create a warming-up littoral zone which is beneficial for aquatic invertebrates, juvenile fish, crayfish, ducks.
- Undisturbed course of natural processes in forest, aquatic and spring habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Elimination of *Heracleum sosnowskyi* (priority sites indicated in nature management plan): mowing several times in the summer, removing or otherwise destroying their roots, and preventing the ripening of seeds.
- Inventory of grassland habitats. The area of semi-natural grasslands in the nature park is significantly larger than it has been previously recorded.
- Development of grassland restoration and management plan. A well-grounded assessment on the minimal area of grasslands for their sustainable conservation is not provided in the nature management plan of 2011. The high level of habitat fragmentation indicates that the current area can not ensure grassland favourable conservation status in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered, as well as in old, extensively managed cultivated grasslands and fallow-lands.
- Potential extension of nature park: evaluation of inclusion of Dienvidsusēja river valley, from Nereta village to Elkšņi village, in order to ensure conservation of semi-natural grasslands.
- Increase of water aeration and self-purification in Lake Sauka by creation of wind-corridors. Openings in the woodland cover near the shore can be created by maintenance of scenically attractive viewpoints and parts of motorways (motorway V792 Lone–Sauka at northwestern part of lake; V820 Viesīte-Deši-Sauka-Rite at lake southwestern part; places at western and southern coast where there are public construction territories according to spatial plan). Agreements with landowners on the creation and accessibility of viewpoints.
- Prevention of untreated wastewater input from Sauka village into Klauce river and further into Lake Sauka (wastewater must be treated in accordance with the requirements of the regulatory enactments). Planning of wastewater collection and treatment solutions in case of new building construction or establishment of recreation facilities near the lake.

5.2. Specific measures

5.2.1. Species

Creation of habitats suitable for *Osmoderma eremita*. In many parts of the nature park there are old broad-leaved trees that have remained at old residential areas. The large-dimension and cavity trees must be preserved, as well as cavity trees which are suitable also for other invertebrate species. The old trees must be liberated (close growing shrubs and young trees must be removed, in order to ensure well-insolated conditions on tree trunk).

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	11.0	<1	Poor.	Non-intervention.		11.0
9080*	Fennoscandian deciduous swamp woods	38.8	<1	Bad.	Non-intervention.		38.8
9020*	Broad-leaved deciduous forests	34.1	<1	Bad.	Non-intervention.		34.1
9010*	Western Taïga	16.9	<1	Bad.	Non-intervention.		16.9
91E0*	Alluvial forests	0.3	<1	Bad.	Non-intervention.		0.3
7160	Fennoscandian mineral-rich springs and springfens	0.3	<1	Poor to bad.	Non-intervention.		0.3
6510	Lowland hay meadows	28.7	<1	Favourable.	Restoration. Maintenance.	Unknown.	28.7
6450	Northern boreal alluvial meadows	6.7	<1	Bad.	Restoration. Maintenance.	Unknown.	6.7
6410	*Molinia* meadows	0.4	<1	Bad.	Restoration. Maintenance.	Unknown	Unknown.
6430	Hydrophilous tall herb fringe communities	Unknown	-	Poor.	Restoration. Maintenance.	Unknown.	85.4
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	85.4	1.5	Favourable.	Restoration. Maintenance.	Unknown.	85.4
6210	Semi-natural dry calcareous grasslands	1.0	<1	Bad.	Restoration. Maintenance.	1.0	1.0
6000	Grasslands to be restored	200.0	3.6	-	Restoration. Maintenance.	200.0	200.0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3260	Natural river reaches and river riffles	1.9	<1	Poor.	Improvement of water discharge: removal or reduction of beaver dams and large woody debris in reaches with gravel or pebble substrate, or with flow velocity over 0.2 m/s. Improvement of water discharge in the area of Dūņupīte river outflow (Lake Sauka).	0.5 0.3	
3150	Natural eutrophic lakes	735.8	13.1	Poor.	Maintenance and increase of open littoral zone (free of reeds) in publicly available and private bathing sites and in boat rentals. Establishment of openings in a belt of near-shore trees and shrubs (in order to improve scenery).	1.0	

Silene | *Nature Park (LV0300400)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Daugavpils municipality, Demene and Skrudaliena rural territories.

AREA: 3825 ha.

NATURE MANAGEMENT PLAN FOR ILGAS NATURE RESERVE: 2007 (2008–2023).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE AREAS: Ilgas and Glušonkas purvs Nature Reserves.

Silene Nature Park includes Lake Riča and Lake Sila with their surrounding landscape. The territory is rich in forests, with small mires, larger and smaller lakes (24 lakes in total). Pērkule Bluff is especially scenically impressive. It is a cliff of Lake Riča that has remained unaffected by human activity. Forests of various types can be found in the nature park, mainly there are bog woodlands with *Pinus sylvestris*, woodlands of *Betula* spp., swamp woods with *Alnus glutinosa*, mixed *P. sylvestris* – *Picea abies* and *Picea abies* – *Betula* spp. woodlands. Grasslands in the area are mainly lowland species-rich dry to mesic grasslands and xeric sand calcareous grasslands, in small areas also alluvial meadows. Species which are very rare in Latvia can be found in the nature park - forest dormouse *Dryomys nitedula* (the only known locality in Latvia) and European fire-bellied toad *Bombina bombina*.

Within the Latgale Region, this is the second most important Natura 2000 site for the conservation of dry grasslands on calcareous substrates typical for Eastern Latvia.

The territory is important for the conservation of grasslands of South-eastern Geobotanical District, and semi-natural grasslands are very important for preserving the characteristic landscape of the nature park. From landscape-ecological point of view, this territory is a part of species dispersal corridor which is important in Eastern Europe. It consists of a series of uplands located in the north-south-west direction – Otepää and Haanja Uplands in Estonia, Latgale and Augšzeme Uplands in Latvia, Aukštaitija, Dzūkija and Sūduva Uplands in Lithuania, Suwałki Upland in Poland.

The territory includes Ilgas Nature Reserve – a small area which is very rich in species and habitats, and Glušonkas purvs Nature Reserve which includes two lakes (Glušņas and Glušonkas), surrounded by transitional mires and quaking bogs.

There are 14 EU protected habitat types found in the nature park. The most important ones of these are: oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* (Lake Riča), natural eutrophic lakes, bog woodlands, swamp woods, lowland species-rich dry to mesic grasslands, transitional mires and quaking bogs.

The most important bird species are *Bonasa bonasia, Ciconia nigra, Pernis apivorus, Crex crex, Dryocopus martius, Dendrocopus leucotos*, cīrulis *Lullula arborea, Anthus pratensis, Lanius collurio*, and others. Examples of rare and protected plant species are *Pulsatilla patens, Anemone sylvestris, Orchis morio, Iris sibirica, Lathyrus niger, Gladiolus imbricatus*. Transitional mires and quaking bogs along the shores of the Rudzīšu and Valenišķu Lakes are particularly important habitats – *Liparis loeselii*, moss *Hamatocaulis vernicosus*, and several other orchid species, such as *Dactylorhiza incarnata, Malaxis monophyllos* grow here.

Lake Riča is a habitat for a very rare and protected plant species – *Najas flexilis*, and other important species such as *Callitriche hermaphroditica* and *Scolochloa festucacea*. *Najas marina* and *Hydrilla verticillata* can be found in Lake Sila. Lakes are important foraging sites for several species of bats.

Ilgas Nature Reserve can be considered as one of the well-researched territories in Latvia regarding invertebrate fauna. At least 30 of the invertebrate species found in the nature reserve are considered to be very important at a national level, for example, *Osmoderma barnabita, Dytiscus latissimus*, and *Oxyporus mannerheimii*. Other important species are *Bombina bombina, Emys orbicularis, Triturus cristatus, Dryomys nitedula, Sicista betulina*.

2. Threats to habitat and species conservation

- Semi-natural grasslands and their species (including forest openings and relatively small wet depressions) are influenced negatively by management cessation

which promotes habitat fragmentation and reduces the area and quality of habitats of species.
- Increase in recreational intensity in the Lake Sila and its shores. Use of heavy-duty watercraft in the entire lake.
- Overgrowth with shrubs around Apaļais Pond. In the future this will increase shading to the pond which is a habitat of several protected species including *Dytiscus latissimus*.
- Invasive species of fish – Amur sleeper *Percottus glehni* has been found in watercourses of Ilgas Nature Reserve. It threatens aquatic amphibian and invertebrate species, including *Bombina bombina* population, by eating its spawn.
- Invasive plant species such as *Solidago canadensis, Heracleum sosnowskyi, Sorbaria sorbifolia* and *Rosa rugosa* are spreading in several grasslands, as well as in Ilgu Manor Park and its surroundings. They form monodominant stands and suppress local species.
- Logging (sanitary felling and thinning) causes forest habitat fragmentation, reduces their quality and connectivity. Timber transportation degrades ground vegetation.
- Erosion of Pērkuļi Bluff due to natural processes and recreational load.

3. Existing management of the protected habitats and its assessment

- For the maintenance of *Bombina bombina*, pond digging and cleaning existing watercourses (removal of vegetation) has been carried out.
- According to Rural Support Service, less than half of semi-natural grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands" in 2014: 36 % of the total area of 6510 *Lowland hay meadows*, 42 % of 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*, 14 % of 6450 *Northern boreal alluvial meadows*. 6120* *Xeric sand calcareous grasslands* have not been registered for this support. The impact of management on the conservation status of grasslands has not been evaluated.

4. Priorities of management and conservation

- Restoration and maintenance of semi-natural grasslands in a favorable conservation status, in an area of at least 150 ha.
- Improving the quality of lake habitats by reducing the overgrowth with emergent macrophytes. This will improve conditions for protected species in these habitats (*Najas flexilis, Bombina bombina*, bats).
- Maintenance of existing ponds and creation of new ponds, improving the habitat availability for invertebrates and amphibians.
- Promotion of the increase of *Bombina bombina* population.
- Promotion of the increase of *Dryomys nitedula* population by using appropriate methods of forest management.
- Restriction and elimination of invasive species.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Development of Individual regulations on protection and use which ensure reduction of fragmentation and conservation of habitats of protected species in forest. For example, forestry methods beneficial to *Dryomys nitedul* must be included - mechanized treatment of soil must be avoided; understory with *Corylus avellana* must be preserved and supported.
- Development of a Nature management plan for the entire park.
- Development of Lake management plan for Lake Silu, in order to ensure a balance between anthropogenic load and conservation of nature values.
- Restriction of the spread of invasive species; elimination of their stands.
- Inventory of semi-natural grasslands. Development and implementation of grassland restoration and management plan. Currently available grassland maps are outdated and do not show the current situation. The high level of fragmentation indicates that the current area can not ensure favourable conservation status of grasslands in the long run. In order to increase landscape-ecological connectivity of grasslands, the creation of semi-natural grasslands in their historical areas should be evaluated. Restoration of the currently remained grasslands is the priority.

5.2. Specific measures

5.2.1. Species

- In 2016, several rare snail species were found in the territory (*Vertigo angustior, Vertigo moulinsiana, Vertigo geyeri*) in habitat types 7140 *Transition mires and quaking bogs* and 6450 *Northern boreal alluvial meadows*. Distribution and population size of species must be studied, in order to specify alluvial grassland management measures for the favourable conservation status of rare snail species.
- For the conservation of *Emys orbicularis*: creation of open air fenced areas for adjustable population.
- For the conservation of *Dryomys nitedula*: installation of dormice nestboxes – about 10 boxes per year. Increase of proportion of *Corylus avellana* by selective cutting in even-aged woodlands (which have not reached the quality of protected habitat).
- For the conservation of *Bombina bombina*: Removal of shrubs and reeds in Apaļais Pond and newly-created habitats (once per 3-5 years, in a 2-20 m wide belt, from 1 October to 1 April). The distance from the water body to the nearest shrubs or trees should ensure that the water surface is not shaded during the day.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	202.0	5.3	Bad.	Non-intervention.		
9080*	Fennoscandian deciduous swamp woods	222.7	5.8	Bad.	Non-intervention.		
9020*	Broad-leaved deciduous forests	1.2	<1	Favourable.	Non-intervention.		
9010*	Western Taïga	128.4	3.3	Favourable.	Non-intervention.		
7140	Transition mires and quaking bogs	13.3	<1	Favourable.	Non-intervention.		
7110*	Active raised bogs	2.3	<1	Favourable.	Non-intervention.		
6510	Lowland hay meadows	1.3	<1	Bad.	Restoration. Maintenance.		
6450	Northern boreal alluvial meadows	4.8	<1	Bad.	Restoration. Maintenance.		
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	58.5	1.5	Poor.	Restoration. Maintenance.		
6230*	Species-rich *Nardus* grasslands	0.5	<1	Poor.	Restoration. Maintenance.		

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6120*	Xeric sand calcareous grasslands	7.9	<1	Bad.	Restoration. Maintenance.		
6000	Grasslands to be restored	70.0	1.8	-	Restoration. Maintenance.		
3260	Natural river reaches and river riffles	2.5	<1	Poor.	Ensure water discharge in Silica and Valnanišķu rivers. Removal or reduction of large woody debris; demolition of beaver dams in reaches with pebble or gravel bed (indications of high quality riffles; sites suitable for lampreys and salmonids).		
3160	Natural dystrophic lakes and ponds	15.9	<1	Poor.	Non-intervention.		
3150	Natural eutrophic lakes	365.9	9.6	Poor.	Removal of overgrowth: reed mowing in Lake Sila, maintenance of existing bathing sites. Restoration of water bodies: deepening and cleaning (overgrowth removal) of overgrown ditches.		
3130	*Lobelia-Isoetes* lakes	637.9	16.7	Poor.	Thinning of monodominant reedbeds at *Najas flexilis* localities in Lake Riču.		

Svētes paliene | *Nature Park (LV0303200)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Jelgava municipality Līvbērze and Valgunde rural territories.

AREA: 931 ha.

NATURE MANAGEMENT PLAN: 2007 (2007– 2016).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 134 of 03 March 2008, Regulation on Individual Protection and Use of Svētes Paliene Nature Park.

Svētes paliene Nature Park includes the regularly flooded floodplain area of Svēte and Lielupe rivers, which is a very important area for waterbirds during the spring migration. Here, several thousands of waterbirds and waders gather together during the migration. Four protected grassland habitats of the EU importance have been found in the territory, as well as natural river reaches (Lielupe river), and natural eutrophic lakes (oxbow lakes). Also 45 protected bird species and three protected plant species have been found.

The first drainage was carried out in the territory around the 1800s when the canals for faster flood water discharge were established in the lower reaches of Bērze and Auce rivers. Until the construction of protection dams and polders in 1991, floodplains were regularly flooded. Five winter polders with pump stations and three summer polders for grasslands were established. After the restoration of Vārpa protection polders and repair of floodgates, this polder is not flooded anymore, and its importance to migratory waterbirds is lost. Currently, only a small area on the left bank of the Svēte river is subject to flooding, as well as 300 ha on the right bank of the Svēte, areas adjoining the Melnezers (Melnīzeris) lake, and Ķīšu Grasslands on the right bank of Lielupe river in Valgunde village. Based on the ecological conditions, floodplains do not correspond to natural river floodplains, as there is no regular flooding, and humidity regime is regulated by ditches and pumping stations.

Relatively natural alluvial grasslands are preserved in the territory, with natural levees of Svēte river, depressions, and abundant locality of *Fritillaria meleagris*. Protected species *Gladiolus imbricatus, Dactylorhiza baltica*, and *Platanthera bifolia* can be found in grasslands. Ecologically, the territory belongs to a single complex with Lielupes palienes pļavas Nature Reserve and Kaļķa-Odiņu Alluvial Grasslands which are located in Ķemeri National Park. The territory is important for the reduction of fragmentation of grassland habitats as it serves as a species distribution corridor between Zemgale and Coastal Geobotanical Districts.

It is one of the most important core areas for the conservation of grassland biodiversity in central part of Latvia. At a national scale, the territory is nationally important (one of the nine priority areas) for the protection of grassland-breeding waders.

Because of the migratory birds, the area is included in the list of Important bird areas. The most important migratory birds which can be observed in large numbers are *Cygnus cygnus, Anser fabalis, Anser albifrons* and *Anas acuta*. Alluvial grasslands are particularly suitable for breeding of *Circus pygargus, Philomachus pugnax, Crex crex, Gallinago media, Botaurus stellaris, Porzana porzana*. The territory is also an important foraging site for *Ciconia nigra, Pandion haliaetus, Aquila pomarina, Limosa limosa, Numenius arquata, Chlidonias niger, Asio flammeus, Luscinia svecica*, and other species of birds.

Lampetra fluviatilis can be found in Svēte river. Great diversity of invertebrates can be observed in grasslands – butterflies, dragonflies, and beetles.

2. Threats to habitat and species conservation

- Changes in the hydrological regime which is characteristic for floodplains. The established ditch network drains the area which therefore is less suitable for grassland-breeding waders and for floodplain grassland habitats. Due to discontinuation of management, grasslands overgrow with shrubs more rapidly.
- Grassland habitats are threatened by overgrowth due to lack of management, as well as grubbing up (intensive farming is restarted in old fallow-lands). Breeding birds are threatened by early mowing.
- The use of plants for decorative purposes. Localities of *Fritillaria meleagris* and *Platanthera bifolia* are most threatened.

3. Existing management of the protected habitats and its assessment

- In 2006-2008, in the framework of the LIFE-Nature project "Restoration of Latvian Floodplains for EU priority species and habitats" (LIFE04NAT/LV/000198), extensive alluvial grassland restoration work was carried out in an area of at least 120 hectares (shrub felling, first-time mowing with haymaking, manual mowing).
- According to Rural Support Service, in 2014 applications to Rural Development Programme measure "Maintaining biodiversity in grasslands" were submitted for most of the restored grasslands. However, at least 100 ha of alluvial grasslands have not been managed within this measure, and also part of the restored grasslands overgrows with shrubs again. The influence of management on the grassland habitat quality has not been evaluated.

4. Priorities of management and conservation

- Conservation of habitats and habitats of plant and bird species in a favorable conservation status is a priority.
- Preservation and restoration of grasslands (total area of semi-natural and cultivated perennial grasslands) in the maximum possible area.
- Establishment of semi-natural grassland habitats in the area of current cultivated grasslands and old fallow-lands.
- Conservation and enlargement of grassland-breeding wader populations by appropriate management and by restoration and maintenance of appropriate hydrological regime.
- Rewetting, ensuring the necessary moisture regime for migratory birds in spring. First, moisture regime must be restored in Vārpa Summer Polder, after the research of migratory and breeding species.

5. Necessary management and conservation measures

5.1. General measures

- Grassland habitat inventory, with particular attention to evaluation of habitat type 6430 *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels* (it is possible that part of the areas of this habitat type belong to highly degraded alluvial grasslands which must be restored, instead of maintenance as habitat type 6430), and the distribution of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*, by evaluation if fallow-land grasslands (E.2.2 according to Latvian Habitats Classification) mapped in 2007 (nature management plan) correspond to this habitat type.
- Development of a plan for the creation/restoration of semi-natural grasslands instead of cultivated grasslands and old fallow-lands.
- Detailed survey on the migratory and breeding birds – their species composition, habitats, and the possibilities of restoring hydrologic regimes suitable for grassland-breeding waders and *Gallinago media*.
- Development of a detailed plan for the restoration of alluvial grasslands in Vārpa Polder (left bank of Svēte river) and Mellīzers floodplain (opposite to Vītoliņi farmstead, between Iecava river mouth and Lake Mellīzeris); preparing the basis for a construction project for the necessary activities. The plan and project must include detailed information on engineering measures for rewetting, methods and sites, for example, localities of ditch dams. In the rest of the areas, deterioration of the hydrological regime from the species and habitat conservation point of view of is not permissible. Provision of sufficient flooding for migratory waterbirds in Vārpa Summer Polder, by stopping water being pumped from the polder, and, depending on the situation, opening or closing the floodgates, in order to ensure suitable staying, staging and foraging conditions for spring migrants.
- Investigation of the territory regarding the species composition, habitats and potential length of stay of migratory and breeding birds, for the purpose of development of water maintenance level schedules which prevent the flood risk in a Flood risk area of national significance and achieves balance between economic activities and bird species conservation.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3260	Natural river reaches and river riffles	102.0	11.0	Poor.	Removal of sediments and debris, and mowing of aquatic macrophytes in cases if flood risk is caused by a massive development of them. Limiting of activities of beavers if flood risk is increased due to their dams – Svēte river and drainage systems.	5.0	0.1 0.5
6430	Hydrophilous tall herb fringe communities	203.6	21.9	Favourable.	Habitat area must be specified. Maintenance. Restoration.	Unknown	Unknown
6450	Northern boreal alluvial meadows	416.9	44.8	Bad.	Maintenance. Restoration.	56.5	416.9
6510	Lowland hay meadows	11.9	1.3	Bad.	Maintenance. Restoration.	1.8	11.9

Talsu pauguraine | *Nature Park (LV0302000)*

1. Brief description

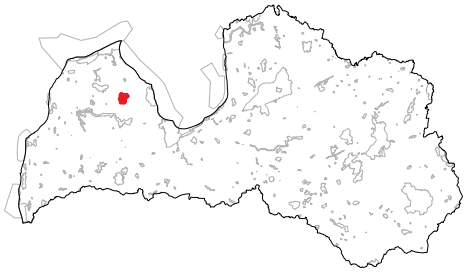
YEAR OF FOUNDATION: 1987.

LOCATION: Talsi municipality Laidze, Lauciena and Lībagi rural territories.

AREA: 3671 ha.

NATURE MANAGEMENT PLAN: 2013 (2014–2024).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Talsu pauguraine Nature Park includes a scenic part of Ziemeļkursa Upland – a visually attractive terrain, mosaic of woodlands and open landscapes, with several small lakes. The highest point in Ziemeļkursa Upland, Kamparkalns (174.6 m above sea level) is located in the nature park. Woodlands occupy the most part of the territory, and cover large areas on the steepest slopes of hills. Woodlands are mostly dominated by spruces (*Picea abies*), birches (*Betula* spp.) and pines (*Pinus sylvestris*); significant areas are covered also by broadleaved forests. Research forests cover 39 % of the nature park. There are also plantations of introduced tree species (*Larix decidua, Carpinus betulus, Fagus sylvatica*); the establishment of these plantations began in the middle of 19th century.

The most flat areas are occupied by agricultural lands. The hills are mostly covered by forests. In terrain depressions there are lakes, the largest ones being Lakes Čumals and Ābeļu. In total, there are 12 larger lakes and about 150 small lakes. Some lakes are located in subglacial valleys and have elongated shape.

There are 13 protected habitats of EU importance in the nature park. The most significant areas are covered by forests – oak woodlands, forests on slopes, western Taïga and swamp woods. Also large areas are occupied by natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation. Fens and transition mires are small, in terrain depressions or lake shores.

The territory is located in a part of Western Latvia Geobotanical District which is poor in semi-natural grasslands, therefore it is very important for grassland biodiversity conservation and fragmentation reduction in a region, as a species distribution corridor and a core area. The current grassland area is sufficient for the long-term maintenance of grassland diversity – in case if semi-natural grassland habitats are restored. Potentially (if the lost areas of grassland habitats are restored), it is one of the top ten most important Natura 2000 sites for the protection of habitat type 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) in Latvia (2.4 % of the total area of habitat type in Natura 2000 sites).

The nature park is an important habitat for many rare and protected plant and animal species, there are 35 protected species of plants, 15 bird, 14 mammal, 28 rare and/or protected species of invertebrates, one protected species of amphibians and reptiles. Rare bird species *Bonasa bonasia, Circus aeruginosus, Aquila pomarina, Crex crex, Grus grus, Glaucidium passerinum*, all of the woodpecker species which can be found in Latvia, *Lanius collurio*, an others, are breeding in the territory.

The most important plant species are *Liparis loeselii,* moss *Hamatocaulis vernicosus*. There are protected plant species that are found only or almost exclusively in Western Latvia, such as *Laserpitium latifolium, Rosa mollis, Cardamine flexuosa, Trifolium dubium*, and others. Important invertebrate species are *Osmoderma eremita, Vertigo geyeri, Dytiscus latissimus*, and *Graphoderus bilineatus*. Lakes and their surroundings are suitable foraging sites for bats, including *Myotis dasycneme*.

2. Threats to habitat and species conservation

- Semi-natural grasslands and their species are adversely affected by management cessation which promotes fragmentation and decreases the area and quality of species habitats.
- The spread of invasive plant species *Heracleum sosnowskyi.*
- Bats are negatively influenced by lack of cavity trees.
- Quality of woodland habitats is adversely affected by selective felling resulting in removal of biologically-old and large trees, as well as by removal of dead wood in vicinity of residential areas (Vanagkalns) (particularly in oak woodlands and swamp woods).
- Protected woodland habitats are small and isolated. The use of forests for commercial purposes has been unfavorable for conservation for EU protected woodland habitats and for the reduction of their fragmentation.

- Quality of aquatic habitats is adversely affected by overgrowth and shading of lake shores.
- Fens are threatened by overgrowth and may also be affected by activities of beavers.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 most of the grasslands (72-96 %) were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". The influence of management on habitats has not been evaluated.

4. Priorities of management and conservation

- Conservation of semi-natural grasslands in an area of at least 40 hectares; restoration in an area of at least 190 hectares, in order to promote their landscape-ecological connectivity. Restoration of habitat type 6410 Molinia *meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae) is the priority.
- Thinning of dense *Corylus avellana* stands in order to improve habitats for *Muscardinus avellanarius* and other species.
- Placement on nestboxes for bats.
- Elimination of invasive plant species *Heracleum sosnowskyi* stands.
- Felling of shrubs on lake shores (Lakes Bērzene, Vēzene, Bezdubeņu (Kalnmuižas), Lejaslāču).
- Reed mowing in recreation sites and bathing sites.
- Reduction of anthropogenic load in lakes; improvement of lake surroundings, repair or replacement of old footbridges in bathing sites.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Amendments in Individual regulations on protection and use; approval of Functional zoning of the territory. Provision of restrictions on forestry activities: logging (commercial felling and selective felling) and any removal of dead wood (also after natural disturbances such as wind-throws) are not allowed in protected woodland habitats
- Elimination of *Heracleum sosnowskyi* in an area of 23.5 hectares. Sosnowsky's hogweed is dispersing in nature park and in surrounding territories. Regular elimination measures are necessary (mowing, in optimal case also extraction of rhizomes) in sites specified in nature management plan. Part of invaded area is located outside the nature park but its abatement is necessary for the conservation of nature and landscape values of the territory.
- Development of grassland restoration and management plan. Well-grounded evaluation on the minimal area of grasslands for their sustainable conservation is not provided in the nature management plan of year 2013. However, it is indicated that semi-natural grasslands should be restored in 230 hectares large area of old cultivated grasslands and fallow-lands which are successfully re-naturalising. It is also emphasized in the nature management plan that most of the previously known EU protected grasslands are irreversibly lost and without restoration potential. Therefore, restoration of sites with high restoration potential is a priority. The high level of habitat fragmentation indicates that the current area can not ensure favourable conservation status of grasslands in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas as well as in old extensively-managed cultivated grasslands and fallow-lands must be considered. Restoration of grasslands which were assessed as EU protected habitats in 2000s but currently are overgrown and does not correspond to criteria of EU protected habitats, but their restoration potential is high, is a priority.

5.2. Specific measures

5.2.1. Species

- Thinning of dense *Corylus avellana* stands in order to improve habitats for *Muscardinus avellanarius*. Thinning may be proceeded outside the protected forest habitats.
- For the conservation of dendrophilic bat species: cavity trees must be preserved in forests, as well as in parks, alleys and roadsides. In places where there are no cavity trees, it is recommended to put out nestboxes for bats.

5.2.2. Habitats

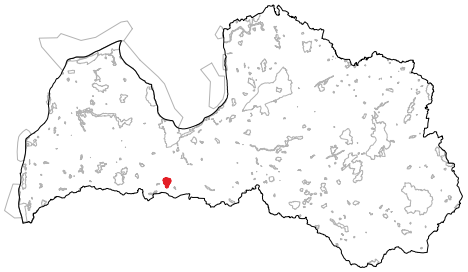
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	22.0	<1	Bad.	Non-intervention.		22.0
9080*	Fennoscandian deciduous swamp woods	9.4	<1	Poor.	Non-intervention.		9.4
9160	Oak forests	37.1	1.0	Bad.	Non-intervention.		37.1
9180*	Slope forests	27.2	<1	Bad.	Non-intervention.		27.2
91D0*	Bog woodland	22.7	<1	Poor.	Non-intervention.		22.7
7230	Alkaline fens	0.8	<1	Poor.	Felling of trees and shrubs in a fen at Braņģkalni farmstead (in winter, to avoid influence on protected snail species) – according to nature management plan. Blocking of runoff (specified in nature management plan).		1
7140	Transition mires and quaking bogs	0.2	<1	Poor.	Felling of shrubs in land of "Kārļi" (locality of moss *Hamatocaulis vernicosus*).		0.2
6510	Lowland hay meadows	4.2	<1	Favourable.	Restoration. Maintenance.	1.7	4.2
6410	*Molinia* meadows	0.2	<1	Favourable.	Restoration. Maintenance.	18.3	18.5
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	3.3	<1	Favourable.	Restoration. Maintenance.	13.9	17.2
6210	Semi-natural dry calcareous grasslands	0.0	<1	Favourable.	Restoration. Maintenance.	0.9	0.9
6000	Grasslands to be restored	200.0	5.4	-	Restoration. Maintenance.	200.0	200.0
3260	Natural river reaches and river riffles	2.0	<1	Poor.	Maintenance of water flow in inflows and outflows of lakes in order to avoid littoral paludification and deterioration of lake habitats.		0.3

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	28.8	<1	Poor.	Brush cutting in the area near the shore, desirable at recreation sites and at footbridges (particularly in Lakes Vēzenes, Bezdubeņu and Lejaslāču). Shrubs must be felled gradually (partial or complete felling up to 30 m wide segments); felling of up to 20% of shoreline length is permissible. In largest lakes – mowing of reeds in recreation sites is permissible and desirable. Repair of old footbridges in bathing sites.		5.0

One-time grassland restoration measures are necessary in an area of at least 230 hectares (areas shown in nature management plan of 2013). The main restoration measures include felling of trees and shrubs, root grinding, targeted creation of species composition by introduction of semi-natural grassland species. For several grassland habitats, area for management in the table is indicated larger as the current area of habitat – because the restoration of grasslands in areas which are completely overgrown must be planned.

Tērvete | *Nature Park (LV0300700)*

1. Brief description



YEAR OF FOUNDATION: 1957.

LOCATION: Tērvete municipality Tērvete rural territory; Jelgava municipality Zaļenieki rural territory.

AREA: 1374 ha.

NATURE MANAGEMENT PLAN: 2009 (2009–2018).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 589 of 28 August 2012, Regulation on Individual Protection and Use of Tērvete Nature Park.

Tērvete Nature Park is located in the ancient valleys of Tērvete and Skujaine rivers, including also side-ravines, mixed old broadleaved and pine forests. Pine (*Pinus sylvestris*) woodlands of rare forest site type can be found – *dižsils* (dry pine forest with abundant understory of *Corylus avellana* and *Quercus robur*). It is one of the most scenic sites in landscape of agricultural lands typical for Zemgale Region. Most of the territory is covered by forests. Alluvial grasslands can be found along the naturally meandering Tērvete river, as well as along small, seasonally drying-out oxbow lakes. The upper part of Tērvete river ancient valley, as well as hilltops are covered with pine woodlands with a significant proportion of deciduous trees – *Quercus robur, Fraxinus excelsior, Tilia cordata, Acer platanoides*. Groundfloor vegetation is very diverse. Almost half of the pine woodlands are more than 100 years old. There are genetic resource forests (GRF) for pines in the territory. A unique part of the nature park is Veco Priežu Parks (Old Pine Park) – woodland with more than 300 year old pines with high scientific and aesthetic value.

Near the confluence of Tērvete and Skujene rivers, an artificial Tērvetes (Gulbju) water reservoir was established between 1975 and 1981, in an area of 74 hectares. It is shallow and exorheic, with 2.3 kilometers long dike.

There are 10 protected habitat types of EU importance in the nature park. The largest areas are covered by western Taïga. Important habitats are also slope forests with old trees, mineral-rich springs and springfens, and others. Semi-natural dry grasslands on calcareous substrates and water courses with river riffles are also important. The area of semi-natural grasslands is small, but they are important for grassland species distribution in Tērvete river valley, particularly taking into account that semi-natural grasslands in Zemgale Region are small and fragmented. In Zemgale Geobotanical District, this is the second most important Natura 2000 territory for the conservation of semi-natural grasslands (after Bauska Nature Park).

There are more than 100 rare and protected species of plants, mosses and animals in the nature park. There is an abundant locality of plant species *Ranunculus lanuginosus;* also *Hypericum hirsutum* can be found. Both of these plant species are characteristic to Zemgale Region but are rare in the rest of Latvia. There is one of the two localities of *Neottianthe cucullata* in Latvia, as well as localities of *Orobanche pallidiflora* and *Pimpinella major.*

Important bird species in the nature park are *Ciconia nigra, Pernis apivorus, Alcedo atthis*, and others. Gulbju reservoir is an important stopover and feeding site for migratory waterbirds. *Anser albifrons, Anser fabalis, Mergus merganser, Cygnus cygnus, Pandion haliaetus* can be found here. Dead standing trees are important for woodpeckers, such as *Dryocopus martius,* and cavity-nesting birds. Important invertebrate species are *Unio crassus, Ancylus fluviatilis, Nothorina punctata, Bombus pomorum.*

2. Threats to habitat and species conservation

- Discontinuation of grassland management; overgrowth.
- Economic activities which result in reduction of dead wood and biologically-old trees in woodlands.
- The nature park is intensively used for recreation. Visitor infrastructure is being established, and many visitor attractions are created in natural woodland habitats. In general, it has a negative impact on natural ecosystems, forest structure and vegetation in the direct vicinity of objects. It also increases disturbance for birds during the breeding season.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in 2014 only a small part of the grasslands (6-33 % of the total area) were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Management influence on habitats has not been evaluated.

4. Priorities of management and conservation

- Restoration of semi-natural grasslands in maximum possible area (including historical grasslands, about 20 hectares) and maintenance in favorable conservation status. In case of semi-natural grassland restoration, the area of grasslands would be sufficient for the sustainable conservation of semi-natural grassland biodiversity in the nature park.
- Undisturbed course of natural processes in forest habitats, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Extension of the territory by incorporation of semi-natural grasslands adjoining south-western and northern edges (in Tērvete river valley) of the nature park.
- Construction of new wastewater treatment plant for Tērvete sanatorium village.
- Conservation of reservoir – mud removal in the neutral zone, reduction of overgrowth in western part (property of "Pļavenieki") by removal of aquatic macrophytes (*Nuphar* spp. and their rhizomes). Repair and maintenance of flood gates.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	28.9	2.1	Poor.	Non-intervention.		28.9
9080*	Fennoscandian deciduous swamp woods	0.6	<1	Bad.	Non-intervention.		0.6
9020*	Broad-leaved deciduous forests	26.2	1.9	Poor.	Non-intervention.		26.2
9010*	Western Taïga	430.0	31.3	Bad.	Non-intervention. Additional surveillance in order to prevent removal of standing and laying dead wood in the woodlands.		430.0
7160	Fennoscandian mineral-rich springs and springfens	26.2	1.9	Favourable.	Non-intervention.		26.2
6510	Lowland hay meadows	12.7	<1	Bad.	Restoration. Maintenance.	11.8	12.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.5	<1	Bad.	Restoration. Maintenance.	0.0	0.5

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6210	Semi-natural dry calcareous grasslands	11.3	<1	Bad.	Restoration. Maintenance.	9.7	11.3
6000	Grasslands to be restored	20.0	1.6	-	Maintenance. Restoration.	20.0	20.0
3260	Natural river reaches and river riffles	3.6	<1	Poor.	Removal of beaver dams and inundations; removal of large woody debris in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality.	3.6	

One-time grassland restoration measures are necessary in an area of at least 37 hectares (including about 20 hectares of historical grasslands which currently do not correspond to criteria of EU grassland habitats).

Užavas lejtece | *Nature Park (LV0304300)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ventspils municipality Užava and Ziras rural territories.

AREA: 1434 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2016).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Užavas lejtece Nature Park includes polders of Užava River. This is an important concentration, stopover and foraging site for migratory birds and waders. The most part of the nature park is still used in agriculture. Almost all agricultural lands have been cultivated and used for the cultivation of various crops. The largest areas are covered by perennial grasslands. The entire area of the nature park was drained in 1960s when Užava polder was established in an area of 3400 hectares. The drainage system consists of network of open ditches with a runoff to the Užava River. Some narrow fragments of oxbows have remained.

The most important nature value of the territory is its bird fauna. During the spring migration, several thousands of migrating birds concentrate here to rest and to prepare for a further flight.

During the summer, there are relatively large numbers of breeding birds and large numbers of non-migratory birds. The territory is an Internationally Important Bird and Biodiversity Area in Latvia. The area is particularly important for the breeding of *Crex crex*, as well as for migrating birds - *Anser fabalis, Cygnus cygnus, Cygnus columbianus, Grus grus*. Also *Circus pygargus, Haliaeetus albicilla*, and others.

Rare plant species - *Allium schoenoprasum* and *Trifolium dubium* are found in grasslands. Protected moss species *Isothecium myosuroides* are found in woodlands.

There is a relatively rich aquatic fauna in Užava River with *Unio crassus, Lampetra fluviatilis, Salmo salar,* as well as *Lutra lutra*.

Užavas augštece and Užavas lejtece Nature Reserves together with grasslands of middle part of Užava River (which are currently not included in Natura 2000), together with Diļļu Pļavas Nature Reserve form an important landscape-ecological corridor for species dispersal. For grassland species and habitats, this is one of the most important core areas in the coastal part of Coastal Geobotanical region.

2. Threats to habitat and species conservation

- The most important factor affecting semi-natural grasslands is the intensification of their management (meadow improvement, grubbing up) or non-management, which contributes to overgrowth of grasslands.
- Lack of management of agricultural lands. At present, polders are not functioning because the infrastructure is not functional. The nature park area can be important for birds only if management of agricultural lands is ensured.
- Forced draining of polders during spring flooding, thus shortening the time that migrating birds can spend in Užava floodplain grasslands.
- Woody debris dams promote accumulation of sediments and burial of habitats suitable for *Unio crassus*.
- Overgrowth of banks of oxbow lakes and increase of their shading. Clogging of oxbow lakes with twig and leaf litter consumes dissolved oxygen and decreases diversity of aquatic organisms.
- The quality of habitats of breeding birds is threatened by application of chemical plant protection products in the territory of nature park.
- Drainage ditches overgrow with trees and shrubs. This causes fragmentation of open grassland landscape, and habitats become unsuitable for grassland-breeding birds.

3. Existing management of the protected habitats and its assessment

- In 1928, the bed of Užavas River was straightened and deepened, and the drainage ditch system was established. Repeated drainage (since the previous ditch system was clogged) took place in 1961-1967, and a system of polders was created. Most of the land was improved by grubbing up and by establishment

of sown grasslands. Almost all natural habitats were destroyed by the establishment of drainage system. Currently, naturalisation of grasslands has occurred, as they are managed extensively (without improvement), and also the moisture is improved since the polder system is partially inoperative. If polders will be restored, the hydrological regime will change again, and grassland naturalization will be stopped. At the same time, the maintenance of drainage systems provides an environment suitable for birds because then the agricultural activities are maintained which would be difficult in case of excessive moisture.

- According to Rural Support Service, in 2014 almost all alluvial grasslands (99 %) were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". However, this is only a small part of the total grassland area in the nature park. Also most of the cultivated grasslands are managed in scope of this measure, but there are also overgrown areas.

4. Priorities of management and conservation

- Grassland-breeding birds and migratory birds are a priority of nature park, therefore their protection measures are prioritized over measures of semi-natural grassland protection. However, semi-natural grassland restoration and maintenance in favourable conservation status and in the maximum possible area is necessary in the long-term. This priority includes also maintenance of perennial grasslands and their gradual development into semi-natural grasslands.
- Favorable conditions for migratory birds. The gradual reconstruction of the polder system and the management of agricultural land, which would provide suitable residing and foraging conditions for migratory birds.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation of the consolidation of protected nature territories "Užavas augštece", "Užavas lejtece", and "Diļļu pļavas" in one Natura 2000 site, including also the grasslands of the middle part of Užava river, thus forming a landscape-ecologically compact grassland area.
- Implementation of Užava Polders reconstruction plan. Polder maintenance measures are a priority according to the management plan of Venta river drainage basin. Gradual polder system reconstruction includes restoration of polder 1 and polder 2 which overlap with the nature park area. During spring flooding, regulators of restored polders must be open, and the flooding of floodplains in the nature park territory must be ensured. The forced pumping of water from the polders to the Užava river is not allowed unless a critical line of the water level is reached (3.2 m at the bridge over the Užava river), which may place a risk to infrastructure of agriculture and roads. In the summer and autumn, polder function is maintained in a way necessary for agricultural purposes. At this time of year, water level regulation does not significantly affect bird habitats.
- Approval of Individual regulations on protection and use in order to prohibit hunting of water and wetland birds, as well as to prohibit the application of chemical plant protection products in agricultural production.
- Inventory of grasslands; development of grassland restoration and management plan. The currently available grassland maps are outdated and do not reflect the real situation. Plan must include also the evaluation of restoration of semi-natural grasslands in their historical areas and in areas of cultivated grasslands, and the evaluation of permissible proportion and spatial arrangement of arable crops in the nature park.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	76.3	5.3	Poor.	Restoration. Maintenance.	Unknown	76.3
6000	Grasslands to be restored	700.0	48.8	-	Restoration. Maintenance.	700.0	700.0
3260	Natural river reaches and river riffles	3.0	<1	Poor.	Decrease of large woody debris in order to ensure water discharge and to decrease flood risk, as well as to avoid accumulation of sediments in gravel-bed reaches suitable for spawning of *Unio crassus, Salmo trutta, and Lampetra fluviatilis*. Once per year, on necessity.		
3150	Natural eutrophic lakes	2.0	<1	Poor.	Felling of trees and shrubs around oxbow lakes. Once per year.		0.3

Areas of semi-natural grasslands bust be clarified during the development of grassland restoration plan (the currently available information in the Nature management plan indicate that restoration is necessary but habitat types and areas to be managed are not specified). Restoration is the priority in grasslands which are specified as important for birds or botanically valuable in the Nature management plan.

Vecumu meži | *Nature Park (LV0304800)*

1. Brief description

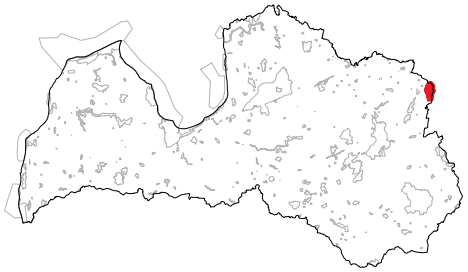
YEAR OF FOUNDATION: 2004.

LOCATION: Viļaka municipality Vecumi and Žīguri rural territories.

AREA: 7842 ha.

NATURE MANAGEMENT PLAN: 2004 (2004–2008).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 886 of 02 November 2005, Regulation on Individual Protection and Use of Vecumu Meži Nature Park.



Vecumu meži Nature Park is located at the Latvian – Russian border. It includes both woodlands and agricultural lands. In the north-east side, the territory has a border with a vast forest area, there are several micro-reserves for the protection of bird species. *Alnus glutinosa* woodlands of the nature park are very diverse, and these are some of the most outstanding forests of this type in Latvia. There are also very species-rich aspen (*Populus tremula*) woodlands which have developed after large-scale disturbance in the area of the previous broadleaf and *Picea abies* forests. Part of the territory is occupied by grasslands in various stages of overgrowth, as well as by intensively used agricultural land. Part of the grasslands is not managed and therefore biodiversity in these areas is low.

There are nine EU protected habitat types in the nature park. Large areas of wet forests, especially swamp woods with *Alnus glutinosa*, as well as woodlands with old *Populus tremula* are especially important. These woodlands are very biodiverse, with a significant amount of protected species of vascular plants, lichens, mushrooms and insects.

Grasslands are inventoried, but their mapping is incomplete; the area of semi-natural grasslands is larger than it is currently known. The territory is potentially very significant as the core area of semi-natural grassland habitats. It connects semi-natural grasslands of Mudava Lowland and East-Latvia Lowland, and serves as a species dispersal corridor.

The most important plant species are *Cinna latifolia, Carex atherodes, Glyceria lithuanica, Epipogium aphyllum, Gladiolus imbricatus, Jovibarba globifera*. Important invertebrate species are insects *Leucorrhinia pectoralis, Lycaena dispar, Ophiogomphus cecilia*, and a *mollusc Unio crassus*.

The territory is included in the list of Important Bird and Biodiversity Areas (LV056 „Vecumi"). For *Aquila pomarina* and *Ciconia nigra*, this is one of the most important breeding sites in Latvia. Old aspen trees with large branches are particularly suitable for these species. *Alnus glutinosa* woodlands are breeding and foraging habitats for several species of woodpeckers – *Dendrocopos leucotos, Dendrocopos medius*, and *Picoides tridactylus*. The Eurasian otter *Lutra lutra* lives in the territory, and the brown bear *Ursus arctos* is immigrating from adjacent areas. Previously, the Siberian flying squirrel *Pteromys volans* was found here, but most likely it has disappeared due to destruction of suitable habitats (old, mixed pine-spruce forests).

2. Threats to habitat and species conservation

- Semi-natural grasslands and their habitats are influenced negatively by discontinuation of management which promotes fragmentation and reduces the area and quality of habitats of species. Part of the natural grasslands has been mown with grass shredding, which has caused eutrophication.
- Foraging resources and thus the population of *Aquila pomarina* is threatened by overgrowth of agricultural lands.
- The intensive felling carried out before the establishment of nature park has contributed to the fragmentation of forests; there are large areas of new woodlands.
- The quality of Badnova (Vecumu) Mire has been deteriorated due to drainage and peat extraction.
- Deterioration of capercaillie (*Tetrao urogallus*) leks. Drainage causes overgrowth of lek sites with *Picea abies*, and changes in ground vegetation.
- Large numbers of beavers (*Castro fiber*) in Kira and Vēda rivers interfere with the flow of the rivers and create impoundments in riffle reaches.
- Eutrophication of grasslands in floodplains of Kira and Vēda rivers occurs due to runoff from agricultural lands.

3. Existing management of the protected habitats and its assessment

- In 2014, demolition of beaver dams was carried out in Vēda river, following the initiative of the local residents.
- According to Rural Support Service, in 2014 70-80 % of the semi-natural grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". The results of grassland management have not been assessed.
- Habitat type 6510 *Lowland hay meadows* was inventoried within the Natura 2000 monitoring (2011-2012). Botanical quality was evaluated as bad in half of the grasslands, and sufficient or good in the other half.

4. Priorities of management and conservation

- Conservation of semi-natural grasslands and extensively managed (mown, grazed) cultivated grasslands and fallow-lands in their maximum possible area (at least 2 000 ha), to provide foraging areas for *Aquila pomarina* and breeding sites for *Crex crex*.
- Restoration and maintenance of semi-natural grasslands in at least 500-700 hectares. The priority is the restoration of floodplain grasslands and historical grasslands in the terraces of undrained reaches of the Vēda and Kira rivers (currently overgrown with expansive species, shrubs and forest), as well as restoration of extensively managed cultivated grasslands with good potential of restoration (potential habitats of EU importance).
- Restoration of *Tetrao urogallus* leks, including the restoration of optimal hydrological regime.
- Reduction of woodland fragmentation by increasing the area and integrity of protected habitats, providing non-intervention in woodlands which have not yet reached the quality of protected habitats. The development is expected towards habitat types *Fennoscandian herb-rich forests with* Picea abies, *western Taïga*, and *Fennoscandian deciduous swamp woods*.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- It is still possible that some Siberian flying squirrels *Pteromys volans* might immigrate to the nature park from adjacent territories, including from Russia. Therefore it is necessary to conserve habitats suitable for flying squirrels (woodlands with mature and old aspen), as well as to create perspective habitats (woodlands with new aspen). In order to maintain suitable habitats for a long period of time, facilitating aspen regeneration by forestry activities is necessary.
- Prevention of establishment of beaver dams and impoundments in river reaches with pebble-bed and boulder-bed, in order to ensure suitable conditions for migration and spawning of *Lampetra planeri*, as well as conditions suitable for *Unio crassus*.

5. Necessary management and conservation measures

5.1. General measures

- Update of the nature conservation plan and habitat maps.
- Investigation of the possibilities of rewetting in *Tetrao urogallus* leks and in degraded raised bog. Development and implementation of restoration project according to research results.
- Amendment of the Individual regulations on protection and use of the territory, setting the limits on forestry activities in the functional zone of the nature park during the bird breeding period. Reduction of the volumes of logging which is increasing every year.
- Removal of large woody debris and beaver dams in river riffle areas.
- Inventory and mapping of grasslands (both semi-natural and cultivated) and fallow-lands; development and implementation of grassland management plan. The current grassland maps are outdated and do not show the current situation. In the Nature management plan of 2004, a reasoned assessment of the minimum grassland area for their sustainable conservation is not provided. The high level of fragmentation indicates that the current area can not provide a favorable conservation status for semi-natural grasslands in the long term. In order to increase the landscape-ecological connectivity of semi-natural grassland habitats, the establishment of semi-natural grasslands in their historical areas must be considered. The restoration of currently preserved semi-natural grasslands is the priority.

- Changing the name of the territory from "Vecumu meži" ("Woodlands of Vecumi") to "Vecumi" because the current name suggests that woodlands are the only value of the territory. It is misleading and reduces the awareness of other habitats.
- Evaluation of the extension of nature park by inclusion of Vēda river valley, its part from the western side of the nature reserve, including Virica river floodplain, up to Vēda upstream at the southern shore of Lake Tepenīca, also including grasslands adjoining the lake.

5.2. Specific measures

5.2.1. Species

- For the conservation of *Tetrao urogallus* population (3 – 4 specimens in the nature park): continuous rewetting in one of the *Tetrao urogallus* leks (specified in Nature management plan) by complete blocking and filling of dam located at western part of forest block 249. Felling of *Picea abies* understory and advance growth (on necessity).
- Necessary conservation measures for *Aquila pomarina* include annual conservation of perennial grasslands in a landscape mosaic in an area of at least 3 000 ha (semi-natural grasslands, extensively managed cultivated grasslands and fallow-lands).

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	185.7	2.4	Poor.	Non-intervention. Rewetting in *Tetrao urogallus* leks and associated territories.	According to research results.	185.7
9080*	Fennoscandian deciduous swamp woods	29.3	<1	Favourable.	Non-intervention.		29.3
9010*	Western Taïga	165.5	2.1	Favourable.	Non-intervention.		165.5
9000	Potential Protected woodland habitat	190.0	2.4	-	Non-intervention. Targeted thinning in areas of previous clearcuts where *Populus tremula* is naturally regenerating.	65.0	125.0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91E0*	Alluvial forests	179.4	2.3	Poor.	Non-intervention.		179.4
9020	Broad-leaved deciduous forests	0.8	<1	Favourable.	Non-intervention.		0.8
9050	Herb rich spruce forests	1.01	<1	Favourable.	Non-intervention.		0.8
7120	Degraded raised bogs	58.8	<1	Bad.	Rewetting (ditch blocking of filling up).	58.8	
6510	Lowland hay meadows	51.9	<1	Favourable.	Restoration. Maintenance.	8.6	51.9
6410	Molinia meadows	0.7	<1	Bad.	Restoration. Maintenance.	0.7	0.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	13.4	<1	Poor.	Restoration. Maintenance.	4.0	13.4
6000	Grasslands to be restored	500.0	6.4	-	Restoration. Maintenance.	500.0	500.0
3260	Natural river reaches and river riffles	25.0	<1	Poor.	Provision of water discharge. Removal or reduction of large woody debris; demolition of beaver dams in river reaches where pebbles of boulders in river bed indicate on riffles of high quality.	25	
3150	Natural eutrophic lakes	0.4	<1	Poor.	Maintenance and enlargement of the open littoral part of the lake.	0.1	

Vilce | *Nature Park (LV0304900)*

1. Brief description

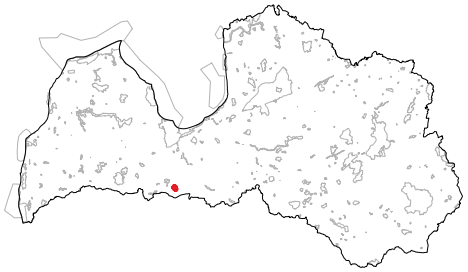
YEAR OF FOUNDATION: 2004.

LOCATION: Jelgava municipality Vilce rural territory.

AREA: 114 ha.

NATURE MANAGEMENT PLAN: 2006 (2007–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Vilce Nature Park includes valleys of Vilce and Rukūze rivers, with steep slopes which are covered by mixed forests of *Fraxinus excelsior* and other deciduous trees. There are also natural river reaches with riffles, small sandstone outcrops on a bank of Rukūze river, and grasslands on shores of Vilce river. The territory is a very popular tourist destination as it is one of the most scenic sites in Zemgale Region where flat terrain and large agricultural lands are characteristic to the area. It is surrounded by human-transformed landscapes and residential areas, therefore it is particularly important for the biodiversity conservation as it is functioning as a species distribution corridor. The Zaķu Pļava Grassland is a popular venue for recreation and sports events. In several places there are spruce (*Picea abies*) plantations created in clear-felled areas.

The area of grasslands is small, bet they may function as stepping stones facilitating dispersal of grassland species, especially considering that the area of semi-natural grasslands in Zemgale Region is small, and they are fragmented. There is also historic evidence on the previous extensive agriculture period; shallow ditch system can be found in the grassland in the southern part of nature reserve.

The mixed *Fraxinus excelsior* forests dominating in the territory correspond to forest site type *mistrājs (Heteroherbosa)* which is characteristic to Zemgale Plain but can not be found elsewhere in Latvia. There are eight protected habitats of EU importance. In slope forests at Vilce and Rukūze rivers, there are abundant localities of rare plant species which are characteristic only to Zemgale region – *Ranunculus lanuginosus* and *Hypericum hirsutum*, as well as other rare plant species – *Carex ornithopoda, Lathyrus niger, Conioselinum tataricum*. Old trees of the nature park are important habitats for rare invertebrate species such as *Osmoderma barnabita, Liocola marmorata, Nothorhina punctata, Lasius fuliginosus*. Breeding bird species include *Bonasa bonasia, Glaucidium passerinum, Alcedo atthis, Picus canus, Dryocopus martius, Dendrocopos leucotos, Dendrocopos medius,* and others. In river riffle areas, *Lampetra planeri* is spawning, and this is a habitat for *Cobitis taenia*.

2. Threats to habitat and species conservation

- Grassland overgrowth and fragmentation is caused by insufficient management or lack of management. In some places, grasslands are grubbed up.
- Anthropogenic influence can potentially increase, which will also increase the load on habitats and species. The most visited places are the Zaķu Pļava Grassland and surroundings of Vilce Castle Mound.
- Activities of beavers (*Castor fiber*). In several sites, inundations are created due to dams and large woody debris created by beavers.
- Sandstone outcrops are damaged by natural erosion, but even more important damage is done by engraved inscriptions made by visitors.
- Lack of dead wood is an important factor influencing breeding woodpeckers.

3. Existing management of the protected habitats and its assessment

- In 2007, felling of trees and shrubs around oaks (*Quercus robur*) and large pines (*Pinus sylvestris*) along the trail was carried out. This measure improved the scenery and conditions for oaks, but these measures can not be attributed to the habitat management.
- The liberation (insolation improvement) of oaks on slopes in not desirable.
- In 2005 and 2006, the strengthening of significantly eroded slopes was organized by JSC "Latvijas valsts meži".
- According to Natura 2000 standard form, habitat type 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) is included in the territory in an area of 10.13 ha. In year 2015, in database "Ozols" this habitat type was mapped in an area of 6.46 hectares.
- In 2015, experts of Nature Conservation Agency evaluated the management of habitat type 6510 in year 2014. It was found that 1.66 ha were adequately managed, and were also included in land parcels

as "biologically valuable grasslands", 4.8 ha were overgrowing and removed from land parcels.
- In 2015, grassland habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* was included in land parcels and was a "biologically valuable grassland". During the inventory it was found that 0.3 ha were mown with grass shredding, 0.38 hectares were grubbed up (0.45 ha were not evaluated).

4. Priorities of management and conservation

- Restoration and regular maintenance of semi-natural grasslands in maximum possible area.
- Maintenance of *Osmoderma barnabita* localities in optimal condition by restoring and maintaining the wooded grassland.
- Maintenance of optimal conditions for *Nothorhina punctata* and other invertebrates (insolation improvement on trunks of large pines).
- Increasing the area of broadleaved forests by increase of proportion of broadleaved trees in woodlands.
- Prevention of anthropogenic load on steep slopes.
- Maintenance of riffles in Vilce and Rukūze rivers by removal of large woody debris and beaver dams.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Maintenance of trails and other infrastructure elements, directing the visitors only through well-maintained trails. During larger events, such as orienteering competitions, the movement of visitors is allowed only along the maintained trails, and trampling of ground vegetation on slopes should be avoided. With the number of visitors rising, additional delimiting barriers might be necessary at sandstone outcrops in order to organize the movement of visitors.
- Development and approval of Individual regulations on protection and use. Regulations must ensure the conservation of forest biodiversity according to habitat requirements of woodpeckers. It is necessary to increase volumes of dead wood by preventing its removal. A prohibition on clear-felling is a necessary precondition for the conservation of nature values throughout the nature park.
- Update of grassland habitat maps. Currently, 12.1 hectares of the total area of grasslands (21 ha) are recognized as EU protected habitat types. The possible restoration of the rest of the grasslands to semi-natural grasslands must be evaluated.
- There is a small lake in Vilce river floodplain, at its inflow to Svēte river. Most probably, this lake has been washed out by Vilce river. It partly corresponds to Latvian protected habitat type *Oxbows*, and to EU protected habitat type 3150 *Natural eutrophic lakes with* Magnopotamion *or* Hydrocharition - *type vegetation*. Its area is 0.13 hectares, and it is important as a potential habitat for rare species of dragonflies. It is necessary to evaluate the necessity of management by creating at least one access corridor to the oxbow lake.

5.2. Specific measures

5.2.1. Species

- Restoration of wooded grasslands (localities of *Osmoderma barnabita*) is necessary. Measures: first-time mowing and felling of shrubs in an area of 1.24 hectares (in accordance with nature management plan).
- Maintenance of optimal conditions for *Nothorhina punctata* – insolation improvement on trunks of large pines (sites are indicated in the nature management plan) – around pine trees - regular felling of shrubs and trees (up to 20 cm diameter).

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	41.4	28.7	Poor.	Non-intervention.		41.4
9000	Potential Protected woodland habitat	28.6	19.7	-	Liberation of oaks (4th and 10th compartments of block 158) – felling of trees and shrubs below the crowns of oaks and in radius of 5-8 m. Selective felling for the increase of broadleaf admixture (c. 8,4,12,13 of bl. 159, c. 2 of bl. 166).	2.4 5.2	21.0
9010 *	Western Taïga	4.5	3.1		Non-intervention.		4.5
91E0*	Alluvial forests	1.4	1.0	Favourable.	Non-intervention.		1.4
8220	Siliceous rocky slopes	0.1	⟨1	Poor.	Non-intervention, except construction of delimiting barriers.		0.1
6510	Lowland hay meadows	10.8	7.5	Bad.	Restoration. Maintenance.	At least 10.8	At least 10.8
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.3	⟨1	Bad.	Restoration. Maintenance.	1.3	1.3
6530*	Fennoscandian wooded meadows	1.24	⟨1	Bad.	Restoration. Maintenance.	1.24	1.24
3260	Natural river reaches and river riffles	4.2	3.0	Bad.	Removal or reduction of large woody debris in sites where they promote shore erosion, as well as in reaches with pebble or boulder substrate (once per 3-5 years). Demolition of beaver dams (on necessity, annually). Reduction of large woody debris in river reach between Vilce school and Zaķu Grassland (~ 480 meters, every 1-2 years).	0.5 On necessity.	4.2

Zvārdes meži | *Nature Park (LV0305000)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Saldus municipality Zvārde, Jaunauce, Rumba municipalities.

AREA: 8173 ha.

NATURE MANAGEMENT PLAN: 2005 (2005–2009).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 139 of 22 February 2005, Regulation on Individual Protection and Use of the Zvārdes Meži Nature Park.

Zvārdes meži Nature Park includes large massif of forests in Kurzeme region where a peculiar habitat complex has developed due to the unique history of the territory (nearly complete elimination of economic activity during the operation of the Soviet Army military training site). Old, almost unaffected woodlands are biologically the most valuable ones, especially woodlands of *Populus tremula*. Particularly important are also swamp woods of *Alnus glutinosa* which are characteristic for the nature park.

There are several important EU protected grassland habitat types but they cover small areas: Fennoscandian lowland species-rich dry to mesic grasslands and semi-natural dry grasslands on calcareous substrates. Ezere river is the borderline in the north-eastern part of the territory, and it connects Svētaiņa and Ķerkliņa Lakes which are located in subglacial valleys. Steep banks are characteristic for both lakes. Rivers in the nature park are mostly untransformed, often inundated by beavers. Often, river valleys are paludified. The natural riverbeds usually are curvy, narrow and shallow.

There are 12 protected habitat types of EU importance in the nature park. Zvārdes meži is an Internationally Important Bird and Biodiversity Area in Latvia (LV024), 31 protected bird species have been found here, including 24 species of the Birds Directive. Several micro-reserves for the protection of bird species have been established in the nature park and its immediate proximity. *Aquila pomarina, Ciconia nigra* and *Pandion haliaeetus* are breeding in the territory. Also *Bonasa bonasia, Haliaeetus albicilla, Pernis apivorus, Dendrocopos leucotos, Picoides tridactylus, Picus canus* can be found here.

There are 20 protected plant species in the nature park, such as *Ajuga pyramidalis, Dactylorhiza baltica, Dactylorhiza incarnata, Primula farinosa* , and others. *Triturus cristatus* and *Vertigo geyeri* can be found in the area. The nature park is important for six protected mammal species - *Lutra lutra, Muscardinus avellanarius,* including four species of bats, such as *Eptesicus nilssonii*, and *Nyctalus noctula.*

2. Threats to habitat and species conservation

- Grassland management discontinuation; grassland degradation due to overgrowth with shrubs.
- The disappearance of landscape mosaic due to overgrowth of grasslands and other agricultural lands. This threatens the foraging resources and thereby the population of lesser spotted eagle (*Aquila pomarina*).
- Fragmentation and decrease of areas of old woodlands.

3. Existing management of the protected habitats and its assessment

- Littoral macrophytes have been mown at Lake Svētaiņi for the maintenance of angling and bathing access in the vicinity of residential area. As a result, open, productive littoral zones are created, ensuring the feeding of juvenile fish. This also improves the accessibility and landscape quality of the lake. The measure is generally evaluated as positive.
- According to Rural Support Service, in 2014 only one dry grassland on calcareous substrate (1 ha) was managed in scope of Rural Development Programme measure “Maintaining biodiversity in grasslands”.

4. Priorities of management and conservation

- Maintenance of semi-natural grasslands and extensively managed (mown or grazed) cultivated grasslands and fallow-lands in the maximum area (at least 950 ha) in order to provide foraging sites for *Aquila pomarina* and breeding sites for *Crex crex*. Priority areas are specified in Nature management plan of 2005 but they should be updated.

- Restoration and maintenance of semi-natural grasslands in the area of at least 50-100 hectares (priority areas for restoration are located in northern, north-eastern and central parts of the nature park, including those that currently overgrow with expansive species, shrubs and forest, as well as extensively managed grasslands and fallow-lands with good regeneration potential – potential habitats of EU importance).
- Reduction of fragmentation of woodland habitats. Creation of future protected woodland habitats in spruce plantations.
- Undisturbed course of natural processes in habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps according to the latest methods.
- Development of a new Nature management plan. Evaluation of the existing functional zoning and regulations for ensuring the reduction of habitat fragmentation.
- Inventory of grasslands (both semi-natural and cultivated) and fallow-lands. Development and implementation of grassland restoration plan in order to increase the area of semi-natural grasslands and to preserve foraging sites for *Aquila pomarina*. Current maps of grasslands are outdated and do not show the current situation. Nature management plan of 2005 does not provide a reasoned assessment on the minimal area of grasslands for their sustainable preservation. High level of fragmentation suggests that that the current area can not ensure a favorable conservation status of semi-natural grassland habitats in the long term. In order to increase the ecological connectivity of semi-natural grassland habitats, the establishment of semi-natural grasslands in their historical areas must be evaluated. The restoration of currently preserved semi-natural grasslands is the priority.

5.2. Specific measures - habitats

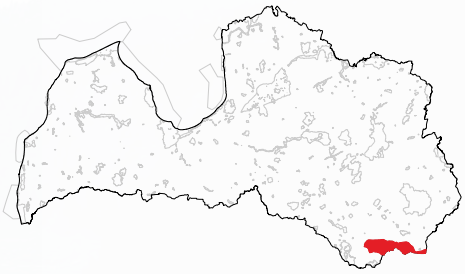
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	22.5	<1	Favourable.	Non-intervention.		22.5
9180*	Slope forests	8.3	<1	Favourable.	Non-intervention.		8.3
9080*	Fennoscandian deciduous swamp woods	113.2	1.4	Favourable to bad.	Non-intervention.		113.2
9020*	Broad-leaved deciduous forests	14.3	<1	Poor.	Non-intervention.		14.3
9000	Potential Protected woodland habitat	405.0	5.0	-	Non-intervention. Selective thinning in *Picea abies* plantations in order to increase proportion of deciduous trees. Creation of gaps in *Picea abies* plantations.	55.0	350.0

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	23.5	<1	Favourable to poor.	Non-intervention.		141.6
91E0*	Alluvial forests	14.4	<1	Poor.	Non-intervention.		14.4
9050	Herb rich spruce forests	0.1	<1	Favourable.	Non-intervention.		0.1
7160	Fennoscandian mineral-rich springs and springfens	0.1	<1	Favourable.	Non-intervention.		0.1
6410	*Molinia* meadows	0.03	<1	Bad.	Restoration. Maintenance.	0.03	 0.03
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.2	<1	Bad.	Restoration. Maintenance.	0.2	 0.2
6210	Semi-natural dry calcareous grasslands	11.7	<1	Bad.	Restoration. Maintenance.	11.7	 11.7
6000	Grasslands to be restored	950.0	11.6	-	Restoration. Maintenance.	950.0	 950.0
3260	Natural river reaches and river riffles	15.0	<1	Poor.	Non-intervention, except cases if grassland management of river banks is necessary. Removal of fallen logs and beaver dams – on necessity.		
3150	Natural eutrophic lakes	30.0	<1	Poor.	Non-intervention. Maintenance of open littoral zone in Lake Svētaiņi.		29.9 0.1

PROTECTED LANDSCAPE AREAS

Augšdaugava | *Protected Landscape Area (LV0600400)*

1. Brief description



YEAR OF FOUNDATION: 1999.

LOCATION: Daugavpils municipality Naujene, Saliena, Skrudaliena, Tabore, Vecsaliena rural territories; Krāslava municipality Kalnieši, Kaplava, Krāslava, Piedruja, Ūdrīši rural territories and Krāslava town.

AREA: 52 098 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE TERRITORIES:

- Adamovas krauja, Daugavas vārti (Slutišķu un Ververu krauja), Mālkalnes avots, Sandarišku karengravas, Sproģu gravas, Viļušu avots Geological and Geomorphological Nature Monuments;
- Hoftenbergas parks, Juzefovas parks, Rozališķu parks Dendrological Plantings;
- Daugavas loki Nature Park (nature management plan developed in 2010 (2010–2022)).

Augšdaugava Protected Landscape Area includes a valley of the middle part of Daugava River, and surrounding territories. In terms of nature and cultural history, this is the most diverse, rich and less modified part of Daugava river valley in Latvia. Landscape mosaic with secondary woodlands and agricultural lands (nowadays mostly used as grasslands) is characteristic for the territory.

The valley of Daugava River is an important value of nature, and a high number of protected habitats can be found here. Therefore, it is one of the most important species aggregation centers and distribution corridors in the Baltic geobotanical province and its adjoining provinces. In this aspect, the territory is also internationally important.

There are 18 EU protected habitat types. Protected species include 50 species of plants, 33 bird, 31 invertebrate, five fish and cyclostome species.

The territory comprises 23 % of the total area of habitat type 6120* Xeric sand calcareous grasslands in Latvia, therefore this is one of the most important Natura 2000 sites for the conservation of this habitat type in Latvia. It is the fifth most important for conservation of 6270* *Fennoscandian lowland species-rich dry to mesic grasslands,* the ninth most important for 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) and at the same time the most important for the conservation of eastern variant of this habitat type, which is characteristic only for eastern Latvia. It is also among the first 15 Natura 2000 territories for 6450 *Northern boreal alluvial meadows* and 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis). Grasslands are an important habitat for protected plant species *Gentiana cruciata, Gladiolus imbricatus, Iris sibirica, Cnidium dubium* and the very rare *Orobanche caerulescens*.

The forests are unevenly distributed and concentrated near Daugava and in valleys of smaller rivers where outstanding forests on slopes can be found. Dry forests dominated by pines (*Pinus sylvestris*) are rather intensively managed. Woodlands of *Betula* spp. and *Alnus incana* are usually found in agricultural lands which are long abandoned. Aquatic habitats cover 1.3 % of the territory. A rather high gradient of flow is characteristic for lower reaches of Daugava river tributaries.

Thanks to the diversity of habitats, large variety of protected invertebrate species can be found in the territory – *Ophiogomphus cecilia, Oxyporus mannerheimii, Osmoderma barnabita, Lycaena dispar, Agrilus biguttatus, Dorcus parallelopipedus, Cochlodina orthostoma, Unio crassus* in rivers, and others. The territory is also rich in bird species. Examples of rare bird species are *Ciconia nigra, Glaucidium passerinum, Aquila pomarina, Pernis apivorus, Sterna albifrons*. Grasslands are important habitats for *Crex crex* and *Gallinago media*.

2. Threats to habitat and species conservation

- Open slopes, road verges, alluvial grasslands and fluvial terraces of Daugava river valley overgrow with shrubs.
- Wet habitats may be adversely affected by rewetting.
- All types of logging (including commercial felling and sanitary felling (felling of damaged and infested trees)) are allowed in protected woodland habitats in accordance to the existing regulatory enactments. As a result, volumes of important biodiversity structures such as biologically-old trees and dead wood are decreased.
- The greatest threat to grassland habitats is their abandonment and overgrowth with forest. In 2010s, the territory was in one of the first places concerning the proportion of unmanaged (abandoned) grasslands of EU importance. In some areas, grasslands are managed too intensively or grubbed up.
- River habitats are threatened by hypothetical plans to make the Daugava river navigable, which would require an increase of water level.

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage protected forest and mire habitats.
- According to Rural Support Service, grasslands are managed in small areas in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Habitat types 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis) and 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* (managed 42 % and 47 % respectively) are in the best condition. The condition of other EU grassland habitat types is worse. Only 26 % of 6120* *Xeric sand calcareous grasslands*, 10 % of 6230* *Species-rich* Nardus grasslands, *on siliceous substrates in mountain areas (and submountain areas, in Continental Europe*), and 9 % of 6450 *Northern boreal alluvial meadows* are managed.
- In Slutišķi village, up to 5 hectares of dry grasslands (6120* un 6210) were managed in scope of EC LIFE programme project "National Conservation and Management Programme for Natura 2000 Sites in Latvia" (LIFE11 NAT/LV/000371).

4. Priorities of management and conservation

- Reduction of grassland habitat fragmentation; their restoration and maintenance in favourable conservation status.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Conservation of natural flooding regime and biological quality of aquatic habitats.
- Reduction of forest habitat fragmentation; increase of area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat. Development towards habitat types 9050 *Fennoscandian herb-rich forests with* Picea abies, 9010* *Western Taïga*, and 9080* *Fennoscandian deciduous swamp woods* is expected.
- Improvement and maintenance of the most important viewpoints.

5. Necessary management and conservation measures

5.1. General measures

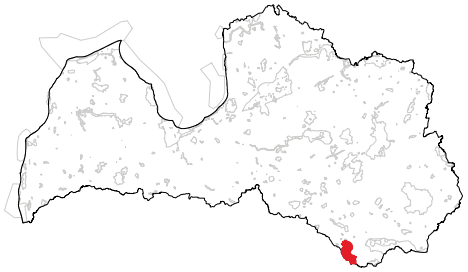
- Development of nature management plan and Individual regulations on protection and use in order to provide conservation of habitats.
- Detailed mapping of grassland habitats and their potential restoration sites. Development of grassland restoration and conservation plan. The current landscape-ecological connectivity of grasslands is low, therefore the analysis of their functional landscape-ecological connectivity and possibilities of its increase is necessary after habitat mapping.
- Establishment of micro-reserves for grassland habitats. In order to promote grassland landscape-ecological connectivity between Augšdaugava and Augšzeme Protected Landscape Areas, and Dvietes paliene Nature Park, it is necessary to ensure conservation of grasslands in Daugava river valley in the area from the western border of Augšdaugava Protected Landscape Area to the south-eastern border of Dvietes paliene Nature Park.
- Measures for the protection of bats (protection of maternity colonies in churches, inventory and conservation of hibernation sites).
- Restriction of spread of invasive species *Acer negundo* in Daugava river floodplain, *Solidago canadensis* in all territory.
- Partial removal of excessive trees and shrubs (obstructing the view) on Sturišķi and Ververi cliffs.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	36.5	<1	Bad.	Non-intervention.		36.5
9180*	Slope forests	97.1	<1	Bad.	Non-intervention.		97.1
9010*	Western Taïga	241.8	<1	Bad.	Non-intervention.		241.8
9000	Potential Protected woodland habitat	155.5	<1	-	Non-intervention. Improvement of stand structure.		155.5
7220*	Petrifying springs	1.1	<1	Favourable.	Non-intervention.		1.1
7160	Fennoscandian mineral-rich springs and springfens	1.3	<1	Favourable.	Non-intervention.		1.3
7140	Transition mires and quaking bogs	39.6	<1	Favourable.	Non-intervention.		39.6
7120	Degraded raised bogs	1.1	<1	Bad.	Rewetting		1.1
6430	Hydrophilous tall herb fringe communities	49.5	<1	Poor.	Restoration. Maintenance.	49.5	49.5
6450	Northern boreal alluvial meadows	216.8	<1	Bad.	Restoration. Maintenance.	Up to 216.8	216.8
6510	Lowland hay meadows	48.5	<1	Bad.	Restoration. Maintenance.	Up to 48.5	48.5
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	169.0	<1	Bad.	Restoration. Maintenance.	Up to 169.0	169.0
6230*	Species-rich *Nardus* grasslands	3.1	<1	Bad.	Restoration. Maintenance.	2.5	3.1
6210	Semi-natural dry calcareous grasslands	60.8	<1	Bad.	Restoration. Maintenance.	Up to 60.8	60.8
6120*	Xeric sand calcareous grasslands	73.2	<1	Bad.	Restoration. Maintenance.	Up to 73.2	73.2
6000	Grasslands to be restored	500	1.0	-	Restoration. Maintenance.	500	500
3270	Rivers with muddy banks	22.3	<1	Poor.	Non-intervention.		22.3
3260	Natural river reaches and river riffles	1449	2.8	Poor.	Reduction of number of beaver dams, maintenance of river riffles in tributaries of Daugava river – in reaches with *Unio crassus*.		2
3150	Natural eutrophic lakes	4.0	<1	Poor.	Partial mowing of emergent vegetation in littoral zones of lakes. Mowing in belts in order to restore shallow littoral zones.		2

Augšzeme | *Protected Landscape Area (LV0600300)*

1. Brief description



YEAR OF FOUNDATION: 1977.

LOCATION: Daugavpils municipality Kalkūne, Medumi and Svente rural territories; Ilūkste municipality Šēdere rural territory.

AREA: 20 814 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE AREAS:

- four Nature Reserves – Bardinska ezers, Medumu ezera salas, Skujines ezers, Sventes ezera salas;
- two Nature Parks – Svente and Medumu ezeraine;
- two Dendrological Plantings – Jaunsventes parks and Medumu parks;
- one Protected Avenue – Medumu aleja.

Augšzeme Protected Landscape Area is established for the conservation of visually impressive landscape.

It includes Rauda Lake District (Lakeland) (five lakes), almost the entire Svente Lake District (15 lakes, does not include Pelečina Lake), the entire Medumu Lake District (13 lakes), the entire Kumpinišķu (Vilkumiesta) Lake District (eight lakes), five of the 15 Laucesa Lake District lakes, Laucesa valley, as well as six of the 12 Kurcuma Lakeland lakes. Ten lakes are located on a Latvian-Lithuanian border, and only part of their area is located in Latvia. In total there are 52 lakes. Also a large size hill massif of the Augšzeme Upland is part of the territory. In total, 21 EU protected habitat types can be found in the protected landscape area: woodlands, grasslands, mires and freshwater habitats. Almost half of the territory is occupied by forests and scrubs, with open landscapes inbetween. Mires and wetlands are located in depressions among the hills. Water habitats occupy 8% of the territory. Lake Svente is a slightly eutrophic lake. It is one of the most biologically valuable and most sensitive lakes not only in the Augšzeme Protected Landscape Area but also in the entire territory of Latvia.

EU protected grassland habitats cover 260 hectares large area. At the national level, Augšzeme Protected Landscape Area is the fourth most important Natura 2000 site for the conservation of habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) (5.8% of the total habitat area in the country). Within the Latgale Region, this is the second most important Natura 2000 site for the conservation of dry grasslands on calcareous substrates typical for Eastern Latvia. From landscape-ecological point of view, this territory is a part of species dispersal corridor which is important in Eastern Europe. It consists of a series of uplands located in the north-south-west direction – Otepää and Haanja Uplands in Estonia, Latgale and Augšzeme Uplands in Latvia, Aukštaitija, Dzūkija and Sūduva Uplands in Lithuania, Suwałki Upland in Poland.

In total, 59 rare or specially protected plant species have been found in the territory – six charophyte species, 13 species of mosses, 37 vascular plant and three lichen species. Examples of very rare plant species are *Thesium ebracteatum, Callitriche hermaphroditica, Elatine hydropiper, Najas flexilis, Najas minor, Nitella syncarpa,* mosses *Hamatocaulis lapponicus, Lophozia rutheana, Philonotis marchica, and Ricciocarpos natans*. Lake Skujine is one of the 25 known localities of *Najas flexilis* in the continental Europe. Dry grasslands on calcareous substrates are important for the protection of populations of *Saxifraga tridactylites, Gentiana cruciata*, and *Carex ornithopoda*.

Also 34 protected bird species and 35 protected or rare invertebrate species have been found in the territory. Svente and Medumi Lakes are one of the few breeding sites of *Milvus migrans*. Other rare bird species in the territory are *Aquilla pomarina*, *Crex crex, Glaucidium passerinum, Circus pygargus, Ciconia nigra*, etc. The most important invertebrate species are *Leucorrhinia pectoralis, Graphoderus bilineatus, Oxyporus mannerheimii, Lycaena dispar*, and *Unio crassus*. Nine protected bat species and six species of reptiles and amphibians can be found in the territory including European fire-bellied toad *Bombina bombina* and European pond turtle *Emyus orbicularis*.

2. Threats to habitat and species conservation

- Forest habitats and their associated species are negatively affected by habitat fragmentation and by logging. If logging is carried out in accordance to regulatory enactments, the volumes of dead wood (necessary for biodiversity) are decreasing, and some proportion of old trees and woodlands are decreasing as well.
- Due to anthropogenic eutrophication, three of Latvia's protected habitats are most threatened – 4.10. *Lakes with stands of* Najas *spp.*, 4.11. *Extensive lake beaches that are not overgrown*, and 4.19. *Lakes with the littoral dominated by mineral soil*. Due to development of coastal residential areas and recreation, outstanding nature values of Svente and Medumi Lakes are particularly threatened.
- Lack of management of grassland habitats; building construction.
- Ploughing of agricultural lands for the cereal farming, resulting in biodiversity decline, decrease of area of meadows and pastures, as well as uncontrolled use of mineral fertilizers and pesticides (also adversely affecting aquatic habitats).
- Fragmentation of grassland habitats.
- Transition mires, littoral parts of lakes and swamps at lakes are affected negatively by activities of beavers (establishment of dams; water level rise).

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to protect habitats of mires and forests.
- Reed mowing in lakes was beneficial – it provided access to water for both humans and birds.
- According to Rural Support Service, in 2014 about half of the EU protected grasslands were managed in the scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Preservation of hydrological regime that is optimal for habitats and species.
- Conservation of at least 260 hectares of grassland habitats; restoration of at least 250 hectares of grassland habitats.
- Creation and maintenance of open littoral areas (free from aquatic macrophytes) in order to maintain fish resources, to promote breeding success of waterbirds, as well as to facilitate that plant residues would be washed onto the coast and to slow down eutrophication.
- Maintenance of river riffles, in order to ensure natural water flow in rivers, and to conserve populations of rare mollusc species in rivers.

5. Necessary management and conservation measures

5.1. General measures

- Approval of Individual regulations on protection and use, in order to restrict building construction at the lakes and to reduce the load of human activities.
- Expand the size of the protected landscape area, including also Lake Peļušina and Laucesa Valley, after the in-depth analysis.
- Development of grassland restoration and conservation plan. Nature Conservation Plan of 2016 does not provide a reasoned assessment of the minimum grassland area for their sustainable conservation. High level of fragmentation indicates that favourable conservation status of grassland habitats can not be provided in a long term. In order to increase the landscape-ecological connectivity of grassland habitats, the establishment of grasslands in their historical areas must be considered. Restoration of grasslands which were assessed as corresponding to EU protected habitat types at the beginning of 21th century but as ineligible in 2016, is the priority.
- Public information on a possible financial support (agri-environmental payments; funding of projects); promotion of private initiative - a large part of the natural values of grasslands in this area can not be preserved without it.
- Reduction of the rate of lake eutrophication – creation of openings in the cover of woody species on the shore, therefore promoting the washout of macrophyte residues, while at the same time ensuring the visual attractiveness of the lake landscape.
- Thinning and strip-mowing of littoral macrophytes in order to create favourable conditions for water invertebrates and for juvenile fish (feeding on invertebrates), as well as for successful duck breeding.
- Limitation of beaver activities and decrease of their number (hunting), to prevent lake water level fluctuations.
- Additional treatment of wastewater of Medumu village, before it is discharged into Dumlu Lake.

- Ensuring of non-intervention regime in small lakes of the wooded areas.

5.2. Specific measures

5.2.1. Species

Population of *Thesium ebracteatum* consists of ~500 specimens, its condition is considered as favourable. Necessary management measures include mowing once per season (end of June, beginning of July) with grass removal.

5.2.2. Habitats

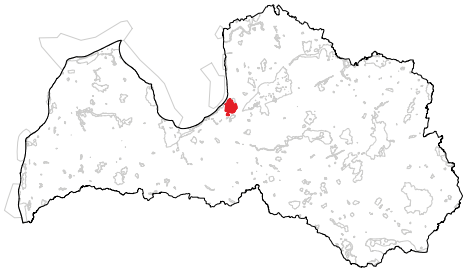
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	94.1	<1	Bad.	Non-intervention.		94.1
91E0*	Alluvial forests	170.2	<1	Bad.	Non-intervention.		170.2
9180*	Slope forests	83.3	<1	Bad.	Non-intervention.		85.1
9160	Oak forests	51.6	<1	Bad.	Non-intervention.		51.6
9080*	Fennoscandian deciduous swamp woods	434.2	2.0	Poor.	Non-intervention.		434.2
9050	Herb rich spruce forests	260.2	1.2	Bad.	Non-intervention.		260.2
9020*	Broad-leaved deciduous forests	122.6	<1	Bad.	Non-intervention.		122.6
9010*	Western Taïga	34.8	<1	Poor.	Non-intervention.		34.8
7220*	Petrifying springs	0.06	<1	Favourable.	Non-intervention.		0.06
7140	Transition mires and quaking bogs	39.7	<1	Poor.	Non-intervention. Limitation of activities of beavers.		39.7
7110*	Active raised bogs	4.6	<1	Bad.	Non-intervention.		4.6
6510	Lowland hay meadows	11.1	<1	Bad.	Restoration. Maintenance.	11.1	11.1
6450	Northern boreal alluvial meadows	11.1	<1	Bad.	Restoration. Maintenance.	11.1	11.1

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6410	*Molinia* meadows	0.6	<1	Bad.	Restoration. Maintenance.	0.6	0.6
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	63.3	<1	Bad.	Restoration. Maintenance.	63.3	63.3
6210*	Semi-natural dry calcareous grasslands	173.3	<1	Bad.	Restoration. Maintenance.	173.3	173.3
6000	Grasslands to be restored	250.0	1.2	-	Restoration. Maintenance.	250.0	250.0
3260	Natural river reaches and river riffles	20.1	<1	Favourable.	Removal or reduction of large woody debris in river reaches where pebbles or boulders in the riverbed indicate on high quality river riffles.		0.6
3140	Charophyte lakes	19.2	<1	Poor.	Non-intervention.		19.2
3150	Natural eutrophic lakes	1373.8	6.6	Poor, bad.	Reed mowing. Removal of large woody debris. Thinning of belt of trees in the S and SW shore of the Skujine Lake.	280 1.9	 0.2

Nature Conservation Plan of 2016 does not provide information on grassland restoration necessity, except for brush cutting in 19 hectares and topsoil loosening in 2 hectares in habitat type 6120* *Xeric sand calcareous grasslands*. However, the conservation status of all grassland habitats is assessed as poor. This means that restoration measures to improve the conservation status are necessary also in the rest of the grasslands – in approx. 240 hectares. To ensure long-term conservation of grassland biodiversity, at least 250 hectares of grasslands have to be restored.

Ādaži | *Protected Landscape Area (LV0600800)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Ādaži, Sēja, Saulkrasti municipalities.

AREA: 10 150 ha.

NATURE MANAGEMENT PLAN: 2015 (2015–2025).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

TERRITORY INCLUDES: Lieluikas and Mazuikas ezeri Nature Reserve.

Ādaži Protected Landscape Area has been established for the conservation of habitat types which are protected in Latvia and EU, with a particular attention to *Dry sand heaths with* Calluna *and* Empetrum nigrum, *Northern Atlantic wet heaths with* Erica tetralix, *Fixed coastal dunes with herbaceous vegetation (grey dunes), Western Taïga, Bog woodland, Fennoscandian deciduous swamp woods, Active raised bogs, Transition mires and quaking bogs*. In total, 17 habitat types of EU importance have been found in the territory. These are the largest areas of European dry heaths in the Baltic countries, and more than 90 % of the total dry heaths area in Latvia is located in the territory.

Heaths and other habitats of the territory are important habitats for several protected species; the area has a very important role for the protection of, for example, *Bufo calamita, Coronella austriaca, Tetrao tetrix, Anthus campestris, Coracias garrulus*, and others. The largest or one of the largest localities in Latvia for several invertebrate species are located in the area: *Oedipoda caerulescens* and *Ergates faber*.

There are 47 protected mushroom and plant species in the territory, for example, *Lobelia dortmanna, Pulsatilla patens, Dianthus arenarius, Pedicularis sceptrum-carolinum, Lycopodiella inundata, Diphasiastrum tristachium*, and others.

Also 45 protected bird species have been found. Besides the above-mentioned, important species are also *Upupa epops, Lullula arborea, Falco columbarius, Dryocopus martius, Columba oenas*, and others. Bats of eight protected species live in the territory. Also 24 invertebrate species protected in Latvia have been found here.

2. Threats to habitat and species conservation

- During the last three decades, heaths and open dune habitats have overgrown due to absent or insufficient disturbances, in a course of succession.
- In absence of fire disturbance, in a course of succession, soils in oligotrophic forests are enriched with nutrients.
- Rare species which depend on protected habitats are threatened, and their populations may decrease due to too intense use of the territory for military training purposes (including degradation of terrain and groundfloor, destruction of forests).
- Eutrophication of lakes can be promoted by increasing load of visitors.

3. Existing management of the protected habitats and its assessment

- Since 1930s, when the military training area was established, the territory has been influenced by military drills (especially during the Soviet times). This was the most important factor promoting the transformation of landscape and the development of the current mosaic of habitats. Until the establishment of protected landscape area in 2004, there was no management or conservation of nature values.
- Targeted management for the conservation of habitats was started in 2007, and has since been continued in various levels and volumes (in order to maintain open heaths and grasslands). In scope of LIFE programme project "Restoration of Biological Diversity in Military Training Area and Natura 2000 site "Adazi" (LIFE06/ NAT/LV/000110), from 2006 to 2009, the restoration of dry heaths was carried out in order to prevent their overgrowth and to improve habitats of rare species (felling of trees, prescribed burning, mowing, ring-barking (girdling) of trees).
- From 2013 to 2017, in the framework of the new LIFE programme project "Improving of the conservation status of specially protected bird species in Natura 2000 site "Adazi"", LIFE12/NAT/LV/000509, restoration of heaths was continued in large areas (felling of trees, prescribed burning, topsoil removal). Also improvement of structural elements was carried out

in western Taïga (creation of dead wood, prescribed burning). These disturbances occur also unplanned, during the military training (vehicle use, blasting, burning, etc.).

- Shores of Lieluika and Mazuika lakes were cleaned of excessive trees and shrubs; cover of reeds was reduced around Lake Mazuika; fence was constructed to prevent too high visitor load. Rewetting in Rampa Mire was started in 2012, and continued in 2017. Dams and water flow regulators were established, and trees in the mire were felled in several hundreds of hectares large area. Most habitat restoration work has substantially improved the conditions for the rare species in territory.
- For the locality of *Pulsatilla patens*, regular groundfloor disturbances were ensured. Artificial nest sites for *Coracias garrulus* and *Upupa epops* were established. Results of the management success show that the conditions of habitats and species have been significantly improved.

4. Priorities of management and conservation

- The long-term conservation of the interaction of natural processes and military training activities, which would ensure the open areas of sands, heaths and grey dune habitats with a characteristic complex of plant and animal species.
- Restoration of mire habitats which are degraded as a result of drainage and burning.
- Conservation of habitats of lakes, bog woodlands and wooded dunes in favourable conservation status and with their species.
- In Lieluikas and Mazuikas lakes - prevention of burial of isoetid habitats with layer of decayed leaves and reeds.

5. Necessary management and conservation measures

5.1. General measures

- Extension of the protected landscape area by connecting the two separate areas. It is particularly important for the conservation of protected species such as Anthus campestris.
- Approval of the Individual regulations on protection and use of the territory. Project of regulations has been developed and included in Nature management plan (2015).
- Investigation of the reasons of water level rise in Lake Mazuika; development and implementation of a project for the prevention of water level rise.

5.2. Specific measures

5.2.1. Species

- Placing nestboxes suitable for *Coracias garrulus* and *Upupa epops*.
- Creation of spawning sites suitable for *Bufo calamita*.
- Placing nestboxes suitable for bats.
- Regular removal of leaf and reed litter from littoral parts of lakes in order to conserve suitable conditions for *Lobelia dortmanna* and Isoëtes lacustris.

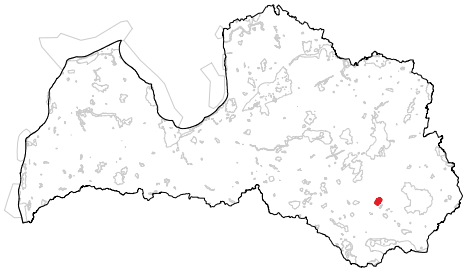
5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	596.8	5.9	Favourable.	Non-intervention.		596.8
9080*	Fennoscandian deciduous swamp woods	188.9	1.9	Poor.	Drainage impact mitigation in eastern part. Research and planning are necessary before the restoration.	According to research results.	
91E0*	Alluvial forests	31.1	<1	Poor.	Non-intervention.		31.1
9010*	Western Taïga	179.3	1.8	Poor.	Prescribed burning. Improvement of structural elements in periphery (all dry pine forests including 2180).	15.3	179.3
9000	Potential Protected woodland habitat	45.0	<1	-	Maintenance of future habitats.	45.0	
7160	Fennoscandian mineral-rich springs and springfens	0.004	<1	Favourable.	Non-intervention.		0.004
7150	Depressions on peat substrates	0.04	<1	Favourable.	Regular disturbances of rare species which need bare substrate (management in complex with heaths).	0.04	
7140	Transition mires and quaking bogs	73.4	<1	Poor.	Felling of trees and shrubs (on necessity; restoration of localities of rare and protected species is the priority).	73.4	
7120	Degraded raised bogs	1036.6	10.2	Poor.	Maintenance (repair on necessity) of dams on ditches. Felling of trees and regrowth of deciduous trees (every 5 years; areas – on necessity).	1036.6	200
7110*	Active raised bogs	168.4	1.7	Poor.	Maintenance (repair on necessity) of dams on ditches; repair and cleaning of culverts (on necessity). Felling of trees and regrowth of deciduous trees (every 5 years; areas – on necessity).	168.4	150
6530	Fennoscandian wooded meadows	0.3	<1	Bad.	Restoration. Maintenance.	0.0	0.3

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
4010	Northern Atlantic wet heaths with Erica tetralix	905	8.9	Poor.	Removal of excess trees – felling, prescribed burning, ring-barking. Mowing the regrowth of deciduous trees (every 5 years). On necessity – rewetting (sites specified in nature management plan).	905	 905
3260	Natural river reaches and river riffles	5	<1	Poor.	Continuous removal of beaver dams in Puska, Melnupe and Cimeļupe rivers (every year).		0.5
3150	Natural eutrophic lakes	26	<1	Poor.	Annual mowing of reeds on Lieluika lake coast in places where they threaten isoetids. Regular cleaning of culvert of brook outflowing of Lieluika lake, in order to prevent water level rise in the lake.		0.5 0.1
3130	Lobelia-Isoetes lakes	21	<1	Poor.	Annual mowing of reeds on coast of Mazuika lake in places where they threaten isoetids. Felling of Betula spp. and shrubs on coast of Mazuika lake (every 5 years).	 0.5	0.5
2320	Dry heaths	2295	22.6	Poor.	Habitat restoration by feeling of trees and shrubs, creating groundfloor disturbance (vehicles etc.), maintenance (sites specified in nature management plan). Felling of new trees and shoots.	917	 1894
2180	Wooded dunes	332	3.3	Poor.	Improvement of structure (measures concerning dry forests, including 2180).	332	
2130*	Grey dunes	135	1.3	Poor.	Restoration: felling of trees and shrubs, groundfloor disturbances (vehicles etc.), maintenance (sites indicated in nature management plan). Felling of new trees and shoots.	135	 135

Kaučers | *Protected Landscape Area (LV0600900)*

1. Brief description



YEAR OF FOUNDATION: 2004.

LOCATION: Preiļi municipality Preiļi rural territory; Riebiņi municipality Rušona rural territory.

AREA: 2769 ha.

NATURE MANAGEMENT PLAN: 2008 (2008–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Kaučers Protected Landscape Area is located in a hilly territory where landscape is dominated by plateau-like hills. Their slopes often are divided by ravines. Paludification occurs in interhill depressions. The high recreational value of the landscape is determined by the relief forms in the complex with vegetation and freshwater ecosystems. Habitat mosaic is characteristic for the territory. Forest territories are rather fragmented.

There are seven lakes in the territory, covering 8% of the area. These are Salmejs, Kaučers, Stupānu (Stuponu) lakes, Limins, Meirauka, Baibas and Asaris (Esereits) lakes. They are important nature values as protected habitats and species habitats. The quality of habitats of lakes is largely determined by runoff from their drainage basins which are dominated by agricultural land and residential areas. Their water quality differs, as well as their degree of overgrowth, negative influences, and conditions which promote their eutrophication. Salmejs and Kaučers lakes are public lakes.

There are 11 EU protected habitat types, 15 rare and protected species of plants, six rare moss species, as well as several important bird species. The only locality of moss *Tortula latifolia* in Latvia is located in the territory.

Protected plant species *Hydrilla verticillata* and *Isoëtes lacustris* (suffering from eutrophication of the lake) grow in Salmeja lake. Also *Najas flexilis* is found here. Valuable fen is located at Meirauka lake, and rare orchid species can be found here, for example, *Corallorhiza trifida, Liparis loeselii,* and rare moss species. The lakes are mostly eutrophic, and characterized by oxygen depletion, which cause phosphorus release from sediments in the water layer, and plays an important role in acceleration of eutrophication.

The landscape is characterized by a large diversity of grassland habitats. Grasslands are important for breeding of *Crex crex*. The territory is the ninth most significant Natura 2000 site for the protection of habitat type 6230* *Species-rich* Nardus *grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe*) and 16th most important for 6270* *Fennoscandian lowland species-rich dry to mesic grasslands* (respectively 3% and 2% of the total area in the Natura 2000 network). Only 97 hectares of EU protected grassland habitats are currently known in the territory. However, the total area of perennial grasslands and old fallow-lands, which potentially may develop to EU protected grassland habitats, is much larger. From landscape-ecological point of view, this territory is a part of species distribution corridor which is important in Eastern Europe. It consists of a series of uplands located in the north-south-west direction – Otepää and Haanja Uplands in Estonia, Latgale and Augšzeme Uplands in Latvia, Aukštaitija, Dzūkija and Sūduva Uplands in Lithuania, Suwałki Upland in Poland.

The territory is important also for several species of invertebrates, such as *Graphoderus bilineatus, Lycaena dispar, Vertigo geyeri*, and amphibian and reptiles - *Triturus cristatus* and *Lacerta agilis*.

2. Threats to habitat and species conservation

- Lack of grassland management; inappropriate management.
- Overgrowth, grubbing up, afforestation, building up of perennial grasslands, increasing grassland fragmentation in the wider region, thereby reducing the potential for increasing the area of grasslands of EU importance in the territory.
- Removal of dead wood, withering and withered trees and logging of biologically-old trees impairs the structural quality of woodland habitats and adversely affects the habitats of their associated species.
- Pollution with municipal waste, illegal picnic sites and fireplaces on shores of lakes. Pollution and degradation of freshwater habitats may be increased due to development of infrastructure without adequate wastewater treatment system.
- Uncontrolled or excessive use of plant protection products or fertilizers on agricultural land, untreated municipal wastewater, and drainage from farms increase pollution in surface waters and adversely affect the status of aquatic habitats.

- On the north-eastern side of Kaučers lake, there is a territory of Kaučera Gailīši Gardening Society. There is no centralised collection of wastewaters from its summer cottages and residences. It threatens the quality of aquatic habitats.
- Lake Salmeja is easily accessible through local roads. Gaiļmuiža village is located about 700 m from the lake, so there is a high anthropogenic load caused by local holidaymakers. Lake eutrophication is promoted by Gaiļmuiža wastewater treatment plant where sand and gravel filters are used and a ditch connects settling pond with a lake. There have been cases when the operation of wastewater treatment plant is not safe (overflow).
- Lake Stupāni is shallow; therefore its overgrowth occurs more intensely.
- North of Gailīši village, invasive plant species *Heracleum sosnowskyi* can be found near the abandoned farm. It might spread to a wider area.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 part of the grasslands were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Habitat types 6510, 6270* and 6410 were managed in up to 44-78 % of their currently known area. Habitat types 6120* and 6230 were managed only in 2-25 %.

4. Priorities of management and conservation

- Restoration and maintenance of semi-natural grasslands at least in their current area (97 ha). Restoration and creation of EU protected grassland habitats in areas of overgrown semi-natural habitats, abandoned cultivated grasslands and fallow-lands, in at least 200 hectares (the total area of agricultural lands is at least 1218 hectares, up to 38 % of which is covered by perennial grasslands), in order to ensure landscape-ecological corridor for species of semi-natural grasslands, protect and increase values of landscapes, and reduce eutrophication in lakes (biogene runoff from semi-natural grasslands is insignificant if compared to fertilised grasslands and arable lands).
- Development of operational rules and regulations for Salmejs and Kaučers lakes introducing conditions and restrictions for use of motorized watercraft (including jet skies).
- Improvement of the functioning Gaiļmuiža wastewater treatment plant; ensuring that wastewaters are properly cleaned before they enter Lake Salmejs.
- Establishment of picnic sites on lake shores according to Nature management plan.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of the fragmentation of forest habitats by increasing the area and integrity of protected habitats, providing of non-interference in woodlands that have not yet reached the quality of protected habitats.

5. Necessary management and conservation measures

5.1. General measures

- Habitat mapping according to the latest methods; also mapping of grasslands where restoration is possible.
- Development and approval of Individual regulations on protection and use, providing measures for the improvement of integrity of forest habitats and setting restriction on forestry intensity.
- Development and implementation of grassland restoration and protection plan. In the Nature management plan of 2008, a reasoned assessment of the minimum natural grassland area for their long-term conservation is not provided. However, it is highlighted that the restoration potential of grasslands is very high. The high level of habitat fragmentation indicates that the current area can not ensure favourable conservation status of grasslands in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered, as well as in areas of current perennial grasslands and fallow-lands.
- Development of a building project; construction of centralized wastewater collection and treatment plant in the territory of Kaučera Gailīši Gardening Society (north western side of Kaučers lake).
- Development and implementation of a plan of establishment of recreational areas in Kaučers Protected Landscape Area.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	4.6	⟨1	Favourable.	Non-intervention.		4.6
9180*	Slope forests	7.0	⟨1	Poor.	Non-intervention.		7.0
9010*	Western Taïga	5.8	⟨1	Poor.	Non-intervention.		5.8
9080*	Fennoscandian deciduous swamp woods	21.5	⟨1	Poor.	Non-intervention.		21.5
91E0*	Alluvial forests	6.2	⟨1	Poor.	Non-intervention.		6.2
91D0*	Bog woodland	12.1	⟨1	Favourable.	Non-intervention.		12.1
9000	Potential Protected woodland habitat	25.0	⟨1	-	Non-intervention.		25.0
7140	Transition mires and quaking bogs	7.0	⟨1	Favourable.	Non-intervention.		7.0
6510	Lowland hay meadows	2.4	⟨1	Favourable.	Restoration. Maintenance.	2.4	2.4
6430	Hydrophilous tall herb fringe communities	8.5	⟨1	Favourable.	Restoration. Maintenance.	0.0	8.5
6410	*Molinia* meadows	4.2	⟨1	Poor.	Restoration. Maintenance.	4.2	4.2
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	76.4	2.8	Bad.	Restoration. Maintenance.	⟩ 35.0	76.4
6230*	Species-rich *Nardus* grasslands	4.3	⟨1	Bad.	Restoration. Maintenance.	4.3	4.3
6120*	Xeric sand calcareous grasslands	1.1	⟨1	Bad.	Restoration. Maintenance.	1.1	1.1
6210	Semi-natural dry calcareous grasslands	0.6	⟨1	Poor.	Restoration. Maintenance.	0.6	0.6
6000	Grasslands to be restored	200.0	7.0	-	Restoration. Maintenance.	200.0	200.0
3150	Natural eutrophic lakes	187.8	6.8	Poor.	Mowing of littoral vegetation in belts. Removal of beaver dams on lake outflows. Non-intervention in Meiuku and Liminu lakes.		0.5 On necessity 12.4

Nīcgales meži | *Protected Landscape Area (LV0601000)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Daugavpils municipality, Nīcgale rural territory.

AREA: 915 ha.

NATURE MANAGEMENT PLAN: 2004 (2005– 2015), validity extended until 2019.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE AREAS: Nīcgales Lielais akmens Protected Geological and Geomorphological Nature Monument.

Nīcgales meži Protected Landscape Area includes a part of a small woodland area extended in SE-NW direction which is located on the right bank of the River Daugava, between Daugava and extensive agricultural land.

The territory is crossed by Šaušupe River with tributaries. The riverbed is not modified and in some places it forms small floodplains. Extensive drainage is not carried out in the territory, however, a dense network of drainage ditches has been created in the adjoining woodlands. Until the formation of protected landscape area, territory was intensively used for logging and forest roads were built. Therefore old, natural woodlands are rare there, protected woodland habitats are fragmented, new and middle-aged deciduous and mixed woodlands are dominant in the area. Five EU protected habitat types can be found in the territory.

The territory is important for the protection of butterflies. About 1200 species of butterflies, including 14 rare and protected species, such as *Catocala fraxini, Euphydryas aurinia, Euphydryas maturna*, and *Lycaena dispar*, have been found in the territory.

The protected landscape area is important also for other rare and protected species - 23 species of birds, three moss and four vascular plant species such as vascular plants *Allium ursinum, Sparganium glomeratum, Ranunculus lanuginosus, Tritomaria quinquedentata, lichen Lobaria pulmonaria*, moss *Lejeunea cavifolia*. Examples of protected bird species are *Bonasa bonasia, Picoides leucotos, Strix uralensis, Glaucidium passerinum*, and others.

2. Threats to habitat and species conservation

- Butterfly caterpillars feed on a variety of host plants – herbaceous plants, grasses, trees and shrubs. Overgrowth of patches, ditch edges and floodplain decrease the open areas which are necessary for rare butterfly species found in the territory.
- Beaver dams and fallen logs in Šaušupe river and its tributaries promote slowdown of the water flow, rise of the water temperature, decrease of dissolved oxygen, shore erosion or paludification (depending on the type of river reach), cover of sand and gravel with sediments, and disappearance of habitats suitable for oxygen-sensitive invertebrates.
- Forest harvesting has caused a significant decrease of forest habitat quality, as well as promoted the fragmentation of habitats. Forests in the territory are still used for commercial purposes, habitat fragmentation is not eliminated, and this can negatively influence condition of their associated species.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Conservation and increase of populations of butterfly species by management of their habitats and maintaining their diversity.
- Undisturbed course of natural processes in forest, as well as in habitats of species that need undisturbed, natural environment.
- Decrease of forest habitat fragmentation; increase of area and integrity of protected habitats; non-interference in woodlands that have not yet reached the quality of protected habitats.

5. Necessary management and conservation measures

5.1. General measures

- Habitat mapping according to the latest methods.
- Update of the Nature management plan and development of Regulation on individual protection and use which must include logging restrictions in order to preserve biologically valuable woodlands.

5.2. Specific measures

5.2.1. Species

14 protected butterfly species. Mowing of sedges in Šaušupe river floodplain – in irregular patches of 5 m^2, at intervals of up to 50 m. Mowing for two consecutive years, after that: three years without mowing. Felling of shrubs in forest animal feeding places. Cutting of shrubs in forest block roads – every 2 years.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9080*	Fennoscandian deciduous swamp woods	1.9	<1	Poor.	Non-intervention.		1.9
9020*	Broad-leaved deciduous forests	18.3	2.0	Poor.	Non-intervention.		18.3
9010*	Western Taïga	55.7	6.1	Poor.	Non-intervention.		55.7
9000	Potential Protected woodland habitat	140.0	15.3	-	Non-intervention. Thinning, increasing the proportion of broadleaved trees.	60.0	80.0
3260	Natural river reaches and river riffles	2.0	<1	Poor.	Ensure the flow rate. Removal or decrease of large woody debris and beaver dams in places with shore erosion as well as in sites where there are riverbeds with sand, pebbles or gravel, or water flow rate is higher than 0.2 m/sec (indication of riffles). Once every 1-3 years, when necessary.	2.0	

Veclaicene | *Protected Landscape Area (LV0600200)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Alūksne municipality Jaunlaicene, Veclaicene and Ziemers rural territories; Ape municipality Ape town with rural territory.

AREA: 20 892 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: for Korneti-Preiļi Nature Reserve – Cabinet Regulation No. 71 of 25 January 2011, Regulation on Individual Protection and Use of Korneti-Preiļi Nature Reserve.

INCLUDES OTHER PROTECTED NATURE AREAS: Korneti-Preiļi, Avotu mežs, Dēliņkalns Nature Reserves, Ziemeru ozolu aleja Protected Avenue, Grūbes dolomīta atsegums Geological and Geomorphological Nature Monument.

Veclaicene Protected Landscape Area includes an extensive territory in Veclaicene hillock, with several large-size hills – Dēliņkalns Hill (271.5 m above the sea level), Sauleskalns Hill and Drusku (Kornetu) castle mound. The territory includes several lakes – a line of deep lakes lies in the Kornetu-Preiļu subglacial valley. Largest of them are: Raipala lake, Pilskalna (Druskas) lake and Lielais Baltiņš lake. Also Kalekaura and Murata lakes are significant to the territory.

About half of the territory of protected landscape area is occupied by forests and shrubs, about one third is occupied by agricultural land, and smaller areas are taken by mires.

Several micro-reserves for the conservation of habitats and bird species have been established in the territory. Significant areas of micro-reserves for the protection of capercaillie (*Tetrao urogallus*) leks are concentrated in eastern part of the territory.

In total, 23 EU protected habitat types have been found in the territory. Large areas are covered by *Western Taïga, Fennoscandian lowland species-rich dry to mesic grasslands, Bog woodlands*. Significant areas are occupied also by *Water courses of plain to montane levels with the* Ranunculion fluitantis *and* Callitricho-Batrachion *vegetation* and *Natural eutrophic lakes with* Magnopotamion *or* Hydrocharition - *type vegetation* as well as Tilio-Acerion forests of slopes, screes and ravines on some steep slopes of hills and in Kornetu-Preiļu subglacial valley. Grūbes dolomīota atsegums Geological and Geomorphological Nature Monument ("Grūbes dolomite outcrop") corresponds to habitat type Calcareous rocky slopes with chasmophytic vegetation. The total length of outcrops is 115 m, and maximum height – 4.5 metres.

Veclaicene Protected Landscape Area is one of the most important territories in Latvia for the protection of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*.

The territory is rich in rare and protected plant and animal species: 24 protected species of plants, six species of moss and lichens, 37 bird, one species of amphibian and reptiles, nine mammal (including 8 species of bats), 35 invertebrate, five fish species. Examples of protected vascular plant species are *Saxifraga hirculus, Listera cordata, Carex atherodes, Corallorhiza trifida, Ceratophyllum submersum, Nitella flexilis*. Mosses - *Anastrophyllum hellerianum* and *Geocalyx graveolens*. Important bird species are *Bonasa bonasia, Tetrao urogallus, Ciconia nigra, Aquilla pomarina, Tetrao tetrix, Caprimulgus europaeus, Lanius collurio,* and others. Protected invertebrate species include *Boros schneideri, Parnassius mnemosyne, Nehalennia speciosa, Ena montana* and *Hirudo medicinalis*.

From landscape-ecological point of view, this territory is a part of species dispersal corridor which is important in eastern Europe. It consists of a series of uplands located in the north-south-west direction – Otepää and Haanja Uplands in Estonia, Latgale and Augšzeme Uplands in Latvia, Aukštaitija, Dzūkija and Sūduva Uplands in Lithuania, Suwałki Upland in Poland.

2. Threats to habitat and species conservation

- Lack of grassland management causing their overgrowth; inappropriate management (shredding of mown grass); too intense management (admixture sowing; fertilisation); building construction; establishment of lawns.

- Decrease of volumes of dead wood in woodlands due to selective felling.
- Disappearance of river riffle areas (inundation and filling with sediments) due to activities of beavers (*Castor fiber*).
- Hydrological regime changes in lakes (beavers block the lake outflows).
- Development of dense belts of emergent vegetation in lakes due to eutrophication and cessation of management.
- Overgrowth of water bodies suitable for *Triturus cristatus* spawning and larvae development. Consumption of *Triturus cristatus* larvae by fish which are released in Triturus cristatus suitable water bodies.
- Spread of invasive plant species *Heracleum sosnowskyi*.
- Load of recreation and tourism in lakes and their shores. In protected landscape area, there are six nature trails, four of them are partially located at shores of lakes.

3. Existing management of the protected habitats and its assessment

- In 2012, in scope of cross-border cooperation project "The green corridor" (*Tuned nature management in transboundary area of Estonia and Latvia*) (EU38806), improvement of Tetrao urogallus leks in bog woodlands was carried out. Further, rewetting is necessary in part of these territories to prevent the repeated overgrowth.
- In framework of the abovementioned project, felling of shrubs and first-time mowing was carried out in grasslands of farm "Mauriņi". The influence of management on habitats has not been evaluated.
- According to Rural Support Service, in 2014 more than half of the grasslands (60-90%) were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 41 % of *Fennoscandian lowland species-rich dry to mesic grasslands* were managed. The impact of management of grassland habitats has not been studied.

4. Priorities of management and conservation

- Conservation of extensively managed (mown and grazed) cultivated grasslands and fallow-lands in their maximum area (at least 3000 ha), in order to ensure foraging sites for *Aquila pomarina* and breeding sites for *Crex crex*, and to preserve the characteristic landscape mosaic.
- Restoration and maintenance of semi-natural grasslands in an area of at least 700 hectares. The restoration of historical grasslands which are now overgrown with shrubs and forest, and extensively managed cultivated grasslands and fallow-lands with a good restoration potential (potential EU protected habitats) is a priority.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by non-intervention in woodlands which have not yet reached the quality of protected habitat, or the improvement of structural elements – creation of canopy gaps and dead wood. Development towards habitat type *Western Taïga* is expected. This management measure is particularly recommended in woodland located between Ziemeri village and Lake Murata.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Improvement of the ecological condition of lakes by decreasing the overgrowth with emergent macrophytes.
- Maintenance of the flow of rivers unimpeded by beaver dams and their caused inundations – in Vaidava and Pērļupīte rivers. Demolition of the mill dam remains, downstream of Korneti.
- Eradication of invasive plant species *Heracleum sosnowskyi*.
- Conservation and restoration of hydrological regime in wet forests.
- Maintenance of spawning sites of *Triturus cristatus;* creation of new spawning sites.
- Improvement and maintenance of *Tetrao urogallus* leks.
- Establishment and maintenance of the necessary infrastructure (stairs, rails) at Grūbe dolomite outcrop.

5. Necessary management and conservation measures

5.1. General measures

- Evaluation and approval of the project of Individual regulations on protection and use. In case of planning the reconstruction or establishment of drainage systems, the territory that is expected to be influenced must be specified. If habitat types 91D0* *Bog woodland* and 9080* *Fennoscandian deciduous swamp woods* are influenced, measures of mitigation of drainage influence must be carried out (for example, change of configuration of ditches or ensuring the blocking of groundwater flow). Ditches

which are draining the woodlands and which are directly connected to the main ditches must be blocked in case of ditch cleaning or deepening. The territories where a possible impact on surrounding wet forests and mires must be evaluated before the performance of drainage works (about 456 ha), are specified in nature management plan.

- Creation and maintenance of publicly available landscape sightseeing sites. Creation of openings in the belt of woody vegetation along the lake shores, in order to ensure aeration in lakes, as well as to maintain a transparent and attractive landscape.
- Fragmentation of emergent vegetation in lake littoral parts; mowing in belts, in order to create open littoral zones which are suitable for invertebrates, juvenile fish, ducks, and to decrease eutrophication (arrival of decayed aquatic plants on the shore).
- Reduction of anthropogenic loads in lakes by establishment and maintenance of recreation sites. In case of maintenance of existing recreation places and creating new ones, establishment of infrastructure elements should be avoided in the area that is closer than 30 metres from the lake. Also the location of protected habitats must be taken into account, and influencing them negatively should be avoided. Complete deforestation in shore areas and discharge of wastewaters into lakes must be avoided.
- Development and implementation of grassland (both semi-natural and cultivated) restoration and management plan. In nature management plan of 2016, it is planned to conserve semi-natural grasslands in an area of 380 ha which is the currently known area. However, a well-grounded assessment of the minimal necessary area of sustainable conservation of grasslands in the landscape level and for the conservation of populations of birds (*Aquila pomarina, Crex crex*) is not provided. The area of these grasslands can include also extensively managed cultivated grasslands and fallow-lands. The high level of habitat fragmentation indicates that the current area can not ensure grassland favourable conservation status in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas and extensively-managed cultivated grasslands and fallow-lands with high restoration potential must be considered.

5.2. Specific measures

5.2.1. Species

- Maintenance of *Tetrao urogallus* leks – rewetting and management if overgrowth is observed.
- Management of *Triturus cristatus* spawning sites – felling of shrubs at suitable ponds, as well as creation of new spawning sites by excavation of shallow ponds. Methods are specified in nature management plan.

5.2.2. Habitats

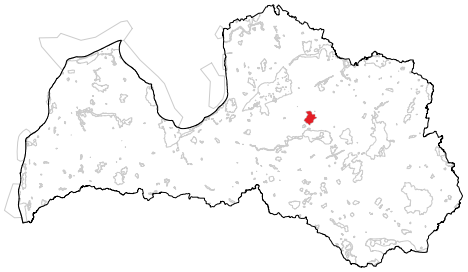
Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	240.2	1.1	Favourable.	Non-intervention. Rewetting around Lake Ķirlīšu (blocking or filling of ditch which connects the lake to Vaidava river).	37.3	240.2
9180*	Slope forests	46.4	<1	Poor.	Non-intervention.		46.4
9160	Oak forests	5.6	<1	Poor.	Non-intervention.		5.6
9050	Herb rich spruce forests	81.8	<1	Poor.	Non-intervention.		81.8
9080*	Fennoscandian deciduous swamp woods	20.0	<1	Favourable.	Non-intervention.		20.0
91E0*	Alluvial forests	2.2	<1	Poor.	Non-intervention.		2.2
9020*	Broad-leaved deciduous forests	3.0	<1	Poor.	Non-intervention.		3.0
9010*	Western Taïga	353.4	1.7	Poor.	Non-intervention.		353.4
9000	Potential Protected woodland habitat	221.0	1.1	-	Non-intervention.	35.0	185.5
8210	Calcareous rocky slopes	0.07	<1	Poor.	Grūbes dolomite outcrop: mowing of herbs and shrubs, establishment of infrastructure (stairs, rails).	On necessity.	
7160	Fennoscandian mineral-rich springs and springfens	12.6	<1	Favourable.	Non-intervention.		12.6
7140	Transition mires and quaking bogs	9.8	<1	Favourable.	Mowing of reeds at Kūriņkalna and Mazā Paiķa lakes. Felling of shrubs at Lielā Paiķa lake.		3.7 0.2
7110*	Active raised bogs	2.5	<1	Favourable.	Non-intervention.		2.5
6450	Northern boreal alluvial meadows	39.7	<1	Bad.	Restoration. Maintenance.	12.2	39.7
6410	Molinia meadows	0.4	<1	Bad.	Restoration. Maintenance.	0.4	0.4

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6120*	Xeric sand calcareous grasslands	1.6	<1	Bad.	Restoration. Maintenance.	1.6	1.6
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	283.9	1.4	Bad.	Restoration. Maintenance.	15.5	283.9
6230*	Species-rich *Nardus* grasslands	1.3	<1	Bad.	Restoration. Maintenance.	1.3	1.3
6210	Semi-natural dry calcareous grasslands	5.5	<1	Bad.	Restoration. Maintenance.	0.0	5.5
6510	Lowland hay meadows	62.7	<1	Bad.	Restoration. Maintenance.	0.0	62.7
6530*	Fennoscandian wooded meadows	0.6	<1	Bad.	Restoration. Maintenance.	0.0	0.6
6000	Grasslands to be restored	320.0	1.5	-	Restoration. Maintenance.	320.0	320.0
3260	Natural river reaches and river riffles	6.6	<1	Favourable.	Removal or reduction of beaver dams in Vaidava, Pērļupīte and other rivers – ir areas of riverbank erosion as well as in reaches where riverbed with boulders or pebbles indicate on river riffles of high quality. Demolition of remains of Dzirnavu Dam on Pērļupīte downstream of Korneti.	On necessity 0.2	
3150	Natural eutrophic lakes	67.1	<1	Poor.	Mowing of reeds in recreation sites and bathing sites. Reduction of emergent macrophyte vegetation.	On necessity	
3130	*Lobelia-Isoetes* lakes	45.8	<1	Poor.	Non-intervention. Mowing of reeds in recreation sites and bathing sites.		0.1

One-time grassland restoration measures are necessary in an area of at least 320 ha (29 ha of grasslands which must be restored are indicated in nature management plan of 2016; other areas must be clarified during the development of grassland restoration plan). Restoration measures specified in the nature management plan include felling of trees and shrubs. However, it is expected that activities such as eradication of invasive species, regulation of hydrological regime, restoration of species composition etc. will be necessary.

Vecpiebalga | *Protected Landscape Area (LV0600100)*

1. Brief description



YEAR OF FOUNDATION: 1987.

LOCATION: Vecpiebalga municipality, Ineši, Taurene, Vecpiebalga rural territories.

AREA: 8 923 ha.

NATURE MANAGEMENT PLAN: 2016 (2016–2028).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE AREAS: Sproģi Nature Reserve.

The Protected Landscape Area "Vecpiebalga" is located in the Vidzeme Upland, including visually expressive hillock with a mosaic of lakes, grasslands and woodlands. There are seven lakes, occupying almost 20 % of the territory. The most important ones are Lakes Alauksts and Inesis with islands which, together with the peninsula, are included in Sproģi Nature Reserve. The territory is dominated by dry forests. The dominating species are *Betula* spp. or *Picea abies*, often also *Populus tremula*. Wet forests are fragmented, more common in terrain depression around Lake Tauns. *Pinus sylvestris* woodlands are more common in terrain depressions, in mires or drained sites, and on lake peninsulas. Grasslands cover relatively large areas, and are grazed or mown.

In total, 22 EU protected habitat types have been found in the territory. The most important ones are habitats of lakes – oligotrophic to mesotrophic (Lake Alauksts), natural eutrophic lakes (Inesis and other lakes). Other important habitats are transition mires and quaking bogs (around Lakes Alauksts and Tauns), western Taïga, bog woodlands, Fennoscandian herb-rich forests with *Picea abies*. Fennoscandian hemiboreal natural old broad-leaved deciduous forests are found on lake islands. Other woodland habitats cover smaller areas. The protected landscape area is one of the most important Natura 2000 site in the country for the conservation of lowland hay meadows. Large areas are also covered by Lowland species-rich dry to mesic grasslands, *Molinia* meadows, and dry grasslands on calcareous substrates.

The territory is rich in rare and protected plant and animal species: 21 species of plants, 26 bird, nine mammal, 18 invertebrate, two fish species. The most important plant species are *Gladiolus imbricatus, Isoëtes lacustris, echinospora, Littorella uniflora, Agrimonia pilosa, Lobelia dortmanna, Myriophyllum alterniflorum, Subularia aquatica, Nitella flexilis, Hydrilla verticillata,* moss *Ricciocarpos natans*. The territory is particularly important as a feeding site of *Milvus migrants*, as well as a suitable habitat for *Picoides tridactylus* and *Dendrocopos leucotos*. Other important bird species include *Bonasa bonasia, Ficedula parva, Crex crex, Lanius collurio, Aquila pomarina, Caprimulgus europaeus*, and others.

The most important invertebrate species are *Leucorrhinia pectoralis, Emus hirtus, Apatura iris*, and *Ena montana*.

2. Threats to habitat and species conservation

- Grassland habitats are threatened by lack of management (causing overgrowth), inappropriate management (grass shredding), too intense management (admixture sowing, fertilization, overgrazing), building up, establishment of lawns.
- Quality of wet forests is adversely affected by drainage.
- Forest habitats are fragmented due to intense logging. Large areas are covered by new forests and clear-felled territories.
- Quality of habitats on lake islands is lowered due to removal of dead wood (for its use in campfires).
- Lake habitats are threatened due to pollution with (untreated) household wastewater (low quality water from polluted Lake Tauns is transferred into the Lake Inesis, where, as a result of nutrient enrichment, the particular bay is overgrowing with macrophytes). Currently, wastewater inflow in Lake Tauns is stopped, but biogene elements are accumulated in lake sediments, habitat quality is lowered, and long-term negative influence is expected.
- Aeration intensity and associated degradation of accumulated organic sediments in small lakes is decreased due to dense belts of shrubs along their shores. This causes habitat degradation.
- Dense stands of emergent macrophytes prevents the decayed plant mass from being washed ashore

which settles as a thick layer of slowly degradable layer with low nutritional value and further degrades habitat for invertebrates, juvenile fish, and ducks, as well lowers the scenic value of coastline.
- The quality of landscapes is degraded due to covering of publicly accessible viewpoints (by building construction, planting of trees).
- Activities of beavers (*Castor fiber*). Watercourses outflowing from Lakes Sivēnu, Bezdibenis, Nedzis and Tauns are dammed, water level is elevated, lake coast woodlands are inundated, trees are withering, additional nutrients are leached into lakes, eutrophication is increased and habitats are degraded.
- Recreation. The most important recreation influence occurs in Lakes Alauksts and Inesis where several campsites are located on their shores. At present, negative influence is not observed, but additional infrastructure elements will be necessary if the intensity of recreation will increase. The trampling of submerged vegetation and direct biogene input in lake must be avoided.
- Sediment resuspension, and covering and destruction of submerged vegetation in Lake Alauksts due to use of watercraft and jet skies.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in 2014 less than half of semi-natural grasslands (23-46 %) were managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". The influence of management on grassland protection status has not been evaluated. The poor status of semi-natural grasslands is indicated by the fact that that in the last ten to fifteen years their total area has decreased from 140 to 95 ha (data of nature management plan, 2016).

4. Priorities of management and conservation

- Conservation of extensively managed (mown and grazed) cultivated grasslands and fallow-lands in maximum possible area (at least 2 000 ha), in order to ensure foraging sites for *Aquila pomarina* and breeding sites for *Crex crex*, and to preserve the characteristic landscape mosaic.
- Restoration and maintenance of semi-natural grasslands in an area of at least 200 hectares. Restoration of historic grasslands which are now overgrown with shrubs or forest, as well as extensively managed cultivated grasslands and fallow-lands with good restoration potential (potential EU protected habitats) is the priority.
- Maintenance of aquatic habitats in a favorable conservation status.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of optimal hydrological regime in wet forests and mires.
- Reduction of anthropogenic load in lakes by maintenance and creating recreation sites and by management of lake coasts.
- Habitat quality conservation measures in islands of Lake Inesis which are used for recreation.
- Creation and maintenance of publicly available viewpoints, in accordance to Landscape structural plan.
- Mowing of reeds and felling of shrubs in transition mire habitats around Lakes Alauksts and Tauns.

5. Necessary management and conservation measures

5.1. General measures

- Investigation of the rewetting possibilities in swamp woods. In some swamp wood habitats, rewetting is necessary by filling of drainage systems in the territory of protected habitats or by construction of dams. Preliminary area – 12.9 ha (must be specified according to research).
- Conservation of quality habitats on islands of Lake Inesis. To reduce the removal of dead wood from woodlands, it is recommended to transport firewood to Mīlestības, Bābas, Siena Islands, and to provide control.
- Investigation of sediment removal possibilities in Lake Tauns. It should be noted that this measure is successful only if sufficiently large volume is cleaned – at least 60-70% of the total area of the lake. This measure should be subject to an environmental impact assessment or procedure of impact on the Natura 2000 sites, and must comply with legislation concerning environmental protection and extraction of minerals.
- Development of grassland restoration and management plan. In nature management plan (2016) the objective is specified to conserve semi-natural grasslands in an area of 95 hectares which is their current area. However, a well-grounded assessment on the minimal grassland area for their long-term conservation, as well as for conservation of landscapes, habitats and birds (*Aquila pomarina,*

Crex crex) is not provided. Also the necessity to restore semi-natural grassland at least to the level as it was 10-15 years ago, is not evaluated. The high level of habitat fragmentation indicates that the current area can not ensure grassland favourable conservation status in the long term. Therefore, these issues must be analysed in grassland restoration and management plan. The total target area of grasslands and target area of semi-natural grasslands must be determined. Target grasslands must be identified and time schedule for the measures must be developed. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered, and it should also be considered in extensively managed cultivated grasslands and fallow-lands with good restoration potential (potential grasslands of EU importance).

- Development and approval of Individual regulations on protection and use providing restrictions for the use of jet skies and heavy-duty speedboats in Lake Alauksts.
- In case of establishment of new guest houses and recreational facilities, their wastewater gathering and treatment must be planned in a way that prevents the inflow of incompletely treated wastewaters in lakes (causing expansion of emergent vegetation in littoral zone, mass algal development and habitat degradation).
- Maintenance of bathing sites in order to manage movement of visitors and to decrease anthropogenic load.
- Establishment of openings in the belts of trees and shrubs around the lakes – in order to provide landscape transparency and scenery, as well as to promote the decayed plant mass being washed ashore (decreasing the eutrophication speed).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	53.6	<1	Poor.	Non-intervention. Felling of understory and advance growth, according to expert's judgement.	2.2	53.6
91E0*	Alluvial forests	3.3	<1	Favourable.	Non-intervention.		3.3
9180*	Slope forests	1.7	<1	Favourable.	Non-intervention.		1.7
9160	Oak forests	2.8	<1	Favourable.	Non-intervention.		2.8
9080*	Fennoscandian deciduous swamp woods	21.4	<1	Poor.	Non-intervention. Rewetting. Felling of understory and advance growth, according to expert's judgement.	According to research results. 1.3	21.4
9070	Fennoscandian wooded pastures	0.9	<1	Poor.	Non-intervention.		0.9
9050	Herb rich spruce forests	36.1	<1	Favourable.	Non-intervention. Felling of understory and advance growth, according to expert's judgement.	2.8	36.1

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9020*	Broad-leaved deciduous forests	1.7	<1	Poor.	Non-intervention.		1.7
9010*	Western Taïga	81.0	<1	Favourable.	Non-intervention. Felling of understory and advance growth, according to expert's judgement.	1.6	81.0
7160	Fennoscandian mineral-rich springs and springfens	2.9	<1	Poor.	Non-intervention.	2.9	2.9
7140	Transition mires and quaking bogs	66.3	<1	Poor.	Non-intervention. Reed mowing at Lakes Alauksts and Tauns. Felling of shrubs on lake shores (in complex with lake management).	44.3	18.4
7110*	Active raised bogs	4.1	<1	Favourable.	Non-intervention.		4.1
6510	Lowland hay meadows	40.8	<1	Bad.	Restoration. Maintenance.	Unknown	40.8
6450	Northern boreal alluvial meadows	3.62	<1	Bad.	Restoration. Maintenance.	Unknown	3.62
6410	*Molinia* meadows	8.6	<1	Bad.	Restoration. Maintenance.	Unknown	8.6
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	38.7	<1	Poor.	Restoration. Maintenance.	Unknown	38.7
6230*	Species-rich *Nardus* grasslands	0.6	<1	Favourable.	Restoration. Maintenance.	Unknown	0.6
6210	Semi-natural dry calcareous grasslands	2.7	<1	Poor.	Restoration. Maintenance.	Unknown	2.7
6120*	Xeric sand calcareous grasslands	0.23	<1	Bad.	Restoration. Maintenance.	0.23	0.23
6000	Grasslands to be restored	105.0	1.2	-	Restoration. Maintenance.	105.0	105.0
3160	Natural dystrophic lakes and ponds	1.1	<1	Favourable.	Non-intervention.		

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
3150	Natural eutrophic lakes	666.3	7.5	Poor.	Reed mowing in bathing sites – in all lakes (see nature management plan).	82.9	
					Removal of *Nuphar* spp. rhizomes in Lake Tauns and Inesis (at inflow of Pīle river).	On necessity.	
					Felling and thinning of belt of shrubs along the lake shore (Lake Nedzis is the priority).	On necessity.	
					Felling of individual shrubs, thinning of dense belt of shrubs along Lakes Inesis, Mūrnieku and Tauns (in peninsula).	On necessity.	
					Removal of reed rhizomes in bathing sites of Lake Medzis.	On necessity.	
					Cleaning of Lake Sivēna outflowing brook (to Ogre) – removal of beaver dams and fallen logs.	65.8	
3130	Lobelia-Isoetes lakes	765	8.5	Poor.	Lake Alauksts.	On necessity.	
					Reed mowing in bathing sites – in all lakes (see nature management plan).		
					Felling of shrubs along lakeshores – felling of individual shrubs in bathing sites, thinning in dense shrubberies; not a priority.		
					Removal of *Nuphar* spp rhizomes – in Kakta Gals.		
					Management of recreation activities.		
3260	Natural river reaches and river riffles	3.5	⟨1	Poor.	Cleaning of Lake Sivēna outflowing brook (removal of beaver dams and fallen logs) (in Pīle, Orisāre, Balga). On necessity.	0.3	

One-time grassland restoration measures are necessary in an area of at least 105 hectares. Areas where restoration is necessary are not indicated in nature management plan, therefore they must be clarified during the development of grassland restoration plan. Restoration measures include felling of trees and shrubs, abatement of expansive species, hydrological regulation, species composition restoration; the necessity of these measures must be specified in grassland restoration plan.

Vestiena | *Protected Landscape Area (LV0600500)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Ērgļi municipality Ērgļi and Jumurda rural territories; Madona municipality Arona, Bērzaune, Vestiena rural territories.

AREA: 27 117 ha.

NATURE MANAGEMENT PLAN: 2011 (2011–2020).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

INCLUDES OTHER PROTECTED NATURE AREAS: Gaiziņkalns Nature Park, Ilziņa ezers Nature Reserve, Bolēnu veselības avots Geological and Geomorphological Nature Monument, and Vestienas muižas aleja Dendrological Planting.

The most important characteristic of Vestiena Protected Landscape Area is the landscape of Vidzeme Upland, with a visually expressive relief and a mosaic of nature's diversity. The territory includes the central part of Vidzeme Upland, with the highest point of Latvia – Gaiziņkalns Hill (311.6 m above sea level). There are also other large-size hills – Sirdskalns, Abrienas Kalns, Bolēnu Kalns, and others. There is a high diversity of habitats and their associated rare and protected species. The territory is rich in lakes. Particularly important ones are Kāla, Ilziņa, Taleja and Viešūrs (Kaķīšezers) lakes. The largest river of the territory is Arona river. In most parts, it has a rapid flow and riverbed with boulders and pebbles. The banks of river Bērzaune are steep in some places, with old broadleaf or spruce (*Picea abies*) woodlands in small areas.

In the past, the area has been actively managed, with fields of arable lands, pastures and meadows. Most of the grasslands were highly biodiverse until recently. Forests are mostly composed of Betula spp. – *Picea abies* woodlands, with admixture of *Populus tremula*, or secondary *Alnus incana* woodlands. After the selective logging in late 20th century, old spruce woodlands are rare. Broadleaved forests cover small areas, mainly in ravines and on hill-slopes. More than 90 % of woodlands are less than 100 years old, the old woodlands are small and fragmented.

There are 22 types of EU protected habitats, and 101 rare and protected species have been found in the territory. The most important habitat types include *Natural eutrophic lakes with* Magnopotamion or Hydrocharition - *type vegetation, Semi-natural dry grasslands and scrubland facies on calcareous substrates, Western Taïga*, and *Fennoscandian mineral-rich springs and springfens*.

The protected landscape area is one of the most important Natura 2000 areas in Latvia for the conservation of habitat type 6270* *Fennoscandian lowland species-rich dry to mesic grasslands*, 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis), and 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia).

The most important rare and protected plant species are *Hylocomium umbratum, Carex atherodes, Aconitum lasiostomum, Polystichum aculeatum, Dentaria bulbifera, Orobanche pallidiflora, Agrimonia pilosa, Gladiolus imbricatus, Iris sibirica, Primula farinosa*. Territory is important for several rare bird species, such as *Crex crex, Bonasa bonasia, Aquila pomarina, Caprimulgus europaeus, Lullula arborea, Sylvia nisoria*.

Of the specially protected invertebrate species, particularly important ones are *Ena montana* in woodland on Gaiziņkalns slope, *Acroloxus lacustris* in Viešūra and Taleja lakes, as well as *Clausilia cruciata, Graphoderus bilineatus, Liocola marmorata*. Taleja and Viešūrs (Kaķīšezers) lakes are important foraging sites for six protected bat species, including *Myotis dasycneme*. Also *Lutra lutra* can be found here. Of rare fish and cyclostome species, *Lampetra planeri, Cottus gobio* and *Cobitis taenia* can be found.

There is a well-developed tourism infrastructure in Gaiziņkalns Nature Park, particularly winter tourism and recreation services.

2. Threats to habitat and species conservation

- Overgrowth of agricultural lands with shrubs, resulting in the disappearance of the landscape mosaic.
- Lack of grassland management, resulting in their overgrowth, as well as improper management (grass mulching), too intense management (admixture sowing, fertilization), construction of buildings, establishment of lawns.

- Improvement and grubbing up of semi-natural and cultivated grasslands; use of chemical plant protection products and fertilizers; mowing several times per season, resulting in biodiversity decrease and transformation of grassland habitats.
- Additional anthropogenic load due to expansion of residential areas and building construction on lake shores, as well as in other scenic areas.
- Spread of the invasive plant species *Heracleum sosnowskyi*.
- Elevated water level in Lake Taleja (outflow is dammed by beavers (*Castor fiber*)).
- Large woody debris in rivers promotes sediment accumulation and create additional load for the process of self-purification. Fish migration is restricted by beaver dams.
- Previously done river modification and straightening (e.g. Lubeja, Ļaudonīte rivers), as well as runoff of biogenes from the agricultural lands have left a negative influence.
- Excessive use of plant chemical protection products and fertilizers, especially in the agricultural lands at lake and river shore slopes, are a potential threat.
- The fragmentation of old woodlands and protected habitats, promoted by forestry operations.

3. Existing management of the protected habitats and its assessment

- In 2014, infrastructure at Bolēnu Spring was restored with a financial support of Madona Municipality Council, in order to prevent excessive trampling of the spring discharge.
- Semi-natural grasslands were restored in an area of 36 ha and *Heracleum sosnowskyi* was eradicated in the framework of LIFE programme project HM-VESTIENA – "The improvement of habitats management in Natura 2000 site – Vestiena" (LIFE06 NAT/LV/000196), 2007. – 2009.
- According to Rural Support Service, in 2014 more than half of the total area of grasslands (74 – 94%) was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". Only 26 % of alluvial grasslands and 33% of species-rich *Nardus* grasslands were managed. The influence of management on the grassland conservation status has not been evaluated.

4. Priorities of management and conservation

- Conservation of extensively managed (grazed and mown) cultivated grasslands and fallow-lands (creation of grasslands) in at least 7000 ha, in order to provide foraging resources for *Aquila pomarina* and breeding sites for *Crex crex*, and to preserve the characteristic mosaic landscape structure.
- Restoration and maintenance of semi-natural grasslands in an area of at least 700 ha. The restoration of historical grassland areas which are now overgrown with shrubs or secondary forest, as well as extensively managed cultivated grasslands and fallow-lands with good restoration potential (potential habitats of EU importance), is the priority.
- Restriction of the spread of invasive species.
- Protection and restoration of scenic and biologically valuable solitary trees and alleys.
- Creation and maintenance of publicly accessible viewpoints.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention in woodlands which have not yet reached the quality of protected habitat.
- Provision of water discharge in river riffles and in natural river reaches.
- Management of river and lake protective belts in order to ensure functionality, habitat quality, and landscape.
- Restoration of natural and optimal water level in Taleja and Laipītis lakes.
- Undisturbed course of natural processes in spring, forest, mire, river and lake habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Update of habitat maps.
- Felling of shrubs and younger trees around the biologically-old and large trees ("bio-trees", wide-crowned trees), in order to extend their life and suitability to rare insect, lichen, moss and mushroom species.
- Development and approval of Individual regulations on protection and use.
- Management of protective belts of rivers and lakes (management is described in details in nature management plan).
- When planning a construction of new buildings, guest houses or recreation-related objects, their wastewater collection and treatment must be managed in a way that prevents the input of incompletely treated wastewaters in lakes, and to prevent expansion of emergent vegetation in littoral zone, algal blooms and habitat deterioration.

- Creation of openings in a belt of trees and shrubs along the lake shores, in order to ensure lake water aeration and landscape transparency.
- Creation, improvement and maintenance of bathing sites for the management of visitor activities and for the prevention of trampling of habitats of submerged vegetation.
- Development and approval of grassland (both semi-natural and cultivated) restoration and management plan. In nature management plan of 2011, the target areas of semi-natural grasslands are not specified, and a well-grounded evaluation on the minimal grassland area for their sustainable conservation (including conservation of landscape structure, habitats and bird populations (*Aquila pomarina, Crex crex*)) is not provided. The high level of habitat fragmentation indicates that the current area can not ensure grassland favourable conservation status in the long term. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas must be considered, as well in areas of extensively managed cultivated grasslands and fallow-lands with good restoration potential (potential EU protected grassland habitat types).
- Integration of requirements of grassland restoration and management plan (including semi-natural grasslands, extensively managed cultivated grasslands and fallow-lands) in a landscape plan of the protected landscape area (development of such plan is recommended in nature management plan of 2011). It is recommended that localities of previous grasslands should be taken into account, in order to preserve information on landscape as a heritage, information on human-nature relationships.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	311.9	1.1	Favourable.	Non-intervention.		311.9
9180*	Slope forests	68.3	<1	Favourable.	Non-intervention.		68.3
9160	Oak forests	6.8	<1	Poor.	Non-intervention.		6.8
9080*	Fennoscandian deciduous swamp woods	38.1	<1	Poor.	Non-intervention.		38.1
9020*	Broad-leaved deciduous forests	7.5	<1	Favourable.	Non-intervention.		7.5
9010*	Western Taïga	168.3	<1	Bad.	Non-intervention.		168.3
91E0*	Alluvial forests	0.03	<1	Poor.	Non-intervention.		0.03
9000	Potential Protected woodland habitats	75.0	<1	-	Non-intervention.		75.0
7160	Fennoscandian mineral-rich springs and springfens	10.1	<1	Favourable.	Non-intervention, except maintenance of the existing tourism infrastructure.		10.1
7140	Transition mires and quaking bogs	6.9	<1	Favourable.	Non-intervention, except lowering of water level in Lake Taleja (demolition of beaver dam).		6.9
7120	Degraded raised bogs	4.9	<1	Bad.	Non-intervention.		4.9
7110*	Active raised bogs	0.6	<1	Favourable.	Non-intervention.		0.6
6510	Lowland hay meadows	124.6	<1	Favourable.	Restoration. Maintenance.	25.0	124.6

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6450	Northern boreal alluvial meadows	87.8	<1	Bad.	Restoration. Maintenance.	64.0	87.8
6430	Hydrophilous tall herb fringe communities	1.8	<1	Favourable.	Restoration. Maintenance.	0.0	1.8
6410	Molinia meadows	1.7	<1	Favourable.	Restoration. Maintenance.	0.1	1.7
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	289.6	1.1	Favourable.	Restoration. Maintenance. Restoration. Maintenance.	73.0	289.6
6230*	Species-rich Nardus grasslands	1.4	<1	Bad.	Restoration. Maintenance.	1.0	1.4
6210	Semi-natural dry calcareous grasslands	69.8	<1	Favourable.	Restoration. Maintenance.	15.6	69.8
6120*	Xeric sand calcareous grasslands	2.3	<1	Favourable.	Restoration. Maintenance.	0.5	2.3
6000	Grasslands to be restored	200.0	<1	-	Restoration. Maintenance.	200.0	200.0
3260	Natural river reaches and river riffles	8.3	<1	Favourable to poor.	Removal or decrease of beaver dams and large woody debris in sites where riverbed with gravel or pebbles indicate on river rapids of high quality (suitable for lampreys, salmonids, Unio crassus; rivers are specified in nature management plan).		8.3
3150	Natural eutrophic lakes	813.1	3.0	Poor.	Mowing of emergent vegetation in belts – in bathing and other sites. Felling of trees and shrubs in order to establish wind corridors for the lake aeration. Once per 1-3 years. Removal of beaver dams, excessive vegetation and clogs in lake outflow sites (Taleja and Lapītis lakes), in order to ensure natural water level of lake.	2.0 On necessity.	2.0
3140	Charophyte lakes	16.3	<1	Favourable.	Non-intervention (Asmenītis lake).		16.3

Semi-natural grasslands must be restored in an area of at least 303 ha (some grasslands are shown in nature management plan of 2011; others must be clarified during the development of grassland restoration plan). The necessity of potential measures of restoration (felling of trees and shrubs, abatement of expansive species, hydrological regime regulation, species composition restoration, and other activities) must be evaluated and planned in grassland restoration plan.

Ziemeļgauja | *Protected Landscape Area (LV0600700)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ape municipality Gaujiena, Vireši rural territories; Beverīna municipality Brenguļi, Kauguri, Trikāta rural territories; Burtnieki municipality Valmiera rural territory; Strenči municipality Jērcēni and Plāņi rural territories, and Strenči municipal town; Valka municipality Vijciems and Zvārtava rural territory.

AREA: 21749 ha.

NATURE MANAGEMENT PLAN: 2007 (2007–2017).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: Cabinet Regulation No. 957 of 20 November 2008, Regulation on Individual Protection and Use of Ziemeļgauja Protected Landscape Area.

INCLUDES OTHER PROTECTED NATURE TERRITORIES:

- Rāmnieku smilšakmens atsegums, Gaujienas dolomīta atsegums, Jaunžagatu krauja, Žagatu klintis, Randātu klintis un Tilderu krauja, Lejasbindu krauja, Vizlas lejteces atsegumi un Žākļu dižakmens, Sikšņu dolomīta atsegums Geological and Geomorphological Nature Monuments;
- Gaujienas „Vārpu" lapegļu aleja, Vidagas lapegļu alejas un stādījumi Dendrological Plantings and Alleys.

Ziemeļgauja Protected Landscape Area includes extensive and biologically valuable part of River Gauja (which continues in Estonia). The territory is rich in almost unmodified, and in some places also traditionally and extensively managed habitat types – unmodified and very tortuous channel of river Gauja, a net of oxbows, highly biodiverse grasslands, and woodlands with significant areas of broadleaved forests. Several former nature reserves are included in the territory: Pirtslīča-Līkā Atteka, Pukšu Purvs and Zemā Sala. Also Cirgaļu Masīvs (the largest massif of wooded inland dunes in Latvia, covered with dry pine forest) is included in the protected landscape area. Forests are dominated by pines (*Pinus sylvestris*) and cover about 70 % of the territory. Mixed woodlands of *Quercus robur, Ulmus laevis* and *Fraxinus excelsior* can be found in shores of Gauja river and its oxbows. Smaller areas are occupied by *Alnus glutinosa* woodlands. Agricultural lands, mainly grasslands, cover around 17% of the territory. Over time and in interaction between natural factors and human activities, various types of grasslands have developed, from dry grasslands on slopes and terraces of ancient valley of Gauja river, to wet, regularly flooded alluvial grasslands in floodplains and ancient riverbeds.

In total, 26 EU protected habitat types can be found in the territory. Of protected woodland habitats, largest areas are covered by western Taïga, bog woodlands and riparian mixed forests along the great rivers. Grassland habitats are dominated by *Semi-natural dry grasslands and scrubland facies on calcareous substrates* and *Northern boreal alluvial meadows*, together comprising 94 % of all grasslands. Wooded meadows and pastures should be mentioned as particularly typical for Ziemeļgauja, with scattered trees, mainly oaks (*Quercus robur*) and lime trees (*Tilia cordata*), and with very diverse ground vegetation. The area is among the ten most important Natura 2000 sites in Latvia for the protection of the great snipe *Gallinago media*. It is the most important territory in Latvia for the conservation of habitat type 6530* *Fennoscandian wooded meadows* (72 % of the total area in Natura 2000 territories in Latvia), as well as for the conservation of two species associated with this habitat type – *Hapalopilus croceus* (polypore), and *Osmoderma barnabita* (beetle). The territory is also among the first five Natura 2000 territories for the conservation of several types of open semi-natural grasslands – 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) (40.3 %), 5130 Juniperus communis *formations on heaths or calcareous grasslands* (12.7 %), 6450 *Northern boreal alluvial meadows* (6.7%), 6120* *Xeric sand calcareous grasslands* (4.2%). It is thus the largest and most diverse core area of semi-natural grasslands, and an integral part of one of the most important landscape-ecological species distribution corridors – the valley of Gauja river (which is a part of three Geobotanical Districts – Central Vidzeme, North Vidzeme and Coastal). There

are several protected aquatic habitats – *Water courses of plain to montane levels with the* Ranunculion fluitantis and Callitricho-Batrachion *vegetation* (with river riffles – habitat type protected in Latvia), *Rivers with muddy banks with* Chenopodion rubri *p.p. and* Bidention *p.p. vegetation*. In meanders, oxbow lakes can be found which belong to *Natural eutrophic lakes*. There are three mire habitat types – active raised bogs, transition mires and quaking bogs, and Fennoscandian mineral-rich springs and springfens.

There is a large variety of Latvian and EU protected habitats which are rich in very rare species of lichens, vascular plants, invertebrates and birds. In the protected landscape area, 126 rare and protected species have been found: three species of mushrooms, nine lichen, four moss, 13 vascular plant, 47 invertebrate, one reptile, one amphibian, four cyclostome and fish, 35 bird and nine protected mammal species. Particularly important plant species are *Pulsatilla patens, Orchis militaris, Gymnadenia conopsea, Lithospermum officinale, Gentiana cruciata,* and others. The territory in an Internationally Important Bird and Biodiversity Area (LV067). *Bonasa bonasia, Ciconia nigra, Aquila pomarina, Pernis apivorus, Tetrao tetrix, Tetrao urogallus, Caprimulgus europaeus, Crex crex, Gallinago media, Strix uralensis* and others are breeding here. Important invertebrate species include *Osmoderma barnabita, Ophiogomphus cecilia, Unio crassus, Leucorrhinia pectoralis, Hirudo medicinalis, Xylomoia strix*. Areas of oxbows are important breeding and foraging sites for several bat species, for example, *Myotis dasycneme* and *Pipistrellus nathusii*. Rare reptile species include *Lacerta agilis* and *Triturus cristatus*. Fish and cyclostome species – *Cobitis taenia, Cottus gobio, Aspius aspius, Rhodeus sericeus amarus, Lampetra fluviatilis, Misgurnus fossilis, Salmo trutta, Thymalus thymalus*, and *Salmo salar*.

2. Threats to habitat and species conservation

- Semi-natural grasslands and their habitats are adversely affected by management cessation which promotes habitat fragmentation and reduces the area size and quality of the habitat. In the last decade, grass shredding (mulching) was used in large areas of grasslands, and it has caused eutrophication. In some places, grasslands are threatened by too intense management (admixture sowing, fertilization), building construction, establishment of lawns, afforestation.
- In dry pine forests, dense spruce (*Picea abies*) advance growth develop due to lack of natural disturbance – fire. Spruces reduce the insolation and change environmental conditions, influencing the characteristic species composition.
- Old oaks, lime trees and other large-sized trees are surrounded by shrubs and other deciduous trees which change environmental conditions, decrease the vitality of these trees and adversely influence their associated rare species, such as *Osmoderma barnabita*.
- Fragmentation of broadleaved forests. Human activities have encouraged the establishment of pine woodlands in former areas of broadleaved forests (planting of pines in clear-felled areas; pines are pioneer-species in abandoned arable lands and grasslands).
- South-eastern and northern part of Pukši Mire overgrows with pines due to drainage.
- The removal of shrubs and management of alluvial grasslands are hindered by ditches and lodges created by beavers (*Castor fiber*). Beaver dams cause inundations which destroy biological and economic values, and interfere with water flowing out of the grassland in summer. Migration of salmonids and lampreys is disrupted by beaver dams.
- Excessive overgrowth of Gauja river with *Scirpus lacustris* and other aquatic macrophytes.
- Obstacles to fish migration (large woody debris, beaver dams, etc.) in rivers connecting Gauja river with lakes (and the sea) – cascade of Kokšu lakes and Kokšupīte river; Lake Zvārtava and Zvārtava river.
- Overgrowth of oxbow lakes, shading of their shores. Clogging of oxbow lakes with twig and leaf litter consumes oxygen and decreases the potential biodiversity of aquatic organisms.

3. Existing management of the protected habitats and its assessment

- In 2003-2007, in the framework of the LIFE programme project "Protection and management of the Northern Gauja Valley" (LIFE03 NAT/LV/000082), semi-natural grasslands were restored in an area of 290 hectares. Agri-environmental plans were developed for 24 individual farms, which cover around 990 ha of agricultural land. Seven grassland management sites were established; 91 cattle were purchased, livestock sheds and enclosures were constructed. In an area of 380 hectares, forest management measures were carried out. In years 2005 and 2006, *Tetrao urogallus* leks were improved by construction of two dams. Advance growth of spruces was felled in protected woodland habitats in order to improve insolation for old pines. In oak woodlands, felling of advance growth was carried out in small volumes, for the improvement of light conditions. In Randātu Klintis Rocks, trail was established and dangerous trees

along the trail were removed. For the improvement of rock outcrop insolation, further removal of trees should be considered.

- In 2013, in the framework of the Estonian-Latvian cross-border cooperation program *"Tuned nature management in transboundary area of Estonia and Latvia"* (EU38806), large woody debris and excessive aquatic macrophytes were removed from the bed of Gauja river. In result, riverbed substrate conditions were improved and macrophytes did not grow back. Also advance growth was felled in order to improve *Tetrao urogallus* leks.
- According to Rural Support Service, in 2014 the proportions of the various grasslands managed in scope of Rural Development Programme measure „Maintaining biodiversity in grasslands" were very diverse. Largest proportion (57-73 % of total area) was managed of habitat types 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia), 6510 *Lowland hay meadows* (Alopecurus pratensis, Sanguisorba officinalis), 6450 *Northern boreal alluvial meadows,* 6410 *Molinia meadows on calcareous, peaty or clayey-siltladen soils* (Molinion caeruleae), 6270* *Fennoscandian lowland species-rich dry to mesic grasslands.* Habitat types 6530* *Fennoscandian wooded meadows,* 6230* *Species-rich* Nardus grasslands, *on siliceous substrates in mountain areas (and submountain areas, in Continental Europe),* 6120* *Xeric sand calcareous grasslands* were managed in smaller areas (2, 23, 30 % respectively). The impact of management on the conservation status of grassland habitats has not been evaluated.

4. Priorities of management and conservation

- Conservation of permanent grasslands, including semi-natural grasslands and extensively managed cultivated grasslands (which can be restored to semi-natural grasslands in a long term) in an area of at least 3 000 hectares, in order to ensure foraging sites for Aquila *pomarina* and *Crex crex,* to conserve grassland biodiversity and conserve the characteristic structure and landscape mosaic.
- Restoration and maintenance in favourable conservation status for at least 2 000 hectares of open semi-natural grasslands and wooded grassland habitats (it is approximately 66 % of the current area of permanent grasslands). Priorities: restoration of currently overgrowing and abandoned EU grassland habitats; historical grassland areas which are overgrown with shrubs or secondary forest; extensively managed grasslands and fallow-lands with good restoration potential (potential habitats of EU importance).
- Improvement of structure and species composition of dry pine forests on poor soils by prescribed groundfloor burning.
- Reduction of forest habitat fragmentation; increase of the area and integrity of protected habitats by provision of non-intervention or improvement of structural diversity (creation of canopy gaps and dead wood) in woodlands which have not yet reached the quality of protected habitat. In sites where there are patches with younger trees of other species (mainly pines) in old broadleaved forests, the tree species composition should be gradually altered towards the species composition of natural broadleaved trees.
- Rewetting in Pukšu Mire and surrounding bog woodlands.
- Undisturbed course of natural processes in forest, outcrop and spring habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of water discharge in Gauja, Vecpalsa, Vizla and Tirziņa rivers – in sites where riverbed with gravel or pebbles indicate on river riffles of high quality (suitable for spawning of lampreys and salmonids; habitat of *Unio crassus.*)

5. Necessary management and conservation measures

5.1. General measures

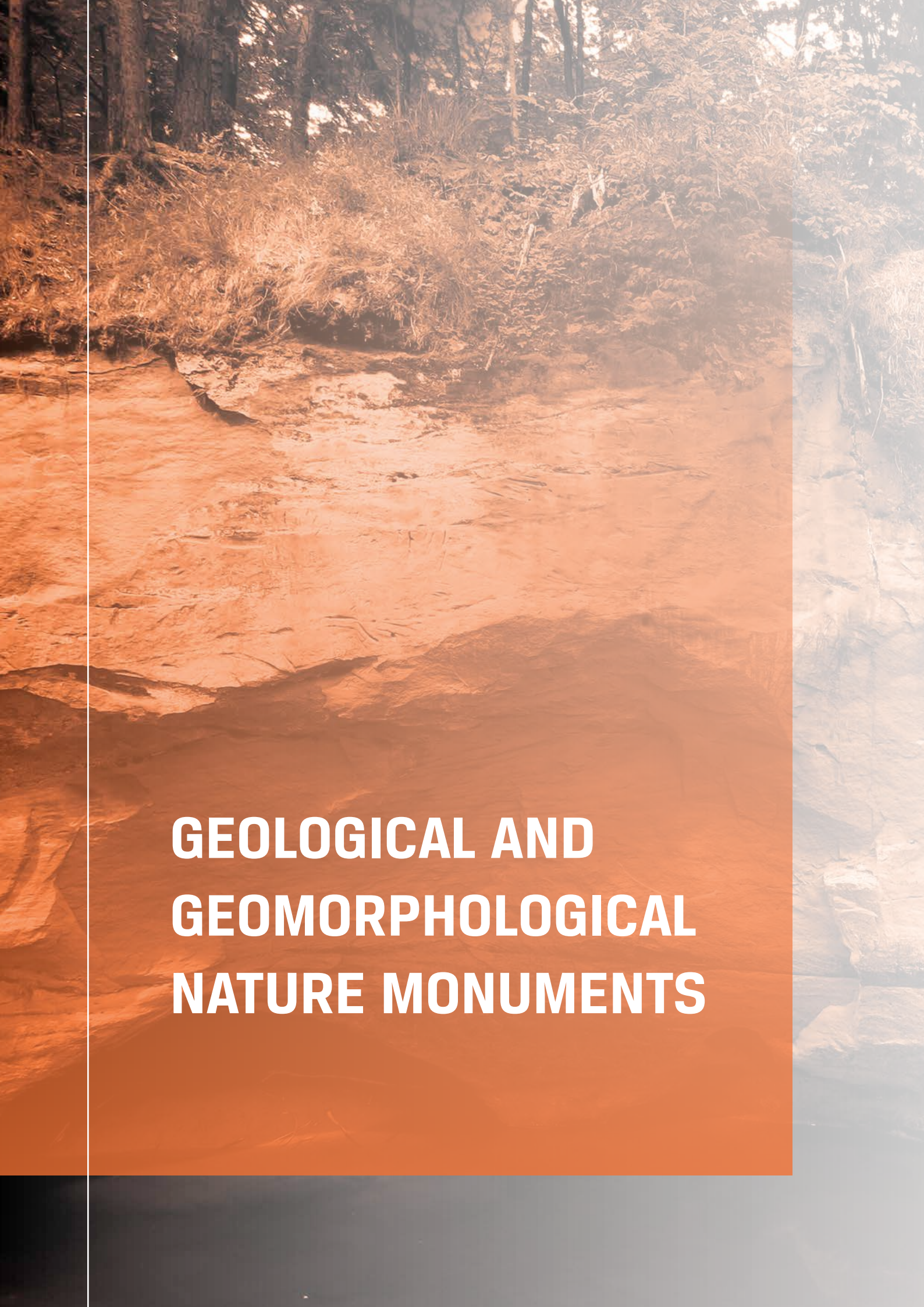
- Update of habitat maps.
- Inventory of semi-natural grasslands (open grasslands, wooded pastures and meadows), cultivated grasslands and fallow-lands. Development and implementation of grassland restoration and management plan. To increase landscape-ecological connectivity of grasslands, the establishment of grassland habitats in their historical areas and in extensively managed cultivated grasslands and fallow-lands (potential EU protected grassland habitat types) must be considered. Restoration of currently remained abandoned grasslands is the priority.
- Felling of shrubs and low-value trees in oxbow lakes and around them (especially the drying-out ones), in order to decrease the accumulation of organic matter (leafs, twigs). Creation of open littoral zones suitable for aquatic invertebrates (dragonflies, caddisflies, mayflies etc) emerging to adults. For some oxbow lakes – restoration of their connection with Gauja river, in order to ensure conditions for fish spawning and wintering.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91F0	Riparian mixed forests	208.9	1.0	Favourable.	Non-intervention. Increase of proportion of broadleaved trees, particularly *Ulmus laevis*, by selective felling.	15.0	193.9
91D0*	Bog woodland	407.5	1.9	Poor.	Non-intervention.		407.5
9180	Slope forests	79.0	<1	Favourable.	Non-intervention.		79.0
9160	Oak forests	115.8	<1	Bad.	Non-intervention. Liberation (insolation improvement) for large old oaks by cutting of shading trees and shrubs).	On necessity.	115.8
9080*	Fennoscandian deciduous swamp woods	9.5	<1	Poor.	Non-intervention.		9.5
9020*	Broad-leaved deciduous forests	2.1	<1	Favourable.	Non-intervention.		2.1
9010*	Western Taïga	770.8	3.5	Poor.	Non-intervention. Prescribed burning of groundfloor (principles explained in nature management plan); maintenance of *Tetrao urogallus* leks (felling of understory and advance growth on necessity).	25.0 On necessity.	745.8
91E0*	Alluvial forests	233.5	1.1	Favourable.	Non-intervention.		233.5
9000	Potential Protected woodland habitat	370.0		-	Non-intervention. Diversification of structure.	20.0	350.0
8220	Siliceous rocky slopes	0.03	<1	Favourable.	Non-intervention.		0.03
8210	Calcareous rocky slopes	0.2	<1	Favourable.	Randātu Klintis Rocks - removal of excess vegetation.		0.2
7160	Fennoscandian mineral-rich springs and springfens	1.3	<1	Favourable.	Non-intervention.		1.3
7140	Transition mires and quaking bogs	349.8	1.6	Poor.	Rewetting (damming of ditches in N part of mire; evaluation of necessity of damming of ditches in SE part of mire.	50	
6530*	Fennoscandian wooded meadows	834.0	3.8	Bad.	Restoration. Maintenance.	558.0	834.0
6510	Lowland hay meadows	54.6	<1	Poor.	Restoration. Maintenance.	19.0	54.6
6450	Northern boreal alluvial meadows	660.5	3.0	Poor.	Restoration. Maintenance.	244.0	660.5

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6430	Hydrophilous tall herb fringe communities	10.7	<1	Favourable.	Restoration. Maintenance.	0.0	10.7
6410	*Molinia* meadows	2.23	<1	Favourable.	Restoration. Maintenance.	0.3	2.23
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	146.7	<1	Poor.	Restoration. Maintenance.	62.0	146.7
6230*	Species-rich *Nardus* grasslands	5.1	<1	Bad.	Restoration. Maintenance.	4.3	5.1
6210	Semi-natural dry calcareous grasslands	753.7	3.5	Favourable.	Restoration. Maintenance.	204.0	753.7
6120*	Xeric sand calcareous grasslands	16.6	<1	Bad.	Restoration. Maintenance.	11.0	16.6
5130	*Juniperus communis* formations on heaths or calcareous grasslands	6.0	<1	Bad.	Restoration. Maintenance.	3.8	6.0
6000	Grasslands to be restored	500.0	2.3	-	Restoration. Maintenance.	500.0	500.0
3270	Rivers with muddy banks	10	<1	Favourable.	Non-intervention.		10
3260	Natural river reaches and river riffles	655.8	3.0	Poor.	Removal of large woody debris and beaver dams in Vecpalsa, Vizla, Tirziņa, Kokšupīte, Zvārtava rivers (at least in the territory of protected landscape area).	30	
3150	Natural eutrophic lakes	183.5	<1	Poor to bad.	Oxbow lakes. In cases if shading of surrounding trees on surface of oxbow lakes exceeds 50 %, felling of near-shore trees and shrubs is allowed (habitat suitability for *Leucorrhinia pectoralis*). Once per 5 years.	10	

In nature management plan of 2007 the area specified for restoration was 1260 ha. The nature management plan was developed 10 years ago, situation on site has changed, and these areas must be updated during the development of grassland restoration and management plan. Areas which must be restored include open grasslands (at least 544 hectares, according to the newest information on grassland management in scope of Rural Development Programme), and wooded meadows (6530*, 9070, 5130) which must be restored in at least 562 hectares, including felling of shrubs and trees in 483 hectares (62 ha in woodlands), and wooded pastures in an area of 820 hectares. When calculating the restoration costs, it must be considered that wooded grasslands partially overlap with open grassland habitats. Also potential EU grassland habitats in cultivated grasslands and fallow-lands must be restored (these areas should be clarified during the development of grassland restoration and management plan).



GEOLOGICAL AND GEOMORPHOLOGICAL NATURE MONUMENTS

Ezernieku karsta kritenes | *Geological and Geomorphological Nature Monument (LV0413300)*

1. Brief description

YEAR OF FOUNDATION: 1976.

LOCATION: Sigulda municipality Allaži rural territory.

AREA: 52 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Ezernieku karsta kritenes Geological and Geomorphological Nature Monument is created for the protection of an area of a peculiar geological process – karst. As a result of karst processes, valleys, crater-like sinkholes and two lakes have been developed. One of the lakes sometimes partly or completely disappears underground. Although the area is small, it includes six EU protected habitats types in small areas – western Taïga, bog woodlands, and grassland and mire habitats. In the north, the nature monument borders with a mosaic of mires and woodlands, a small part of which is included in this protected area.

Several protected and rare species have been found here, for example, Platanthera chlorantha.

2. Threats to habitat and species conservation

Significant threats are unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Evaluation of possible extension of the geological and geomorphological nature monument by including a part of raised bog which is located outside the territory.

5. Necessary management and conservation measures

5.1. General measures

Evaluation of a possible extension of Natura 2000 territory.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	0.9	1.7	Bad.	Non-intervention.		0.9
9010*	Western Taïga	18.9	36.3	Poor.	Non-intervention.		18.9
7140	Transition mires and quaking bogs	0.07	<1	Favourable.	Non-intervention.		0.07
7110*	Active raised bogs	2.4	4.6	Poor.	Non-intervention.		2.4
6510	Lowland hay meadows	0.3	<1	Bad.	Restoration. Maintenance.	0.3	 0.3
3190*	Lakes of gypsum karst	2.2	4.2	Favourable.	Non-intervention. Prevention of mechanical pollution.		2.2 2.2

Kalamecu-Markūzu gravas | *Geological and Geomorphological Nature Monument (LV0401000)*

1. Brief description

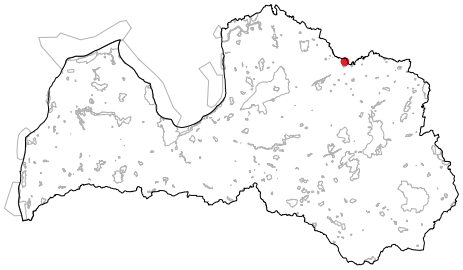
YEAR OF FOUNDATION: 1961.

LOCATION: Ape municipality Gaujiena rural territory.

AREA: 28.21 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kalamecu – Markūzu gravas Geological and Geomorphological Nature Monument is located north of Gaujiena village, in the site where Kalamecu and Markūzu rivers collide, creating Poļaka river (later inflowing in Gauja river). The territory is a canyon-like complex of ravines, with layers of dolomite, waterfalls, caves and dolomite outcrops which are the most important values in the area. There are several small waterfalls in the Kalamecu riverbed which look impressive during the spring floods or after the rain, when rivers form riffles and waterfalls. There are dolomite rock ledges which can collapse therefore caution should be taken when visiting the site. Also Markūzu river ravine is a canyon-like valley with waterfalls and dolomite outcrops. There is an artificial cave (created during the dolomite extraction).

2. Threats to habitat and species conservation

Beavers (*Castor fiber*) create dams in an area of river confluence.

3. Existing management of the protected habitats and its assessment

In the framework of the Estonian-Latvian cross-border cooperation program "Green Corridor" (*Tuned nature management in transboundary area of Estonia and Latvia,* EU38806) in 2013, a collective voluntary work event (*talka*) was organized, during which fallen logs were removed from rivers, and beaver dams were demolished. The influence was positive as the obstacles to water flow were removed. The measure must be continued – activities of beavers must be monitored, dams and fallen logs must be removed on necessity.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest, outcrop and aquatic habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Protection of outcrop habitats by management of visitor movement (stairs, railings, barriers).

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	3.4	12.1	Favourable.	Non-intervention.		3.4
91E0*	Alluvial forests	2.3	8.2	Favourable.	Non-intervention.		2.3
8210	Calcareous rocky slopes	0.03	<1	Favourable.	Non-intervention.		0.03
3260	Natural river reaches and river riffles	0.2	<1	Favourable.	Regular removal of fallen logs.	0.2	

Korkuļu sausgultne un pazemes upe | *Geological and Geomorphological Nature Monument (LV0400400)*

1. Brief description

YEAR OF FOUNDATION: 2000.

LOCATION: Jaunjelgava municipality Sērene rural territory.

AREA: 22.59 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Korkuļu sausgultne un pazemes upe Protected Geological and Geomorphological Nature Monument is established for the protection of karst which is a unique geological formation in Latvia, as well as for the conservation of forests of slopes. A small river (sinking stream) flows through the territory, and its waters disappear in several swallow holes. The territory includes Korkuļi river (Drešupīte river) valley which is 10-15 m deep. The valley slopes are covered with broadleaved forests. The Korkuļi River has a small but pronounced sandbed. Around 300 meters downstream the Korkuļi farmstead, river starts to disappear in swallow holes until it becomes completely dry, but the river valley becomes rather unimpressive. On the Laucesa Cliff, 0.5 km from the point of its disappearance, the river suddenly appears from the underground as several forceful springs. Then it flows into Lauce river. This phenomenon is best observed after rainfall or in springtime when the snow is melting and for a while after that. In Laucesa ravine, there are small outcrops of carbonate bedrocks.

The forest of slopes is almost unaffected and in good condition. In forest on tree trunks, logs, under the bark of withered trees, rich fauna of door snails (*Clausiliidae*) can be found, including indicator species of woodland key habitats – *Lacinaria plicata* and *Macrogastra plicatula*. Rare insect species *Liocola marmorata* has been found, and protected species *Lasius fuliginosus*. Of rare plant species, *Vincetoxicum hirundinaria* can be found.

2. Threats to habitat and species conservation

If the current conservation regime will be ensured and the number of visitors will not increase, habitats and species will not be threatened.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in habitats, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

In 2017, Regulation of the Cabinet of Ministers No. 46 entered into force. The regulations extended the borders of the nature monument. An inventory of species and habitats in the extended parts of the territory is necessary.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	4.7	20.8	Favourable.	Non-intervention.		4.7
8210	Calcareous rocky slopes	⟨0.1	⟨1	Favourable.	Non-intervention.		⟨0.1

Kulšēnu avots | *Geological and Geomorphological Nature Monument (LV0402300)*

1. Brief description

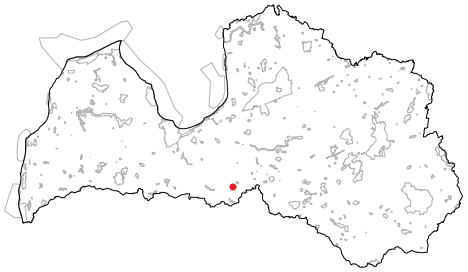
YEAR OF FOUNDATION: 2000.

LOCATION: Bauska municipality Vecsaule rural territory.

AREA: 8.86 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Kulšēnu avots Geological and geomorphological Nature Monument is established for the protection of rare habitat type – *Fennoscandian mineral-rich springs and springfens* (sulphur spring).

Kulšēni Spring is the largest spring discharge in Zemgale Region and, probably, also in Latvia. It is located northeast of the Ozolaine village, in a plain, about 300 meters from the Kulšēni farmstead. For the first time, the magnificent spring discharge was described by nature researcher Zelmārs Lancmanis already in the 1920s.

The sulphur spring discharge ir located at the right side of Avotu Grāvis brook which is a tributary to Iecava river, in the middle of a wet grassland, in a 7x15 meter wide hollow. Its discharge is 138 liters of water per second, and even more during spring floods.

2. Threats to habitat and species conservation

- Renovation of drainage systems in a vicinity of the spring can not be allowed as this can adversely affect hydrological regime.
- Spring discharge site may not be modified, strengthened, or improved with any infrastructure.
- Use of agricultural machinery in a vicinity of spring should be avoided as there is a possibility of collapses.

3. Existing management of the protected habitats and its assessment

The surroundings of the spring are maintained and grasslands are mown. This has a neutral impact on the habitat. Information signs are installed in several places.

4. Priorities of management and conservation

- Conservation of hydrological regime.
- Kulšēni spring is potentially a successful tourism object, relatively easy to access, impressive and visually attractive.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7160	Fennoscandian mineral-rich springs and springfens	0.031	<1	Favourable.	Non-intervention. Removal of excess trees and shrubs, without the use of heavy machinery.		0.031

Ogres dolomītu krauja | *Geological and Geomorphological Nature Monument (LV0412900)*

1. Brief description

YEAR OF FOUNDATION: 1976.

LOCATION: Ogre municipality Ogresgals rural territory.

AREA: 3.58 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

The Geological and Geomorphological Nature Monument is located in Ogresgals village, at the former cardboard factory, in a site where up to 4 meters high dolomite bluff is outcropped on the Ogre river bank. The dolomite bluff is an EU protected habitat type. The territory is established for the protection of a formation which is geologically valuable and important for the paleontological research. Remains of various ancient invertebrate and fossil fish can be found here. The best way to view the dolomite bluff is from the opposite (right) bank of Ogre river when the water level is low.

In the river floodplain, EU protected woodland habitat (*Alluvial forests with* Alnus glutinosa *and* Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)) can be found. The slope up to the river is overgrown with mixed *Picea abies - Betula* spp. woodland.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in outcrop and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
8210	Calcareous rocky slopes	0.3	8.3	Favourable.	Non-intervention.		0.3
91E0*	Alluvial forests	0.4	11.2	Poor.	Non-intervention.		0.4

Pavāru atsegumi | *Geological and Geomorphological Nature Monument (LV0415700)*

1. Brief description

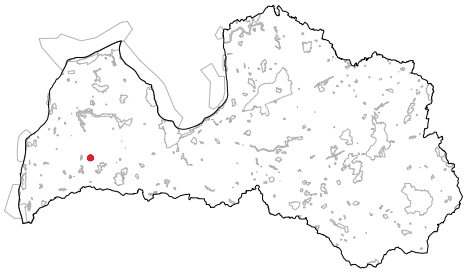
YEAR OF FOUNDATION: 1976.

LOCATION: Skrunda municipality, Skrunda rural territory.

AREA: 2.94 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.



Pavāru atsegumu Geological and Geomorphological Nature Monument is located in Ciecere river valley, in an area with small outcrops and forests on slopes, screes and ravines. The outcrop is about 10 m high, it consists of Upper Devonian sediments (loose, in some places stratified sandstone, siltstone and layers of clayey siltstone with clay interlayers and inclusions) with ichthyofauna residues. The outcrop has been buried and later excavated for geological research. This is one of the three world's oldest discovered sites where tetrapod-like vertebrates moved onto land. Pavāru atsegumi outcrop provides important information on species composition of the Devonian habitat and the position of some ancient species in the food web. Fossil fish residues found here: *Bothriolepis ciecere, Devononchus sp., Holoptychius sp., Ventalepis ketleriensis, Cryptolepis grossi, Glyptomus bystrowi.* The most significant was the discovery of *Ventastega curonica* in 1991. *Tilio-Acerion* forests of slopes, screes and ravines grow in the valley of Ciecere river.

2. Threats to habitat and species conservation

Current processes in the area of the nature monument are not significant and mainly manifest as the formation of collapses.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural forest and outcrop habitats which are slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	1.0	34.0	Favourable.	Non-intervention.		1.0
8220	Siliceous rocky slopes	< 0.01	<1	Favourable.	Non-intervention.		< 0.01

Skaistkalnes karsta kritenes | *Geological and Geomorphological Nature Monument (LV0402200)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Vecumnieki municipality Skaistkalne rural territory.

AREA: 97.5 ha.

NATURE MANAGEMENT PLAN: 2004 (2005–2014).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Skaistkalnes karsta kritenes Geological and Geomorphological Nature Monument includes the most prominent system of karst sinkholes in Latvia, with active ongoing processes, indicated by sinkholes of various types and sizes.

They are often filled with one or several small lakes where water accumulates but disappears from time to time. At the same time, water level is rather constant in Mežmalas and Mežezers lakes which are also karst sinkholes by their origin. Small fens, transition mires and raised bogs (dominated by sedges and *Sphagnum* mosses) can be found in terrain depressions and in the oldest sinkholes. All sinkholes with variable or periodically disappearing water level are protected habitats of EU importance.

The territory is mostly covered by mixed coniferous and deciduous forests; some of them correspond to habitat type of EU importance – western Taïga. Relatively small part of the area is occupied by semi-natural grasslands – *Fennoscandian lowland species-rich dry to mesic grasslands*, and Northern *boreal alluvial meadows* along the Lielupe river.

The oldest and most natural woodlands are important for rare and specially protected bird species, for example, *Aquila pomarina* and *Picoides tridactylus*. Rare plant species *Gentiana cruciata* has been found in alluvial grasslands.

2. Threats to habitat and species conservation

- The territory is sensitive to anthropogenic influences. Unplanned movement of transport and pedestrians can irreversibly damage habitats, as well as contribute to unpredictable and unwanted alterations of karst – the development of sinkholes (below roads, etc.):
  - The rapid and uncontrolled increase in number of visitors. Forest groundfloor vegetation may be adversely affected by newly-established trails and paths.
  - Trampling and climbing on slopes of sinkholes or outcrops promote their erosion, while significantly reducing the aesthetic value of the objects;
  - The use of motor vehicles is a significant negative factor, especially heavy forestry techniques in forest management, the pressure created by it on the soil and the resulting vibration.
- Alluvial and other grasslands are abandoned, and overgrow with high herbaceous plants and *Alnus incana*, causing the disappearance of rare species localities.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 Semi-natural dry grasslands and scrubland facies on calcareous substrates were managed but other grasslands were not managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".

4. Priorities of management and conservation

- Restoration and maintenance of semi-natural grassland habitats and habitats of rare species.
- Undisturbed course of natural processes in natural forest and aquatic habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Approval of Individual regulations on protection and use (including the zoning which is recommended in the nature management plan).
- Optimization of the borders of the protected nature object by including significant natural values outside the territory (forest block 395, compartments from 5 to 14).
- Installation of information boards with information on the allowed movement in the territory.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	14.9	15.3	Bad.	Non-intervention.		14.9
9000	Potential Protected woodland habitat	35.5	36.4	-	Non-intervention.		
6450	Northern boreal alluvial meadows	3.3	3.4	Bad.	Restoration. Maintenance.	3.3	3.3
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	0.1	<1	Bad.	Restoration. Maintenance.	0.1	0.1
6210	Semi-natural dry calcareous grasslands	0.7	<1	Bad.	Restoration. Maintenance.	0.0	0.7
6000	Grasslands to be restored	9.0	9.2	-	Restoration. Maintenance.	9.0	9.0
3190*	Lakes of gypsum karst	11.4	11.7	Favourable.	Non-intervention.		11.4

Stiglavas atsegumi | *Geological and Geomorphological Nature Monument (LV0401900)*

1. Brief description

YEAR OF FOUNDATION: 2000.

LOCATION: Viļaka municipality Šķilbēni rural territory.

AREA: 15 ha.

NATURE MANAGEMENT PLAN: none.

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Stiglavas atsegumi Geological and Geomorphological Nature Monument includes a natural reach of Stiglava river, and the slopes of its ravines which are covered by *Picea abies* and deciduous forests, as well as regularly flooded alluvial forests at the lower part of the ravine. On ravine slopes, there are sandstone outcrops and cave which is located outside the protected nature area. The cave might be suitable for bats. The sandstone bedrocks are quite loose, and there is only in a small area were the wall is firm and stable. There are five EU protected habitat types in the territory. In 2013, Stiglava outcrops were nominated as the geological object of the year by Latvian Centre of Petroglyphs.

The outcrop habitats are small and isolated from other habitats of this type. At the same time, their geological value is high as they contain fossils of placoderm fish, they may be datable, they help to understand the distribution of sediments of a particular suite, etc.

2. Threats to habitat and species conservation

- Increased erosion of sandstone outcrop is caused by trampling and scratching inscriptions onto the wall. Additional pressure to the territory was caused by the geological object of the year nomination , publicity and following placement of the geocache. To find a geocache, it is necessary to get out of the trail, and this contributes to the trampling. Although there is information on the information board that people should not leave trails, people still do that. The largest outcrop and the cave are both at the very beginning of the trail, so all visitors visit it.
- Visiting caves from October to April may potentially threaten the wintering bats if they use this cave. Currently, the cave is not surveyed in a suitable time for the bat counting.

3. Existing management of the protected habitats and its assessment

- In 2006, a well-maintained trail, car park, information board and toilet were constructed within the framework of a project "Survey and nature trail construction at the Stiglavas atsegumi Geological and Geomorphological Nature Monument. The project was supported by Latvian Fund for Environmental Protection and implemented by local municipality.

4. Priorities of management and conservation

- Undisturbed course of natural processes in natural forest, outcrop and watercourse habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Management of visitor flow and limitation of visits to the most sensitive parts of the sandstone outcrop.
- Maintenance of infrastructure which redirects visitors along the trails.
- Maintenance and research of rock outcrops as geologically important objects.

5. Necessary management and conservation measures

5.1. General measures

- Modification of the borders of protected geological and geomorphological nature monument by including Stiglava Cave and part of the Devonian outcrops.
- In order to conserve the habitats, negative influences such as sandstone erosion and groundfloor destruction caused by unmanaged flow of visitors must be prevented. Information boards must be updated, including information on the restrictions on the visit of the objects – a prohibition on entering and walking in certain sensitive areas. The placement of geocache must be monitored, so that it does not encourage the desire to leave the trail.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	4,1	27,3	Favourable.	Non-intervention.		4.1
8310	Caves not open to the public	0,01	<1	Poor.	Construction of infrastructure (trails).		
8220	Siliceous rocky slopes	0,01	<1	Poor.	Construction of infrastructure (trails, viewpoints, openings).		
3260	Natural river reaches and river riffles	1,00	6,7	Poor.	Partial removal of logs fallen in the river, creating a scenic river valley as the basis of the geomorphological monument. Limitation of activities of beavers.	1.0	
91E0*	Alluvial forests	0,7	4,7	Poor.	Non-intervention.		0.7

Zaņas lejtece | *Geological and Geomorphological Nature Monument (LV0415600)*

1. Brief description

YEAR OF FOUNDATION: 1977.

LOCATION: Saldus municipality Zaņa rural territory.

AREA: 43 ha.

NATURE MANAGEMENT PLAN: 2012 (2012–2025).

INDIVIDUAL REGULATIONS ON PROTECTION AND USE: none.

Zaņas lejtece Geological and Geomorphological Nature Monument includes a reach of Zaņa river with a relatively deep valley with a geologically important locality of sedimentary rock of Jurassic period, and its outcrop of a type that can be found only in South Kurzeme region, in Venta River basin. Fossils found in the calcareous rocks are of particular importance in the research of geological processes.

Formation of tufa, a nowadays rare geological process, occurs in the territory. The existing extensive management – grassland management and minimal forestry activities – have contributed to the creation and preservation of natural values. There are eight EU protected habitat types, which occupy 82.6% of the area. Out of these, the most important ones are *Forests of slopes, screes and ravines, Lowland species-rich dry to mesic grasslands, Petrifying springs with tufa formation*, and *Water courses of plain to montane levels*. Habitats are of high quality, and they function as a unified system and are important for preservation of biodiversity not only in Latvia, but also in Europe. There are two micro-reserves established for the protection of forests on slopes.

Grasslands cover a very small area. Their significance would increase if the territory of the restricted area was enlarged, including surrounding grasslands. They play a regional role as a stepping stone for species distribution in southern part of Western-Latvia's Geobotanical District where semi-natural grasslands are very fragmented. They are part of the most important landscape ecological corridor in Western Latvia - Venta valley.

In total, 16 protected plant and animal species have been found in the territory, as well as several rare species, such as plants *Ranunculus lanuginosus, Carex otrubae, Hypericum hirsutum*, invertebrates *Osmoderma eremita, Unio crassus, Lasius fuliginosus, mammal Muscardinus avellanarius*. The black stork uses the territory for foraging, and *Mergus merganser* is breeding here.

The operation of Zaņa hydroelectric power plant (HPP) causes significant water level fluctuations in the river reach in the territory of the Nature Monument.

2. Threats to habitat and species conservation

- The current status of protection of the territory does not ensure the protection of all the nature values (commercial felling is allowed in forests, there is no prohibition on felling at spring discharge sites, no restrictions on removal of snags and natural logs, etc.).
- Grasslands overgrow due to management cessation; eutrophication due to runoff from adjacent intensively managed agricultural lands.
- Zaņa HPP is located about 2.4 km upstream of the nature monument. During the operation, it creates water fluctuations of up to 0.5 meters, causing shore erosion, loss of aquatic organisms, as well as accumulation of sediments in habitats suitable for Unio crassus and other aquatic organisms, and also reduces the overall quality of river riffles.
- Collectors of geological fossils can damage both outcrops and *Unio crassus* by trampling habitat of river riffles.
- The massive falling of logs in the river; 90 % of forests of the territory are old according to forestry terminology, and 97% of them are dominated by *Alnus incana* (50-60 years old woodlands). The intensive use of trails and picnic sites that are established in the territory.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Restoration of semi-natural grasslands in all their historical areas (not all of them are identified in the habitat mapping up to now) and maintenance in a favorable conservation status.
- Formation of landscape of wooded grasslands by leaving solitary trees.

- Ensuring the natural flow of the Zaņa River, avoiding large water level fluctuations and conserving the conditions optimal for population of *Unio crassus*.
- Undisturbed course of natural processes in natural spring, river and forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

- Change of status from nature monument to nature reserve is recommended because it would be more appropriate and would promote the preservation of the nature values of the entire territory, setting the adequate restrictions. Individual regulations on protection and use must be developed and approved.
- Steady operation of Zaņa HPP must be ensured.
- The territory of the protected area must be extended to Zaņa Reservoir.
- Restoration plan for semi-natural grasslands (including grasslands overgrown with forest) of the river valley must be developed and implemented.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	20.9	48.6	Favourable.	Non-intervention.		20.9
9010*	Western Taïga	4.2	9.7	Bad.	Non-intervention.		4.2
91E0*	Alluvial forests	3.3	7.6	Poor.	Non-intervention, except the timely removal of logs fallen in the river.		3.3
7220*	Petrifying springs	0.5	1.1	Favourable.	Non-intervention, except felling of some trees and shrubs (on necessity and after expert's opinion).		0.5
6510	Lowland hay meadows	1.5	3.5	Bad.	Restoration. Maintenance.	0.5	1.5
6430	Hydrophilous tall herb fringe communities	0.6	1.4	Bad.	Restoration. Maintenance.	0.0	0.0
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	1.5	3.4	Bad.	Restoration. Maintenance.	0.5	1.5
6000	Grasslands to be restored	2.0	4.6	-	Restoration. Maintenance.	2.0	2.0
3260	Natural river reaches and river riffles	2.8	6.5	Poor.	Removal of beaver dams and coarse woody debris if they promote erosion and clogging of river reaches suitable for *Unio crassus*.	On necessity.	

Semi-natural grasslands must be restored in their maximum possible area including the currently identified EU protected grasslands and the historic grasslands, which are now overgrown with shrubs and new forest.

MICRO-RESERVES

Bānūžu Zelta avots | *Micro-reserve (LV0831300)*

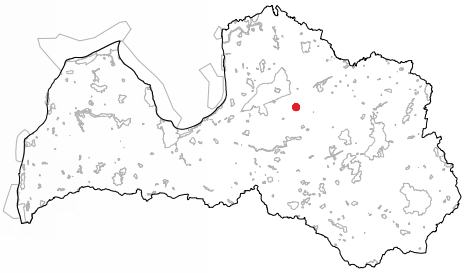
1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Vecpiebalga municipality Taurene rural territory.

AREA: 2.3 ha.

NATURE MANAGEMENT PLAN: none.



Bānūžu Zelta avots Micro-reserve is located northwest of Lake Bānūži. It includes a small slope with spring discharges, and springfen. Bānūžu Svētavots Spring ("Bānūži Holly Spring") is an archaeological monument of local significance. It has long been popular as a site for taking drinking water and is also known as a religious (cult) site.

The natural values of the territory are the habitats of calcareous springs and springfens, and their associated species. Deciduous forest on slope is a habitat for a significant population of rare snail *Ena montana*. Protected plant species which grow in springfens include *Primula farinosa, Carex ornithopoda, Dactylorhiza russowii*, moss *Paludella squarrosa*.

There is an infrastructure at spring discharge site to facilitate access to water taking.

2. Threats to habitat and species conservation

- There are drainage ditches outside the micro-reserve, in adjoining territories.
- Activities of beavers can be observed at south-western border of micro-reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

Preservation of hydrological regime optimal for natural habitats of fens and springfens.

5. Necessary management and conservation measures

5.1. General measures

Hydrological regime research; evaluation of measures for its preservation, taking into account the drainage systems in adjoining territory.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7220*	Petrifying springs	1.1	47.8	Poor.	Felling of shrubs; repeated mowing in (once per 3 years).	1.1	
7160	Fennoscandian mineral-rich springs and springfens	0.8	34.8	Poor.	Felling of trees and shrubs repeated mowing in (once per 3 years). Mowing with grass removal, at least once per three years.	0.8	

Bērzoles riests | *Micro-reserve (LV0830600)*

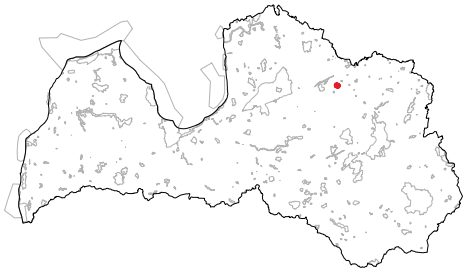
1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Smiltene municipality Palsmane rural territory.

AREA: 103 ha.

NATURE MANAGEMENT PLAN: none.



Bērzoles riests Micro-reserve is located in a territory rich in forests, on the edge of a large forest massif, at Vidaga river. The territory is covered by moist pine woodlands and small mires; very old pines can be found.

Micro-reserve is established for the protection of two EU protected woodland habitat types - 91D0* *Bog woodland* and 9010* *Western Taïga*. Woodlands are well suited for capercaillie *Tetrao urogallus*.

2. Threats to habitat and species conservation

- Bog woodlands can be threatened by changes in hydrological regime both in micro-reserve and in adjacent territories.
- *Tetrao urogallus* leks overgrow with *Picea abies* in the result of previous drainage.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Improvement of conditions in capercaillie *Tetrao urogallus* leks.
- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. Species

Conservation status of capercaillie (*Tetrao urogallus*) population is currently evaluated as poor. For the restoration of habitat, felling of spruces is necessary in compartments 13, 16, 17 on block 385 (area of 2 hectares). Felling is allowed only during the period from 1 November to 31 January.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	49.0	47.6	Poor.	Non-intervention, except measures for management of *Tetrao urogallus* leks. Evaluation of the need of rewetting.		49.0
9010*	Western Taïga	19.2	18.6	Favourable.	Non-intervention.		19.2

Bērzu purvs | *Micro-reserve (LV0830700)*

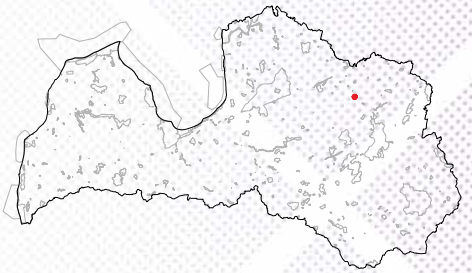
1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Gulbene municipality Lejasciems rural territory.

AREA: 58 ha.

NATURE MANAGEMENT PLAN: none.



Bērzu purvs Micro-reserve is located in a large forest massif, where dry coniferous forests, as well as bog woodlands and drained forests are characteristic. The territory is comprised by dry woodlands and bog woodlands; old pines (*Pinus sylvestris*) can be found. The micro-reserve is established for the protection of habitat type 91D0* Bog woodland. There is also *Tetrao urogallus* lek.

2. Threats to habitat and species conservation

- Overgrowth of lek with *Picea abies* due to earlier drainage.
- Bog woodland can be threatened by hydrological regime changes both in micro-reserve and in adjacent areas.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage forest habitats.

4. Priorities of management and conservation

- Improvement of conditions in *Tetrao urogallus* leks.
- Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. Species

There are two pairs of Tetrao urogallus within the micro-reserve. Necessary conservation measures include: felling of *Picea abies* advance growth and subcanopy layer in area of 7.3 hectares; targeted felling to decrease woodland density in area of 4 hectares and thinning of canopy layer trees in area of 5.7 hectares.

5.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	19.6	33.8	Poor.	Non-intervention, except measures for the improvement of Tetrao urogallus habitat.		19.6

Bulvāra riests | *Micro-reserve (LV0830800)*

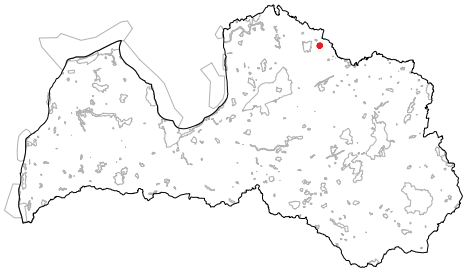
1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Valka municipality, Valka rural territory.

AREA: 81 ha.

NATURE MANAGEMENT PLAN: none.



Bulvāra riests Micro-reserve is located in a large massif of forests. The territory consists of old pine forests; there is a mosaic of dry pine woodlands and wet areas with small mires. Micro-reserve was established for the protection of bog woodlands and western Taïga. Woodlands are sparse and therefore suitable for Tetrao urogallus. Indicator-species characteristic to woodland key habitats can be found in the territory.

2. Threats to habitat and species conservation

Not known.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in natural forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. Species

There are up to five Tetrao urogallus males in a lek. Appropriate habitat management measures are necessary within the micro-reserve – according to expert recommendations.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	53.0	65.4	Favourable, poor.	Non-intervention.		53.0
9010*	Western Taïga	8.4	10.4	Favourable.	Non-intervention.		8.4

Dravenieku avoti | *Micro-reserve (LV0831400)*

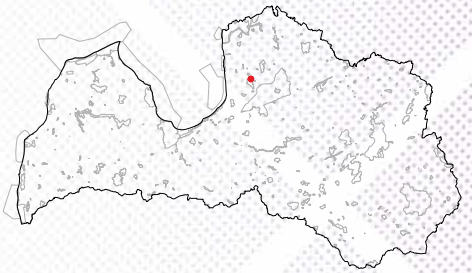
1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Limbaži municipality Limbaži rural territory.

AREA: 2 ha.

NATURE MANAGEMENT PLAN: none.



Dravenieku avoti Micro-reserve is located on the shore of Lake Sāruma. It is established for the protection of geomorphological formation which is also a rare habitat type - petrifying springs with tufa formation (*Cratoneurion*). Habitat is formed by a mosaic of spring discharge sites and woodlands. It is a habitat for several rare and protected species, such as Schoenus ferrugineus, *Pinguicula vulgaris, Dactylorhiza incarnata*, and *Carex davalliana*. The upper part of the slope and also territory outside the micro-reserve was previously used for tufa extraction. Woodlands are dominated by *Betula* spp. and *Alnus glutinosa*, with a typical understory. An old, now overgrown ditch is located at the north-west edge. In some of the spring discharge sites there is a dense layer of shrubs.

2. Threats to habitat and species conservation

- The quality of spring discharge sites is affected negatively by overgrowth.
- Micro-reserve is located at Lake Sāruma whose water level is maintained by Nabe watercourse – a drainage object of national significance.
- Trampling and pollution with municipal waste at angling sites and picnic sites established in the south-eastern part of the micro-reserve.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in mire habitats, as well as in habitats of species that need undisturbed, natural environment.
- Reduction of overgrowth.

5. Necessary management and conservation measures

5.1. General measures

Regular collection of municipal waste.

5.2. Specific measures – habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7160	Fennoscandian mineral-rich springs and springfens	⟨0.1	⟨1	Favourable.	Non-intervention.		⟨0.1
7220*	Petrifying springs	1.5	75.0	Favourable.	Non-intervention.		1.5
7230	Alkaline fens	0.2	10.0	Favourable.	Felling of certain shrubs on the edges of two open mires; junipers must be left.	0.2	

Dubļukrogs | *Micro-reserve (LV0830400)*

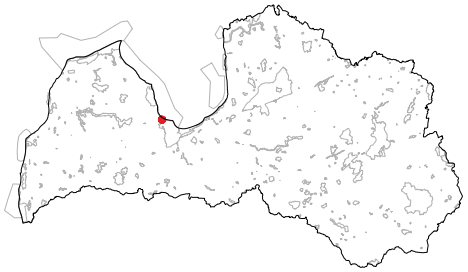
1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Engure municipality, Engure and Smārde rural territories.

AREA: 9.6 ha.

NATURE MANAGEMENT PLAN: none.



Dubļukrogs Micro-reserve is located at the northern border of the Ķemeri National Park, and it is a part of large areas of forests and mires. The territory is established for the conservation of bog woodlands, alkaline fens and Molinia meadows on calcareous, peaty or clayey-siltladen soils. A very rare and protected species - *Saussurea alpina* ssp. *esthonica* – can be found here, as well as other rare and protected plant species such as *Orobanche pallidiflora*, *Lonicera caerulea* ssp. *pallasii, Dactylorhiza russowii,* and *Pinguicula vulgaris*.

2. Threats to habitat and species conservation

The main threat is the lack of management. Grasslands and fens were managed in the past but now are overgrown with trees and shrubs. This can cause the disappearance of rare plant species, or the deterioration of their populations.

3. Existing management of the protected habitats and its assessment

In 2014 JSC "Latvian State Forests" organised tree and shrub felling in the area of 1 ha. In 2015, shrubs were cut in another 1 ha area. Only a few solitary old conifers were preserved. Shrub regrowth was cut every year between 2014 and 2016. According to results of *Saussurea alpina* ssp. *esthonica* monitoring, the number of plants has increased considerably - possibly due to the improvement of lighting conditions.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest, as well as in habitats of species that need undisturbed, natural environment.
- Regular management of alkaline fens and calcareous grasslands.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	5.7	59.3	Favourable.	Non-intervention.	5.7	
7230	Alkaline fens	2.6	27.0	Poor.	Regular (once a year or less) cutting of shrub regrowth. Grass mowing and removal.		2.6
6410	*Molinia* meadows	1.3	13.5	Poor.	Regular (once a year or less) cutting of shrub regrowth. Grass mowing and removal.		1.3

Dzelmes | *Micro-reserve (LV0804600)*

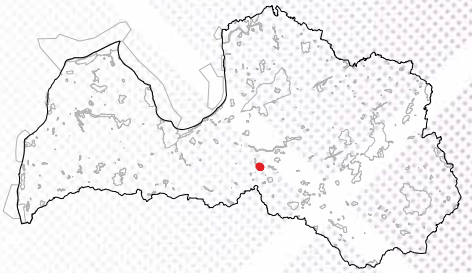
1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Lielvārde municipality Jumprava rural territory.

AREA: 2.9 ha.

NATURE MANAGEMENT PLAN: none.



Dzelmes Micro-reserve is located on the right bank of the river Daugava. The territory is very important for the conservation of dolomite outcrop of Daugava river bank, and grasslands located on it. There are many rare and protected plant species – *Jovibarba sobolifera, Ajuga genevensis, Gentiana cruciata, Anemone sylvestris, Vincetoxicum hirundinaria, Saxifraga tridactylites, Peucedanum oreoselinum*, moss *Mannia fragrans*.

This is one of the most important territories in Latvia for the conservation of habitat type 6110* *Rupicolous calcareous or basophilic grasslands of the* Alysso-Sedion albi. The territory is important as part of the landscape-ecological grassland aggregation between Daugava pie Kaibalas Nature Reserve and Daugavas ieleja Nature Park which ensure the functionality of this part of Daugava river as an ecological corridor.

2. Threats to habitat and species conservation

- Eutrophication from the adjacent intensely managed agricultural land.
- Overgrowth with shrubs which increase shading that is unfavorable for habitat characteristic species. Overgrowth is promoted by eutrophication from the adjoining intensively managed agricultural land.
- Coastal erosion, promoted by water level elevations caused by Pļaviņu and Ķeguma hydroelectric power plants.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

Restoration and maintenance of EU protected habitat type 6110* *Rupicolous calcareous or basophilic grasslands of the* Alysso-Sedion albi in favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

- Development and implementation of EU protected habitat restoration and management plan; continuous monitoring of habitat conservation status.
- Provision of at least 5 meters wide buffer zone along the entire length of the territory next to the intensively managed agricultural land. Its proper management (annual mowing in the second half of June and beginning of July, with hay removal from the territory).

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
8210	Calcareous rocky slopes	0.05	1.7	Poor.	Non-intervention, except in places where removal of trees and shrubs from the outcrop is necessary, on border with 6110* (management of 6110* is a priority).		0.05
6210	Semi-natural dry calcareous grasslands	0.6	20.7	Bad.	Mowing with haymaking. Restriction of invasive plant species (Saponaria officinalis): mowing at least twice per season, before the blossoming).		0.6
6110*	Semi-natural dry calcareous grasslands	0.08	2.8	Bad.	Gradual and selective felling and removal of trees and shrubs.	0.08	

Dzirnieku pļava | *Micro-reserve (LV0831600)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Kuldīga municipality Kurmāle rural territory.

AREA: 0.9 ha.

NATURE MANAGEMENT PLAN: none.

Dzirnieku pļava Micro-reserve is located near Lake Vīlgāle. It is established for the conservation of moist grassland habitat which is the only locality of fringed pink *Dianthus superbus* in Latvia. In Latvia, *Dianthus superbus* grows near the southwestern border of its distribution range, and its occurrence has decreased due to drainage and management cessation of moist grasslands. It is on a verge of extinction in Latvia.

2. Threats to habitat and species conservation

- Management cessation and overgrowth with shrubs.
- Complete overgrowth of drainage system (promoting abandonment and overgrowth of grasslands); restoration of the drainage system to the extent that it reduces the moisture condition suitability for the species.

3. Existing management of the protected habitats and its assessment

Grassland has not been managed for at least ten years, except a small part in its north-eastern edge.

4. Priorities of management and conservation

- Restoration of grassland and maintenance in favourable conservation status, while preserving the population of *Dianthus superbus*.
- Maintenance of *Dianthus superbus* population in favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

- Extension of the Natura 2000 territory: restoration and inclusion of:
  - Grasslands adjoining Lake Vīlgāle;
  - Drained grasslands in northern part of Jāmaņupe (Cerenda) river floodplain (Jātele and Pūcpļavas Grasslands).
- Inventory of the abovementioned grasslands; development and implementation of grassland restoration and management plan aimed at maintenance of grasslands of EU importance and the locality of *Dianthus superbus*.
- Monitoring of *Dianthus superbus* population; development of species conservation plan.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6410	*Molinia* meadows	0.7	77.8	Bad.	Restoration. Maintenance.	0.7	 0.7

One-time grassland restoration measures. Grassland must be restored, and methods supporting the conservation of *Dianthus superbus* must be used (patches with *Dianthus superbus* left unmown, and mown after its seed shed). Grassland must be restored as soon as possible, as the species does not have a long-term seed bank, so it can disappear.
Annual grassland management measures are necessary in the entire grassland area, using methods which are supporting *Dianthus superbus* population.

Elles purvs | *Micro-reserve (LV0831500)*

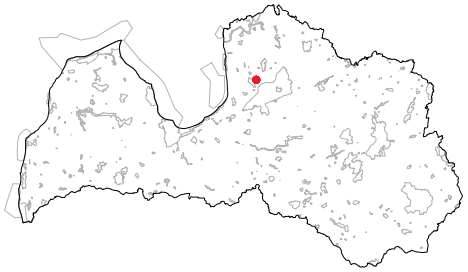
1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Pārgauja municipality, Stalbe rural territory.

AREA: 19.4 ha.

NATURE MANAGEMENT PLAN: none.



Elles purvs Micro-reserve is located in Nabe river which is overgrown with bog woodlands, and it includes north-west part of the partly exploited Elle Mire. The territory is important for the conservation of bog woodlands, transition mires and quaking bogs, and alkaline fens. Previously open fen is overgrown with trees and shrubs in the past decades. Probably earlier the territory has been used as a meadow or pasture. Rare moss species *Hamatocaulis vernicosus* can be found here, as well as several rare vascular plant species. Shrubby birch *Betula humilis* can be found in the shrub layer.

2. Threats to habitat and species conservation

Overgrowth of fen with trees and shrubs. It is promoted by the old, overgrown drainage system as well as by management cessation.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to protect or manage habitats.

4. Priorities of management and conservation

Removal of trees and shrubs; maintenance of open landscapes in fen and transition mire. It is recommended to increase the area of open mire by felling a young woodland which has developed in the open mire due to drainage and management changes.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	13.2	68.0	Favourable.	Non-intervention. Transformation to protected mire habitat (felling of trees).	8.0	5.0
7140	Transition mires and quaking bogs	3.9	20.1	Poor.	Felling of trees and shrubs, preserving old trees and clusters of trees. Brush cutting at least once per 2-3 years.	3.9	
7230	Alkaline fens	2.4	12.4	Poor.	Felling of trees and shrubs, preserving old trees and clusters of trees. Brush cutting at least once per 2-3 years.	10	

Gaujienas purvainie meži | *Micro-reserve (LV0826300)*

1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Ape municipality, Vireši rural territory.

AREA: 69 ha.

NATURE MANAGEMENT PLAN: none.

The micro-reserve is located in a partially drained forest area between the Gauja River and the Dzērves River. It is crossed by a well-maintained forest road in northeastern – southwestern direction. The micro-reserve has a wide buffer-zone which is not included in Natura 2000 network.

The territory is important for the conservation of bog woodlands, and it is a significant capercaillie *Tetrao urogallus* lek site. There are wet pine (*Pinus sylvestris*) woodlands which are partly overgrown with spruces (*Picea abies*) but they are sparse and transparent in the most part of the area. Most of the pines are old, with thick branches which are suitable for capercaillie males sitting and displaying themselves at a lek site.

2. Threats to habitat and species conservation

Overgrowth of pine woodlands by spruces (caused by previous drainage).

3. Existing management of the protected habitats and its assessment

- On the one side of the road (forest block 476) the entire area is in a suitable condition for capercaillie lek, since pines and spruces of the subcanopy layer were felled in 2015. Felled trees were left on site. The surroundings are transparent, with *Vaccinium myrtillus, Ledum palustre* in the ground vegetation, dense *Lycopodium* colonies in some areas. In the central part, there is a small, wet area with reeds.
- On the other side of the road (block 461) there is a dense understory, and it lacks open, transparent areas.
- The territory is influenced negatively by drainage as well as by clear-felling carried out at the micro-reserve and its buffer zone. Spruces are planted in the clear-felled areas (pine planting would be preferable); also natural regeneration with birches (*Betula* spp.) can be observed.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Rewetting in those parts of mire and forest which are affected by drainage.
- Maintenance of capercaillie lek according to requirements of the species.

5. Necessary management and conservation measures

5.1. General measures

Hydrological regime research.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	68.3	99.0	Poor.	Non-intervention. According to evaluation of rewetting possibilities and expert conclusions on maintenance of capercaillie *Tetrao urogallus* leks.	According to research results.	68.3

Graviņas | *Micro-reserve (LV0830900)*

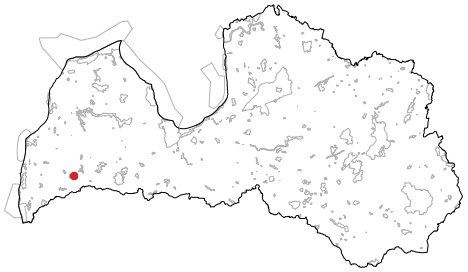
1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Vaiņode municipality Embūte rural territory.

AREA: 6.6 ha.

NATURE MANAGEMENT PLAN: none.



Graviņas Micro-reserve is located in a small woodland in a valley of Šķervelis river, on slope. In the south, it borders with agricultural lands.

The area is important for the protection of forests and springs of slopes. Particularly valuable are *Fraxinus excelsior* forests on slopes. There are rare and protected plant species, such as the *Cypripedium calceolus*, *Polygonatum verticillatum*, *Primula farinosa*, and *Pinguicula vulgaris*.

2. Threats to habitat and species conservation

- Forestry activities, removal of old trees and dead wood, damage of groundcover.
- Sensitive protected plant species are influenced by hydrological regime changes caused by previous drainage of forests.
- In some areas in spring discharges, there are wild pig mud baths.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Maintenance of light conditions optimal for the rare plant species.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9180*	Slope forests	6.0	90.9	Favourable.	Non-intervention. Felling of *Alnus incana* in some places in localities of rare plant species (*Cypripedium calceolus*)		7.0
7220*	Petrifying springs	1.1	16.6	Favourable.	Non-intervention.		1.1

Igaunijas riests | *Micro-reserve (LV0843500)*

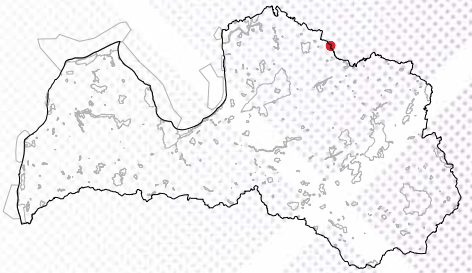
1. Brief description

YEAR OF FOUNDATION: 2002.

LOCATION: Valka municipality Valka rural territory.

AREA: 161 ha.

NATURE MANAGEMENT PLAN: none.



Igaunijas riests Micro-reserve is located at the Latvian-Estonian border. It includes dry pine forests on terrain elevations and swamp woods in terrain depressions which form a mosaic of woodlands of various ages. The territory is important for the protection of capercaillie *Tetrao urogallus* leks, as well as for the protection of bog woodlands and western Taïga. In most parts of the micro-reserve, woodlands are sparse and transparent. In some places in pine woodlands, there is a dense advance growth with spruces. Several ditches cross the territory.

2. Threats to habitat and species conservation

Habitats of bog woodlands are affected negatively by previous drainage which has caused overgrowth with understory and subcanopy layer with spruces (*Picea abies*).

3. Existing management of the protected habitats and its assessment

Economic activities have been carried out in the surrounding forests. There are areas that were clear-felled in 2015 and before. Several young forests are located in the buffer zone. A dense understory has developed in woodlands in micro-reserve, and *Picea abies* in the subcanopy layer, and sparse woodlands can be found in some forest areas that are no more than 1 ha large. In the central part of the micro-reserve, blocking of dams was carried out; mire is wet but withering of spruces has not occurred.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.
- Restoration and preservation of hydrological regime optimal for mire habitats.

5. Necessary management and conservation measures

5.1. General measures

Analysis of hydrological regime; rewetting in accordance to expert recommendations for the management of *Tetrao urogallus* leks.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	39.9	24.8	Poor.	Rewetting (according to research results).	39.9	
9010*	Western Taïga	14.2	8.8	Favourable.	Non-intervention.		14.2

Kaļņa riests | *Micro-reserve (LV0831100)*

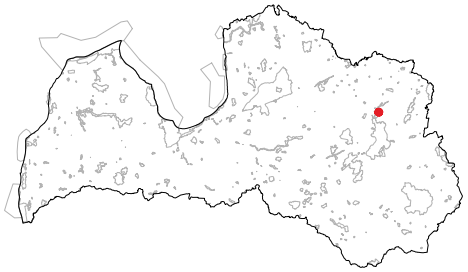
1. Brief description

YEAR OF FOUNDATION: 2003.

LOCATION: Gulbene municipality Stradu rural territory.

AREA: 76.17 ha.

NATURE MANAGEMENT PLAN: none.



Kaļņa riests Micro-reserve is located in a vast, forest-rich area. It is established for the protection of capercaillie *Tetrao urogallus* leks in western Taïga habitat. Nearby there are several nature reserves and micro-reserves for the protection of birds and forest habitats. Woodlands of the territory consist of both pine woodlands and dry coniferous forests on dune-like terrain elevations. Woodlands adjacent to the territory are heavily drained, but hydrological regime in the micro-reserve has not been significantly changed. Rare and protected species such as *Tragosoma depsarium* and *Boros schneideri* have been found in the woodlands.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Undisturbed course of natural processes in forest and mire habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Inventory of the territory in order to specify the measures necessary for preservation of capercaillie *Tetrao urogallus* leks.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	14.1	18.5	Favourable.	Non-intervention.		14.1
91D0*	Bog woodland	23.4	30.7	Favourable.	Non-intervention.		23.4

Maitiķu avoti | *Micro-reserve (LV0831700)*

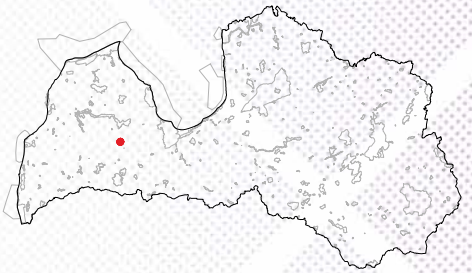
1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Kandava municipality Zante rural territory.

AREA: 1.5 ha.

NATURE MANAGEMENT PLAN: none.



Maitiķu avoti Micro-reserve is located on a coast of Amula river. It includes two tufa mounds, each about 100 m in diameter, formed by tufa-forming springs. The territory is important for the conservation of peculiar springs and alkaline fen. Protected plant species include *Primula farinosa, Pinguicula vulgaris, Dactylorhiza incarnata.*

Due to activities of beavers (*Castor fiber*), the territory has been inundated for a long time, and therefore it is difficult to access it for the management purposes. The beaver inundation is permanent, stable, with open pools in some places.

2. Threats to habitat and species conservation

- Calcareous springs and their surroundings are inundated due to activities of beavers. This causes paludification and change in vegetation composition, and makes management difficult.
- Open spring discharge sites and mires overgrow with shrubs.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage protected habitats.

4. Priorities of management and conservation

- Removal of beaver dams in Amula river and prevention of inundations in floodplain, in order to maintain hydrological regime in protected habitat, and to make it possible to carry out the restoration and management of alkaline fens.
- Felling of trees and shrubs in springfens; mowing and removal of aquatic plants.

5. Necessary management and conservation measures

5.1. General measures

- Revision of borders of the micro-reserve. Possibly, the extension of Natura 2000 territory is necessary, by inclusion of the entire biologically valuable complex of wetlands in the surrounding of springs. Near the micro-reserve, in the basal part of slope (left bank of Amula river), there is a peculiar, vigorous spring discharge (Maitiķu spring) which currently is not included in the micro-reserve and is not protected. The immediate vicinity of springs, which is directly related to the conservation of spring habitats, is also not included in the micro-reserve.
- Repeated inventory of the territory and its surrounding habitats in accordance to the newest methods.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7230	Alkaline fens	0.8	53.3	Poor.	In Amula river: regular removal of beaver dams and reduction of beaver population. In fen: felling of shrubs, regular mowing of regrowth, mowing and removal of grass (at least annually during the first two years, later at least once per 2 – 4 years).		0.8

Melderupītes meži | *Micro-reserve (LV0826800)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Alūksne municipality Mārkalne and Ziemers rural territories.

AREA: 281 ha.

NATURE MANAGEMENT PLAN: none.

Melderupītes meži Micro-reserve is located in extensive area rich in forests and mires, on Latvian-Estonian border. There is a mosaic of dry and wet pine (*Pinus sylvestris*) woodlands, in smaller areas also wet woodlands with *Betula* spp. and *Picea abies*. The most part of the territory is dominated by sparse and transparent woodlands, but dense spruce (*Picea abies*) advance growth and subcanopy are established in some places. There are also old pines with thick side-branches and flat tops which are well suitable for displaying of capercaillie (*Tetrao urogallus*).

The Micro-reserve is important for the conservation of *Tetrao urogallus* leks and bog woodlands. Rare species of mosses, polypores and lichens have been found here, for example, moss *Anastrophyllum hellerianum,* polypore *Fomitopsis rosea*.

2. Threats to habitat and species conservation

Previously sparse wet pine woodlands overgrow with spruce advance growth due to changes caused by drainage.

3. Existing management of the protected habitats and its assessment

In 2012, within the framework of the Estonian-Latvian cross-border cooperation project "The green corridor" (*Tuned nature management in transboundary area of Estonia and Latvia,* Nr.EU38806), spruces in lek were felled in an area of 10.7 ha. The transparency of the site is improved, and it is much more sparse. Felling residues have been dispersed and now are immersed in *Sphagnum* mosses. Before the management of leks in other sites, the monitoring of *Tetrao urogallus* must be carried out, and the influence of management measures must be evaluated.

4. Priorities of management and conservation

Rewetting.
In order to improve conditions for *Tetrao urogallus* displaying, it is necessary to fell part of spruces in advance growth, subcanopy and canopy – in sites where woodland canopy is composed both of spruces and pines, and the advance growth with spruces is characteristic. Management sites must be specified according to recommendations of an ornithologist.

5. Necessary management and conservation measures

5.1. General measures

Research on rewetting possibilities; development of the project.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
7140	Transition mires and quaking bogs	0.2	<1	Poor.	Non-intervention.		0.2
9010*	Western Taïga	7.8	2.8	Poor.	Management of *Tetrao urogallus* leks.		7.8
91D0*	Bog woodland	84.1	30.0	Poor.	Non-intervention, except for measures of management of *Tetrao urogallus* leks. Rewetting.	According to research results	84.1

Mežamatveju kadiķu pļavas | *Micro-reserve (LV0831800)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ludza municipality Nirza rural territory.

AREA: 8.3 ha.

NATURE MANAGEMENT PLAN: none.

Mežamatveju Kadiķu Pļavas Micro-reserve is located in a territory of agricultural lands and small woodlands. It is situated on slopes of hills, bordering with overgrowing agricultural lands. There are formations of *Juniperus communis* in grasslands which therefore are important for the reduction of fragmentation, and their management is a priority. This is the sixth most important territory in Latvia regarding the proportion of habitat type 5130 Juniperus communis *formations on heaths or calcareous grasslands* in the country (9 % of the total area). The micro-reserve is located in the direct vicinity of Mežamatveju pļavas Micro-reserve, and forms a single grassland complex together with it. The micro-reserve is located in a region which is relatively rich in semi-natural grasslands, on the eastern edge of Latgale Upland. However, the protection of grasslands is insufficient here, as only a small part of them is included in protected nature areas. Near the micro-reserve, there is a locality of very rare plant species *Gentiana cruciata*.

2. Threats to habitat and species conservation

- Grasslands are threatened by abandonment and by inappropriate management. Intense establishment of pines (*Pinus sylvestris*) occurs. With time, pines can suppress the junipers. There are willows (*Salix* spp.) in small terrain depressions, and the area of them is increasing with every year as the belt of unmown grasslands is left around the shrubs. Mowing of grasslands without grass removal was carried out in the previous years. It has promoted the spread of expansive plant species from the grassland edges.
- Part of the grassland on the edges is not mown and it overgrows with shrubs.
- Eutrophication of Juniper formations is caused by pine branches cut and left on site in 2010.
- Establishment of forest plantation in the vicinity of micro-reserve is planned.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in 2014 almost the whole area of the 5130 Juniperus communis *formations on heaths or calcareous grasslands* and 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (72 % and 98 % respectively) was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands".
- When evaluating the habitats after management, which has been carried out by landowners, it can be concluded that juniper formations recover and become more vital. The cut pine branches decay gradually, releasing nutrients which promote grassland overgrowth and eutrophication.

4. Priorities of management and conservation

Restoration and maintenance of grasslands and juniper formations in favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

Merging the two adjoining Micro-reserves - Mežamatveju kadiķu pļavas and Mežamatveju pļavas in one Natura 2000 site, to promote the management of territory and the integrity of conservation.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6210	Semi-natural dry calcareous grasslands	3.9	47.0	Poor.	Restoration. Maintenance.	2.0	3.9
5130	*Juniperus communis* formations on heaths or calcareous grasslands	4.2	50.6	Bad.	Restoration. Maintenance.	4.2	4.2

One-time grassland restoration measures are necessary in an area of at least 6 hectares. Grassland restoration measures include cutting of trees and shrubs, restorative grazing or mowing in order to decrease the abundance of expansive species.

Mežamatveju pļavas | *Micro-reserve (LV0831900)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ludza municipality Nirza rural territory.

AREA: 16 ha.

NATURE MANAGEMENT PLAN: none.

Mežamatveju Pļavas Micro-reserve is located in a territory of agricultural lands and small woodlands. It is lying on slopes of hills, bordering with overgrowing agricultural lands and paludified areas. The micro-reserve is located in a region which is relatively rich in semi-natural grasslands, on the eastern edge of Latgale Upland. However, the protection of grasslands is insufficient here, as only small part of them is included in protected nature areas.

The territory is important for the protection of very rare plant species *Gentiana cruciata* and for the protection of grasslands which are its habitat. The micro-reserve is located in the direct vicinity of Mežamatveju kadiķu pļavas Micro-reserve, and forms a single grassland complex together with it.

2. Threats to habitat and species conservation

Grasslands are threatened by abandonment and by inappropriate management. Part of the grasslands in the micro-reserve is overgrowing. In sites where management is difficult (depressions, steep slopes), the management has been insufficient, therefore expansive plant species (such as *Anthriscus sylvestris*) become abundant.

3. Existing management of the protected habitats and its assessment

According to Rural Support Service, in 2014 nearly the whole area of the grasslands (98 %) was managed in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands". In 2015, grassland condition was evaluated as good. In some places, overgrowth starting from the edges and from unmown depressions was observed.

4. Priorities of management and conservation

Restoration of grassland habitats in their maximum possible area and maintenance in favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

Merging the two adjoining micro-reserves - Mežamatveju kadiķu pļavas and Mežamatveju pļavas in a single Natura 2000 site, in order to promote the management of the territory and the integrity of conservation.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
6270*	Fennoscandian lowland species-rich dry to mesic grasslands	5.3	33.1	Favourable.	Restoration. Maintenance.	1.0	5.3
6210	Semi-natural dry calcareous grasslands	7.2	45.0	Poor.	Restoration. Maintenance.	1.0	7.2
6000	Grasslands to be restored	2.7	16.9	-	Restoration. Maintenance.	2.7	2.7

One-time grassland restoration measures are necessary in a small proportion of the total area of grasslands. Also restoration of grasslands in the area which is now overgrown with forest but which was an agricultural land several decades ago (about 2.7 hectares) is desirable. Grassland restoration measures include cutting of trees and shrubs on grassland edges and in depressions, milling of roots, restorative grazing or mowing.

Ozoldārzs | *Micro-reserve (LV0830100)*

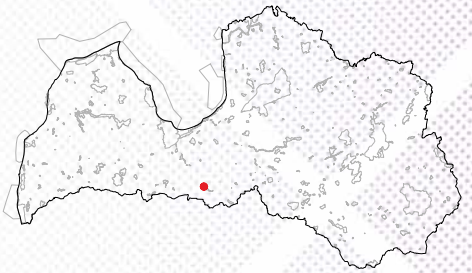
1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Rundāle municipality Rundāle rural territory.

AREA: 18.8 ha.

NATURE MANAGEMENT PLAN: none.



The micro-reserve is a rather large patch of forest in a vast, intensely managed agricultural land near the Lielupe River.

The territory is established for the protection of oak forests (*Sub-Atlantic and medio-European oak or oakhornbeam forests of the* Carpinion betuli). The woodland is composed of more than 200 years old oaks (*Quercus robur*), with admixture of younger broadleaved trees, *Populus tremula* and *Betula* spp. With the withering of old oaks, advance growth of broadleaved trees and a dense understory of *Corylus avellana* develop.

Old maps show that the oak forest has already been there in the 19th century. The oak woodland has developed on agricultural soil; the thickness of the horizon of accumulated humus reaches 57 cm, which indicates on long-term human activity and the use of the territory in the past.

There are particularly rare and protected invertebrate species in the territory – *Osmoderma barnabita* and *Dorcus parallelopipedus*. Protected lichen species *Arthonia spadicea* has been found.

2. Threats to habitat and species conservation

Natural succession resulting in the replacement of oak forest with another protected woodland habitat (9020* *Fennoscandian hemiboreal natural old broad-leaved deciduous forests* (Quercus, Tilia, Acer, Fraxinus *or* Ulmus) *rich in epiphytes*).

3. Existing management of the protected habitats and its assessment

- So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

Conservation of oak forest; experimental management for the promotion of growth of new oaks.

5. Necessary management and conservation measures

5.1. General measures

In order to plan oak restoration measures, orthophoto maps (LIDAR, owned by Institute for Environmental Solutions) may be used as they allow seeing the location of trees and the status of their crowns.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9160	Oak forests	18.6	99.0	Poor.	Non-intervention. Experimental habitat management by felling of *Corylus avellana*, creation of canopy gaps, in order to promote growth of new oaks. The planting of new trees in possible.	1.0	17.6

Priedes | *Micro-reserve (LV0830500)*

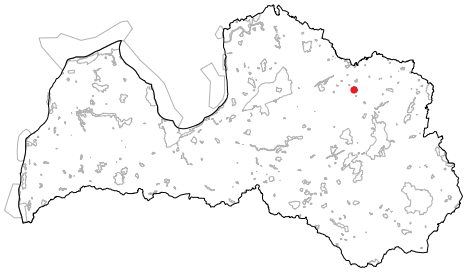
1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Gulbene municipality Lejasciems rural territory.

AREA: 42 ha.

NATURE MANAGEMENT PLAN: none.



Priedes Micro-reserve is established for the protection of capercaillie *Tetrao urogallus* lek site which is located in bog woodlands and western Taïga. There is also a rare and protected species *Carex disperma*. In the buffer-zone of the micro-reserve, there are mainly wet and dry pine forests of various ages.

2. Threats to habitat and species conservation

Unknown.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in protected forest habitats, as well as in habitats of capercaillie *Tetrao urogallus* (undisturbed, natural environment is necessary).
- Maintenance of forest openings for the existence of *Tetrao urogallus* population.

5. Necessary management and conservation measures

5.1. Species

There are three *Tetrao urogallus* males in a lek, condition of the population is considered as bad. For the conservation of *Tetrao urogallus* lek sites: maintenance of forest openings.

5.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	21.4	51.0	Favourable.	Non-intervention.		21.4
9010*	Western Taïga	19.4	46.2	Favourable.	Non-intervention.		19.4

Silzemnieki | *Micro-reserve (LV0830300)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Sigulda municipality Allaži rural territory.

AREA: 1.9 ha.

NATURE MANAGEMENT PLAN: none.

Silzemnieki Micro-reserve includes EU protected habitat type Western Taïga, as well as the locality of very rare species in Latvia - lady's-slipper orchid *Cypripedium calceolus*. According to literature, the locality in the area is known since 1970s. Other localities in the surrounding areas have disappeared after the logging.

Cypripedium calceolus is more abundant in the north-eastern part of the territory, in terrain depression, in wet woodland with deciduous trees and spruces (*Picea abies*). Population size is about 50 specimens. There are also other rare and protected species in the micro-reserve, for example, *Dactylorhiza fuchsii*.

2. Threats to habitat and species conservation

Cypripedium calceolus can potentially be threatened by shade created by dense advance growth and shrubs in understory.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Maintenance of conditions optimal for *Cypripedium calceolus* in the locality.
- Regular monitoring of the locality of *Cypripedium calceolus*; analysis of data and regular assessment of management necessity.

5. Necessary management and conservation measures

5.1. Species

Population of *Cypripedium calceolus* consists of ~500 specimens, its condition is considered as favourable. Periodical evaluation of management necessity according to conditions in locality; implementation of the necessary management (incl. cutting of some shrubs and trees especially spruces which give shade to the locality. Felling of individual spruces in the rest of the territory, in order to create forest gaps as potential habitats for *C. calceolus*. Felling must be carried out in winter when the ground is frozen, and according to the species and habitat expert recommendations.

5.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010	Western Taïga	1.9	100.0	Favourable.	Non-intervention, except measures for the improvement of *Cypripedium calceolus* conditions.		1.9

Šepkas riests | *Micro-reserve (LV0831000)*

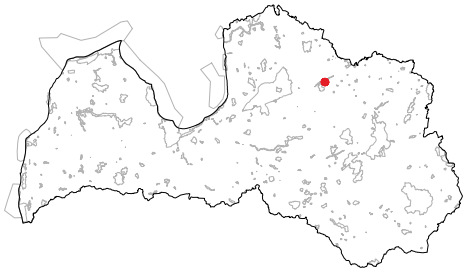
1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Smiltene municipality, Palsmane rural territory.

AREA: 46.0 ha.

NATURE MANAGEMENT PLAN: none.



Šepkas riests Micro-reserve is located in a forested area between the Šepka and Rauza Nature Reserves. It includes bog woodlands which are important lek sites for capercaillie (*Tetrao urogallus*). There are pines (*Pinus sylvestris*) with distinctive flat tops and thick branches which are suitable for *Tetrao urogallus* displaying. Four capercaillie males are permanently displaying in the territory. Parts of the bog woodlands are overgrowing with dense advance growth of spruces (*Picea abies*) which impedes displaying. Large part of the woodland ir sparse and transparent.

2. Threats to habitat and species conservation

Woodland has been previously drained. A ditch connecting Rauza and Šepka rivers is located in the northern part of the territory. Drainage contributes to overgrowing of the territory with dense advance growth of spruces.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Provision of optimal conditions for *Tetrao urogallus* displaying by improvement of quality of bog woodlands in the micro-reserve. Over time, it will create favourable living conditions also for other rare and protected species.
- Research on the rewetting possibilities.

5. Necessary management and conservation measures

5.1. General measures

Research of hydrological regime; rewetting in accordance to research results. Measure includes also the development of a monitoring programme and methods for the evaluation of management success.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	36.6	79.6	Poor.	Felling of spruce overgrowth in the territory of *Tetrao urogallus* leks. On necessity – felling also in buffer zone. Rewetting, in accordance to research results and requirements of *T. urogallus* displaying.	13.3	

Vecsēlpils | *Micro-reserve (LV0830200)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Sala municipality, Sēlpils rural territories.

AREA: 4,7 ha.

NATURE MANAGEMENT PLAN: none.

Vecsēlpils Micro-reserve includes dry grasslands on calcareous substrates and *Juniperus communis* formations on calcareous grasslands. The dry grassland is an important habitat for plant species *Orobanche elatior*. Also other rare and protected plant species can be found here, such as *Ajuga genevensis, Crepis praemorsa, Carex ornithopoda, Gentiana cruciata*.

2. Threats to habitat and species conservation

- Management cessation and overgrowth with shrubs.
- Continuous late mowing has promoted eutrophication and spread of expansive herbaceous species.

3. Existing management of the protected habitats and its assessment

- According to Rural Support Service, in scope of Rural Development Programme measure "Maintaining biodiversity in grasslands" in 2014 habitat type 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* was managed, but *Juniperus communis* formation was not managed. The micro-reserve was surveyed in 2016, and it was found that juniper formation is in critical condition. It has not been managed for a long time, there is a thick litter layer, abundant expansive plant species (*Elytrigia repens, Dactylis glomerata, Calamagrostis epigeios*), area is overgrowing with shrubs and pines. Semi-natural dry grasslands on calcareous substrates were continuously managed by late mowing (after August 15). This caused grassland eutrophication – expansion of *Dactylis glomerata* and *Elytrigia repens*, formation of dense litter layer, and the development of dense layer of herbaceous plants that reduces the suitability for rare plant species.

4. Priorities of management and conservation

Restoration of habitat types 6210 *Semi-natural dry grasslands and scrubland facies on calcareous substrates* (Festuco-Brometalia) and 5130 Juniperus communis *formations on heaths or calcareous grasslands*; their maintenance in favourable conservation status.

5. Necessary management and conservation measures

5.1. General measures

- It is necessary to increase the area of micro-reserve to at least 10 hectares in order to ensure the long-term conservation of habitats (the current area is too small for the preservation of viable populations of protected species in a case if semi-natural grasslands that are not included in protected areas continue do disappear).
- It is necessary to include in the micro-reserve:
  - dry grasslands on calcareous substrates adjoining the micro-reserve in its southeast;
  - wide *Juniperus communis* formation on the opposite side of the motorway (2.5 hectares);
  - *Juniperus communis* formation that is overgrown with forest, north of the micro-reserve.
- Monitoring of the grassland management success. Grasslands must be surveyed once per 2-3 years; the abundance of expansive species, vitality of junipers, as well as populations of rare species must be evaluated. Based on monitoring results, management measures must be improved.

5.2. Specific measures - habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
5130	*Juniperus communis* formations on heaths or calcareous grasslands	0.6	13.0	Bad.	Restoration. Maintenance.	0.6	0.6
6210	Semi-natural dry calcareous grasslands	3.4	72.3	Poor.	Restoration. Maintenance.	3.4	3.4
6000	Grasslands to be restored	0.7	14.8	-	Restoration. Maintenance.	0.7	0.7

One-time restoration measures are needed in the juniper formation - shrub removal, except junipers; smoothing of tussocks; restorative mowing (mowing twice a season is recommended in the first two years) with grass removal, or grazing (relatively intense grazing is recommended in the first two years). In the dry grassland, mowing twice per season is recommended in the first 2-3 years of the restoration (mid-June and late July - early August), followed by grass removal or haymaking. *Orobanche elatior* should be conserved by leaving unmown patches around the specimens. All three shrub clusters in the territory must be cut (saving junipers). After shredding their roots, restorative mowing or grazing must be started.

Vidagas meži | *Micro-reserve (LV0826100)*

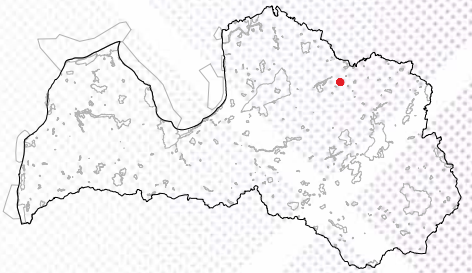
1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Ape municipality Vireši rural territory.

AREA: 130 ha.

NATURE MANAGEMENT PLAN: none.



Vidagas meži Micro-reserve is located in an extensive, wooded area between Vidaga and Niedrupe rivers. It includes particularly valuable old Western Taïga forests dominated by pines (*Pinus sylvestris*) and spruces (*Picea abies*) on hills, and swamp woods in terrain depressions in the surroundings of Vidaga river. Important capercaillie (*Tetrao urogallus*) leks are located in old-growth pine forests as they are sparse and transparent.

Old pines and logs are habitats for very rare and protected insect species - Tragosoma depsarium, as well as *Nothorhina punctata*. The territory is suitable for rare plant species such as *Carex disperma*, *Lycopodium annotinum*, and moss species *Anastrophyllum hellerianum*.

Nest of black stork *Ciconia nigra* is located in the territory (juveniles were observed in a nest in 2015).

2. Threats to habitat and species conservation

- Part of the territory is crossed by drainage ditches that affect the hydrological conditions; advance growth with spruces is developing. Due to unsuitable conditions, capercaillies have disappeared from the territory.
- Management of capercaillie leks can have a negative effect on bog woodlands, so it must be done very carefully, preserving the slow-growing, biologically-old spruces and dead wood.

3. Existing management of the protected habitats and its assessment

Felling of spruces was carried out in the territory around year 2015. The presence of capercaillies was not observed.

4. Priorities of management and conservation

- Restoration of hydrological regime suitable for capercaillie habitats and protected habitats.
- Improvement of conditions in capercaillie leks.
- Undisturbed course of natural processes in forest habitats which are only slightly affected by humans, as well as in habitats of species that need undisturbed, natural environment.

5. Necessary management and conservation measures

5.1. General measures

Evaluation of possible rewetting.

5.2. Specific measures

5.2.1. Species

Conservation status of capercaillie (*Tetrao urogallus*) population is currently evaluated as bad as the species has not been observed in the territory in recent years. For the restoration of habitat, felling of spruces around ditches is necessary, in an area of 12 hectares. Felling residues must be burned or removed from the territory of lek. Felling is allowed only during the period from 1 November to 31 January. For the management of capercaillie leks, guidance included in species management plan and scientific reports must be used.

5.2.2. Habitats

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
91D0*	Bog woodland	5.0	3.8	Favourable.	Non-intervention, except measures for the improvement of quality of capercaillie leks.		5.0
9010*	Western Taïga	69.0	53.1	Favourable.	Non-intervention, except measures for the improvement of quality of capercaillie leks.		69.0
3260	Natural river reaches and river riffles	0.2	<1	Favourable.	Non-intervention.		0.2

Visikums | *Micro-reserve (LV0824700)*

1. Brief description

YEAR OF FOUNDATION: 2004.

LOCATION: Alūksne municipality, Jaunalūksne rural territory.

AREA: 4.6 ha

NATURE MANAGEMENT PLAN: none.

Visikums Micro-reserve is located in a drained forest massif area near the Pededze River. It includes Western Taïga woodland dominated by spruces (*Picea abies*) and deciduous trees, which is an important habitat for a very rare plant species lady's-slipper orchid *Cypripedium calceolus*. The locality is large and abundant, as the growth conditions are suitable for this species.

2. Threats to habitat and species conservation

There are old drainage ditches both in the area of micro-reserve and in a wider area. The moisture regime has stabilized and negative influence on the locality is not observed.

3. Existing management of the protected habitats and its assessment

So far no measures have been taken to manage habitats.

4. Priorities of management and conservation

- Undisturbed course of natural processes in forest habitats, as well as in habitats of species that need undisturbed, natural environment.
- Provision of optimal growing conditions in the locality of *Cypripedium calceolus*.

5. Necessary management and conservation measures

Habitat code	Habitat type	Area (ha)	Cover (%) of the total area of the territory	Habitat quality assessment	Necessary activities	One-time activities or activities with large time interval (ha)	Annual or continuous (ha)
9010*	Western Taïga	4.4	95.7	Poor.	Non-intervention.		4.4

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References

Anon. 2012. A Prioritised Action Framework (PAF) for Natura 2000 for the EU Multiannual Finaning Period 2014–2020. Latvia.

Anon. 2013. Conservation status of species and habitats. Reporting under Article 17 of the Habitats Directive. Latvia, assessment 2007–2012 (2013), European Commission, http://cdr.eionet.europa.eu/lv/eu/art17/envuc1kdw.

AREI 2016. Ziņojums Lauku attīstības programmas 2007–2013 ex-post novērtējums. Agroresursu un ekonomikas institūts.

Auniņš A. (ed.) 2013. European Union protected habitats in Latvia. Interpretation manual. 2nd revised edition. Latvijas Dabas fonds, Vides aizsardzības un reģionālās attīstības ministrija. Latvijas Dabas fonds, Vides aizsardzības un reģionālās attīstības ministrija, Rīga.

Bāra J., Nitcis M., Lārmanis V., Valainis U. 2014. Parkveida pļavu un ganību aizsardzības plāns. Daugavpils Universitātes Sistemātiskās bioloģijas institūts, Daugavpils.

Čakare I. (ed.) 2017. Protected Habitat Management Guidelines for Latvia. Volume 5. Outcrops and caves. Nature Conservation Agency, Sigulda.

DAP 2013. Bioloģiski vērtīgo zālāju monitoringa metodika. Dabas aizsardzības pārvalde, https://www.zm.gov.lv/public/ck/files/ZM/TP%20petijumi/20131120_BVZ_monitoringa_metodika.pdf.

EC 2015. EU assessment of progress in implementing the EU Biodiversity Strategy to 2020. Accompanying the document Report from the Commission to the European Parliament and the Council The Mid-Term Review of the EU Biodiversity Strategy to 2020.

EEA, ETCBD 2016. Explanatory Notes & Guidelines for the period 2013–2018. Extract field-by-field guidance. Draft. European Environment Agency, European Topic Centre on Biological Diversity.

European Commission 2017. An Action Plan for nature, people and the economy. Brussels, http://ec.europa.eu/environment/nature/legislation/fitness_check/action_plan/communication_en.pdf.

European Commission 2011a. Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions. Our life insurance, our natural capital: an EU biodiversitt strategy to 2020.

European Commission 2011b. Links between the Water Framework Directive (WFD 2000/60/EC) and Nature Directives (Birds Directive 2009/147/EC and Habitats Directive 92/43/EEC). Frequently Asked Questions.

European Commission 2016. Fitness Check of the EU Nature Legislation (Birds and Habitats Directives). Brussels, http://ec.europa.eu/environment/nature/legislation/fitness_check/docs/nature_fitness_check.pdf.

Evans D., Arvela M. 2011. Assessment and reporting under Article 17 of the Habitats Directive. Explanatory Notes & Guidelines for the period 2007–2012. European Topic Centre on Biological Diversity.

Gilbert O. L., Anderson P. 2004. Habitat creation and repair. Oxford University Press, Oxford.

Ikauniece S., Evarts-Bunders P., Pošiva A. 2015. 9050 Sugām bagāti egļu meži. Dabas aizsardzības pārvalde, https://www.daba.gov.lv/upload/File/DOC_MON/APR16_ES_biotops_9050.pdf

Ikauniece S. (ed.) 2017. Protected Habitat Management Guidelines for Latvia. Volume 5. Forests. Nature Conservation Agency, Sigulda.

Jātnieks J., Priede A. 2017. Cost estimation. In: Rūsiņa S. (ed.) Protected Habitat Management Guidelines for Latvia. Volume 3. Semi-natural grasslands. Nature Conservation Agency, Sigulda, pp. 85–90.

Kalniņš M. 2014. Priekšlikumi Natura2000 teritoriju dibināšanai lapkoku praulgrauža *Osmoderma eremita* (= *barnabita*) aizsardzībai. Biedrība "Zaļā upe", Sigulda.

Kiehl K., Kirmer A., Donath T. W., Rasran L., Hölzele N. 2010. Species introduction in restoration projects – evaluation of different techniques for the establishment of semi-natural grasslands in Central and Northwestern Europe. Basic and Applied Ecology 11: 285–299.

LAD 2016. Latvijas Lauku attīstības programma 2014–2020. Bioloģiskās daudzveidības uzturēšana zālājos. Ķemeri, 11.07.2016. http://nat-programme.daba.gov.lv/upload/File/APetrovs_IAbolins_BDUZ_PREZ_11072016_Kemeri.pdf.

Laime B. (ed.) 2017. Protected Habitat Management Guidelines for Latvia. Volume 1. Coastal, Inland Dune and Heath Habitats. Nature Conservation Agency, Sigulda.

Lammerant J., Peters R., Snethlage M., Delbaere B., Dickie I., Whiteley G. 2013. Implementation of 2020 EU Biodiversity Strategy: Priorities for the restoration of ecosystems and their services in the EU. Report to the European Commission. ARCADIS (in cooperation with ECNC and Eftec).

Latvia 2030. Sustainable Development Strategy of Latvia until 2030. Saeima of the Republic of Latvia, http://www.pkc.gov.lv/sites/default/files/images-legacy/LV2030/LIAS_2030_en.pdf.

Latvijas Lauku attīstības programma 2014.–2020. gadam. https://www.zm.gov.lv/public/files/CMS_Static_Page_Doc/00/00/01/08/04/Programme_2014LV06RDNP001_4_1_lv002.pdf.

Lārmanis V. 2015. 9070 Meža ganības. Dabas aizsardzības pārvalde, https://www.daba.gov.lv/upload/File/DOC_MON/APR16_ES_biotops_9070.pdf.

LVAEI 2016. Latvijas Lauku attīstības programmas 2007.–2013. gadam ietekme uz bioloģisko daudzveidību: atbalstīto ES nozīmes aizsargājamo zālāju biotopu botāniskā daudzveidība. Atskaite Lauku attīstības programmas 2007–2013 (LAP 2007–2013) Ex-post novērtēšanas ietvaros (sagatavoja S. Rūsiņa). Latvijas Valsts Agrārās ekonomikas institūts, Rīga.

Metrum 2016. Priekšlikumi dabas lieguma "Ances purvi un meži" teritorijas paplašināšanai. Izstrādāti īpaši aizsargājamās dabas teritorijas "Ances purvi un meži" dabas aizsardzības plāna izstrādes ietvaros. SIA "Metrum", Rīga.

Morris R. K. A., Alonso I., Jefferson R. G., Kirby K. J. 2006. The creation of compensatory habitat – can it secure sustainable development? Journal for Nature Conservation 14: 106–116.

Priede A. (ed.) 2017. Protected Habitat Management Guidelines for Latvia. Volume 4. Mires and springs. Nature Conservation Agency, Sigulda.

Rove I. 2015. 91T0 Ķērpjiem bagāti priežu meži. Dabas aizsardzības pārvalde, https://www.daba.gov.lv/upload/File/DOC_MON/APR16_ES_biotops_91T0.pdf

Rūsiņa S. 2017. The Amount of Semi-natural Grassland Area that should be Protected. In: Rūsiņa S. (ed.) Protected Habitat Management Guidelines for Latvia. Volume 3. Semi-natural grasslands. Nature Conservation Agency, Sigulda, 61–62.

Rūsiņa S. (ed.) 2017. Protected Habitat Management Guidelines for Latvia. Volume 3. Semi-natural grasslands. Nature Conservation Agency, Sigulda.

Suško U. 2013. Ārdava ezera un tā apkārtējās teritorijas dabas vērtību raksturojums saistībā ar smalkās najādas *Najas tenuissima* populācijas saglabāšanu tagad un nākotnē. Atzinums. Rīga.

Urtāns A. V. (ed.) 2017. Protected Habitat Management Guidelines for Latvia. Volume 2. Rivers and Lakes. Nature Conservation Agency, Sigulda.

VARAM 2013. Ainavu politikas pamatnostādnes 2013. –2019. gadam. Vides aizsardzības un reģionālās attīstības ministrija, Rīga.

VARAM 2014. Vides politikas pamatnostādnes 2014.–2020. gadam. Ministru kabineta 2014. gada 26. marta rīkojums Nr. 130, http://www.varam.gov.lv/lat/pol/ppd/vide/?doc=17913

VKPAI 2015. Kultūrpolitikas pamatnostādnes 2014.–2020. gadam „Radošā Latvija". Kultūras pieminekļu aizsardzības nozares stratēģija. Valsts kultūras pieminekļu aizsardzības inspekcija, Rīga.

Vilks K. 2014a. Dabas liegumam "Ances purvi un meži" dienvidu pusē pieguļošās Stendes, Rindas un Irbes upju apkārtnes izvērtējums aizsargājamo bezmugurkaulnieku sugu kontekstā. Atskaite. Rīga.

Vilks K. 2014b. Dabas lieguma "Kadiķu nora" izvērtējums aizsargājamo bezmugurkaulnieku sugu kontekstā. Atskaite. Rīga.

Appendix 1.

Summary of Article 17 Report of the Habitats Directive for the period 2007– 2012 (terrestrial habitats)

FV	Favourable conservation status
U1	Unfavourable-inadequate conservation status
U2	Unfavourable-bad conservation status
XX	Unknown conservation status

Papildu apzīmējumi

\+ improving, – declining, = stable, X unknown

Habitat code	Priority habitat	Habitat name	Range	Area	Specific structure and functions	Future prospects	Overall assessment of conservation status
1210		Annual vegetation of drift lines	FV	U1=	U1=	U1=	U1=
1220		Perennial vegetation of stony banks	FV	U1=	U1=	U1=	U1=
1230		Vegetated sea cliffs of the Atlantic and Baltic coasts	FV	FV	FV	FV	FV=
1310		*Salicornia* and other annuals colonising mud and sand	FV	U1=	U1=	U1=	U1=
1630	*	Boreal Baltic coastal meadows	FV	U2–	U2–	U2–	U2–
1640		Boreal Baltic sandy beaches with perennial vegetation	FV	FV	U1=	U1=	U1=
2110		Embryonic shifting dunes	FV	FV	FV	FV	FV
2120		Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	FV	U2=	U1–	U1–	U2=
2130	*	Fixed coastal dunes with herbaceous vegetation (grey dunes)	FV	U1=	U1=	U1=	U1=
2140	*	Decalcified fixed dunes with *Empetrum nigrum*	FV	XX	U1=	U1=	U1=
2170		Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariea*)	FV	FV	U1=	U1=	U1=
2180		Wooded dunes of the Atlantic, Continental and Boreal region	FV	XX	U2–	U2–	U2–
2190		Humid dune slacks	FV	U1	U1	XX	U1x
2320		Dry sand heaths with *Calluna* and *Empetrum nigrum*	FV	U1	FV	XX	U1+
2330		Inland dunes with open *Corynephorus* and *Agrostis grasslands*	FV	FV	FV	FV	FV=

Habitat code	Priority habitat	Habitat name	Range	Area	Specific structure and functions	Future prospects	Overall assessment of conservation status
3130		Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*	FV	U1–	U2–	U2–	U2–
3140		Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.	XX	XX	U1–	XX	U1x
3150		Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation	FV	FV	U2–	XX	U2–
3160		Natural dystrophic lakes and ponds	FV	U1–	U1–	U1–	U1–
3190		Lakes of gypsum karst	FV	FV	XX	XX	XX
3260		Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	FV	FV	U1–	U1–	U1–
3270		Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation	FV	XX	XX	XX	XX
4010		Northern Atlantic wet heaths with *Erica tetralix*	U1	U2	U2	U2	U2x
4030		European dry heaths	U2	U2	U1	U2	U2x
5130		*Juniperus communis* formations on heaths or calcareous grasslands	XX	U2–	U2–	U2–	U2–
6110	*	Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion* albi	FV	U1–	U1–	U1–	U1–
6120	*	Xeric sand calcareous grasslands	FV	U2–	U2–	U2–	U2–
6210		Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)	FV	U2–	U2–	U2–	U2–
6230	*	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)	FV	U2–	U2–	U2–	U2–
6270	*	Fennoscandian lowland species-rich dry to mesic grasslands	FV	U1–	U2–	U1–	U2–
6410		*Molinia* meadows on calcareous, peaty or clayey-siltladen soils (*Molinion caeruleae*)	FV	U1–	U2–	U2–	U2–
6430		Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	FV	FV	FV	FV	FV
6450		Northern boreal alluvial meadows	FV	U1–	U2–	U2–	U2–
6510		Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)	FV	U1–	U2–	U2–	U2–

Habitat code	Priority habitat	Habitat name	Range	Area	Specific structure and functions	Future prospects	Overall assessment of conservation status
6530	*	Fennoscandian wooded meadows	XX	U2–	U2–	U2–	U2–
7110	*	Active raised bogs	FV	U2	U1	U1	U2–
7120		Degraded raised bogs still capable of natural regeneration	U1	U2	U1	U1	U2x
7140		Transition mires and quaking bogs	FV	U1	U1	U1	U1x
7150		Depressions on peat substrates of the *Rhynchosporion*	U1	U1	U1	U1	U1–
7160		Fennoscandian mineral-rich springs and springfens	FV	U1	XX	U1	U1x
7210	*	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*	FV	FV	U1	U1	U1=
7220	*	Petrifying springs with tufa formation (*Cratoneurion*)	FV	U1	XX	U1	U1x
7230		Alkaline fens	U1	U2	U1	U1	U2x
8210		Calcareous rocky slopes with chasmophytic vegetation	FV	FV	FV	FV	FV=
8220		Siliceous rocky slopes with chasmophytic vegetation	FV	FV	FV	FV	FV=
8310		Caves not open to the public	FV	FV	FV	FV	FV+
9010	*	Western Taiga	FV	U2x	U2–	U2–	U2–
9020	*	Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus, Tilia, Acer, Fraxinus* or *Ulmus*) rich in epiphytes	FV	U2–	U2–	U2–	U2–
9060		Coniferous forests on, or connected to, glaciofluvial eskers	FV	FV	U2–	U2–	U2–
9080	*	Fennoscandian deciduous swamp woods	FV	U2–	U2–	U2–	U2–
9160		Sub-Atlantic and medio-European oak or oakhornbeam forests of the *Carpinion betuli*	FV	U2–	U2–	U2–	U2–
9180	*	*Tilio-Acerion* forests of slopes, screes and ravines	FV	XX	U2x	XX	U2x
91D0	*	Bog woodland	FV	U2x	U2–	U2–	U2–
91E0	*	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*	FV	U2–	U2–	U2–	U2–
91F0		Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*)	XX	U2x	U2–	XX	U2–

Appendix 2.

List of protected habitat types of EU importance and their codes

1210 Annual vegetation of drift lines
1220 Perennial vegetation of stony banks
1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
1310 *Salicornia* and other annuals colonising mud and sand
1630* Boreal Baltic coastal meadows
1640 Boreal Baltic sandy beaches with perennial vegetation
2110 Embryonic shifting dunes
2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130* Fixed coastal dunes with herbaceous vegetation (grey dunes)
2140* Decalcified fixed dunes with *Empetrum nigrum*
2170 Dunes with *Salix repens* ssp. *argentea (Salicion arenariea)*
2180 Wooded dunes of the Atlantic, Continental and Boreal region
2190 Humid dune slacks
2320 Dry sand heaths with *Calluna* and *Empetrum nigrum*
2330 Inland dunes with open *Corynephorus* and *Agrostis* grasslands
3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*
3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation
3160 Natural dystrophic lakes and ponds
3190 Lakes of gypsum karst
3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
3270 Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation
4010 Northern Atlantic wet heaths with *Erica tetralix*
4030 European dry heaths
5130 *Juniperus communis* formations on heaths or calcareous grasslands
6110* Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion albi*
6120* Xeric sand calcareous grasslands
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)
6230* Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)
6270* Fennoscandian lowland species-rich dry to mesic grasslands
6410 *Molinia* meadows on calcareous, peaty or clayey-siltladen soils (*Molinion caeruleae*)
6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
6450 Northern boreal alluvial meadows
6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)
6530* Fennoscandian wooded meadows
7110* Active raised bogs
7120 Degraded raised bogs still capable of natural regeneration
7140 Transition mires and quaking bogs
7150 Depressions on peat substrates of the *Rhynchosporion*
7160 Fennoscandian mineral-rich springs and springfens
7210* Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
7220* Petrifying springs with tufa formation (*Cratoneurion*)
7230 Alkaline fens
8210 Calcareous rocky slopes with chasmophytic vegetation
8220 Siliceous rocky slopes with chasmophytic vegetation
8310 Caves not open to the public
9010* Western Taiga
9020* Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus, Tilia, Acer, Fraxinus* or *Ulmus*) rich in epiphytes
9050 Fennoscandian herb-rich forests with *Picea abies*
9060 Coniferous forests on, or connected to, glaciofluvial eskers
9070 Fennoscandian wooded pastures
9080* Fennoscandian deciduous swamp woods
9160 Sub-Atlantic and medio-European oak or oakhornbeam forests of the *Carpinion betuli*
9180* *Tilio-Acerion* forests of slopes, screes and ravines
91D0* Bog woodland
91E0* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*
91F0 Riparian mixed forests of *Quercus robur, Ulmus laevis* and *Ulmus minor, Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers *(Ulmenion minoris)*
91T0 Central European lichen Scots pine forests