



Foundation for Peatland Restoration and Conservation



Interreg

Latvija-Lietuva

European Regional Development Fund



EUROPEAN UNION

Project “LLI-476 IMPROVEMENT OF THE ENVIRONMENTAL CONDITIONS OF THE PUBLIC WATER BODIES IN LATVIA AND LITHUANIA (SAVE PAST FOR FUTURE)”

Deliverable T2.1.3 - Recommendations for improving the conditions for biodiversity in Preili manor park

Vilnius, 2022

The Interreg V-A Latvia – Lithuania Cross Border Cooperation Programme 2014-2020 aims to contribute to the sustainable and cohesive socio-economic development of the Programme regions by helping to make them competitive and attractive for living, working and visiting. This project is funded by the European Union . Total projects size is 1 030 848.12EUR. Out of them co-funding of European Regional Development Fund is 876 220.89 EUR .

This document has been produced with the financial assistance of the European Union. The contents of this document are the sole responsibility of Foundation for Peatland restoration and Conservation and can under no circumstances be regarded as reflecting the position of the European Union.

2014–2020 m. Interreg V-A Latvijos ir Lietuvos bendradarbiavimo per sieną programa siekia prisidėti prie darnaus programos teritorijos vystymosi padėdama jai tapti patrauklia ir konkurencinga vieta gyventi, dirbti ir apsilankyti. Šį Projektą iš dalies finansuoja 2014–2020 m. Interreg V-A Latvijos ir Lietuvos bendradarbiavimo per sieną programa ir Lietuvos Respublika. Visas projekto biudžetas 1 030 848,12 Eur. Iš jų – bendrasis Europos regioninės plėtros fondo finansavimas 876 220,89 Eur.

Šis leidinys parengtas naudojant Europos Sąjungos finansinę paramą. Už šio dokumento turinį atsako VšĮ Pelkių atkūrimo ir apsaugos fondas. Jokiomis aplinkybėmis negali būti laikoma, kad jis atspindi Europos Sąjungos nuomonę.

Contents

Introduction	4
1. Natural values	5
2. Recommendations for improving the conditions for biodiversity.....	7
2.1. Setting up the priority zones for management.....	7
2.2. Recommendations for meadow habitat maintenance	8
2.3. Recommendations for maintenance of veteran trees and trees valuable for biodiversity.....	10
2.4. Controlling the invasive species.....	12
2.5. Creating habitats for birds, bats, insects and other species	13
2.6. Other recommendations.....	15
Annexes.....	17

Introduction

Preiļi manor complex and park is the largest urban park in Latvia. The area of the park is 41.2 ha, of which about 13 ha is occupied by the park's ponds and canals (Figure 1). The building of Preiļi manor is an architectural monument of national significance, in the center of which the park has been preserved as in the 19th century. Today, on the eastern side of the parade courtyard, only the foundations of the building with stone cellars have survived, but the four-row alley and some large trees in the park, testify to the earlier tree plantations. There are 25 species of trees and shrubs in the park, some of them are already considered veteran trees (“Dižkoks” – remarkably old and large tree). There is a four-row linden alley, in midst of which lays Preiļupīte, a tiny river, which was flooded to create a pond and channel system with many islands. In the park, there are beautiful and well-maintained shrub compositions. During Soviet times, many harsh mistakes were made in maintaining the park. Because of the high-water level in Preiļupīte, the main ponds have overgrown. The park is owned by Preiļi council municipality.

The recommendations were prepared while implementing project “LLI-476 IMPROVEMENT OF THE ENVIRONMENTAL CONDITIONS OF THE PUBLIC WATER BODIES IN LATVIA AND LITHUANIA (SAVE PAST FOR FUTURE)”, financed by Interreg V-A Latvia-Lithuania Programme 2014-2020. The project aims to increase capacity of organisations involved into restoration and maintenance of historical parks in complex with water bodies in North-East Lithuania and Latgale as important biodiversity objects by providing comprehensive management attitude on history, nature values and rural landscape. To improve water quality ponds in 3 parks – Anatalieptēs Monastery park, Kamariškiai Manor park (LT) and Preiļi Manor park (LV) – will be reconstructed and cleaned. During these works the emphasis will also be done on arrangement of the landscape and its adaptation for biodiversity protection. Knowledge and experience capacity for organizations involved in the project will be strengthened by organizing events for experience exchange with professionals and experienced field experts and active involvement of stakeholders into the elaboration of recommendations for the improvement of biodiversity status in 8 parks.

This report has been produced with the financial assistance of the European Union. The contents of this report is the sole responsibility of Foundation for Peatland Restoration and Conservation and can under no circumstances be regarded as reflecting the position of the European Union

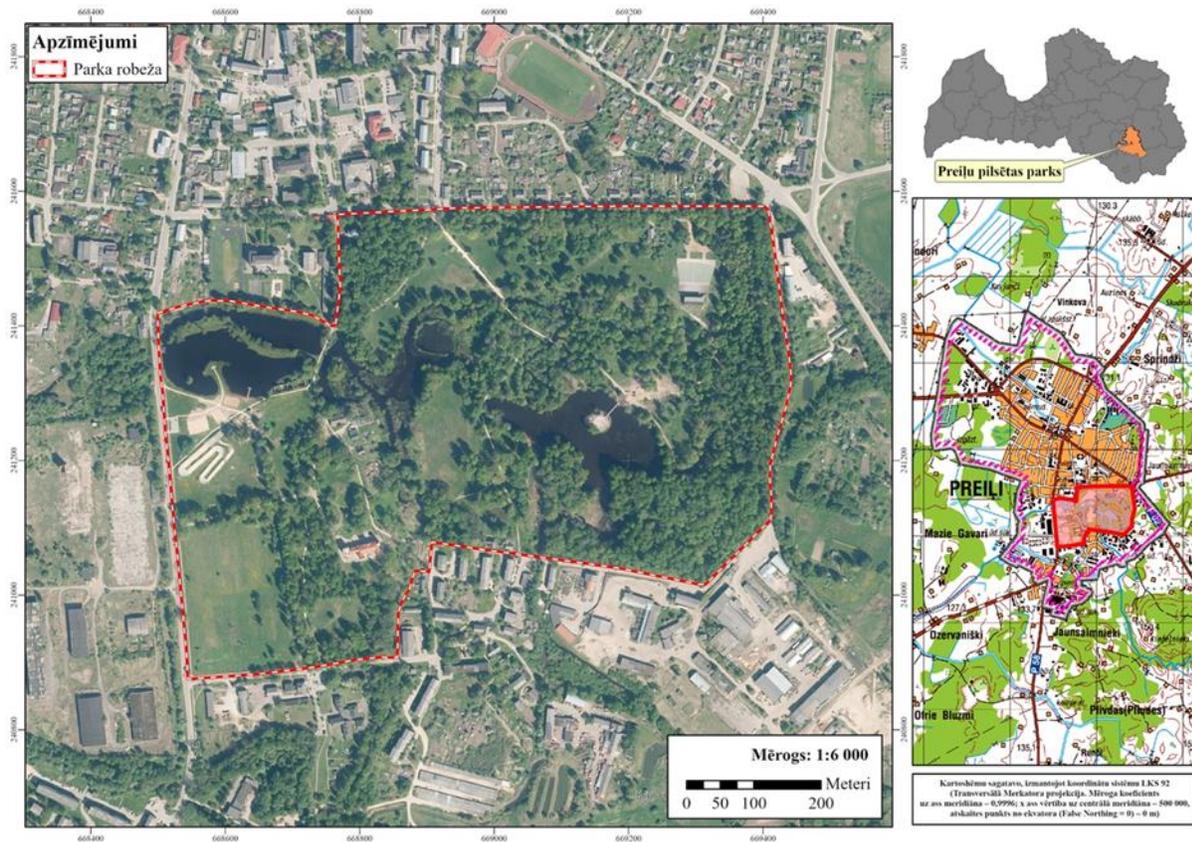


Figure 1. Location of Preili park

1. Natural values

Currently, the good biodiversity status in the Preili manor park is ensured mainly by the big amount of old, hollow trees, system of shallow ponds which totally occupies about 13 ha and remnants of semi natural meadows. During the investigations, 21 veteran trees valuable for biodiversity and 3 valuable groups of oaks were inventoried (Figure 2). In addition, 100 trees potentially suitable for protected and rare invertebrate can be found in this territory. The scheme indicating localities of trees valuable for biodiversity in Preili manor park is provided in annex 1. Some of the trees growing in the park have reached the size of protected large trees and have a special sign indicating their protection status (Figure 2). Hollows, dead timber and other features characteristic to old trees is a habitat for various invertebrates, lichens, birds, bats. One of which is *Osmoderma barnabita* – the insect commonly found in the old trees and protected both on national and European level. Shallow ponds are breeding habitats for some amphibian species and particularly important feeding habitats for bats. Species specialized in the hunting of insects above the surface of the water are very common in Preili manor park. Semi natural meadows also host protected animals and plants species.



Figure 2. Natural values of Preili manor park: old trees and system of ponds

Based on the investigations performed by experts from Daugavpils university, SIA "Dabas eksperti" and Foundation for Peatland Restoration and Conservation 27 protected species were inventoried in Preili manor park (Figure 3). The list of protected invertebrates, birds, bats, lichens and mosses species and the map of their localities is provided in annexes 2, 3.



Figure 3. Protected insects *Osmoderma barnabita* (A), *Dorcus parallelipedus* (B) birds *Dryocopus martius* (C) and fungi *Fistulina hepatica* (D) in Preili park. (Photos: U. Valainis A. Barševskis, A. Mežaka, Ž. Sinkevičius)

2. Recommendations for improving the conditions for biodiversity.

2.1. Setting up the priority zones for management

Successful management of manor parks is usually focused on maintenance of greeneries and preservation of historical values. However, these parks host a unique biodiversity, which must be maintained and secured as well. In order to make a planning process of park maintenance more efficient, we recommend to distinguish the priority zones which would indicate the need of certain management actions. There are at least 6 different priority zones which were prepared and approved for Preili park development. However, from the biodiversity point of view three management priority zones could be distinguished in Preili manor park: priority for natural habitat maintenance, priority for recreational zone maintenance, priority for natural meadow maintenance. The zone of recreational priority occupies territory near the most visited objects such as manor, parking place, pathways, etc. Since this zone is commonly visited by

people and has representative or recreational priority, management actions should be focused on well-being of visitors. Whereas, more remote parts of the park represented by biodiversity values should be managed extensively. However, it should be taken into consideration, that nature conservation actions should not pose any danger for the park visitors.

2.2. Recommendations for meadow habitat maintenance

In the territory of Preili Park there are several high-value meadow habitats in terms of biological diversity, for which appropriate management must be ensured. This park is one of the few positive examples of how biodiversity rich meadows can be preserved in an urban environment while making them attractive to visitors. In order to ensure the favorable conservation status of meadow habitats in Preili park territory the following actions might be recommended:

- to mow the tall grass and ruderal vegetation several times during the vegetation period and to cut the shrubs, leaving only valuable elements of the woody vegetation. The mowed biomass must be removed from the area;
- the frequency of mowing depends on the nature management priority areas: 1. in representative /recreational areas standard lawn care guidelines should be followed; 2. in areas valuable for natural values (zones of biodiversity priority) late mowing should be performed, which is usually done twice a year in late July and in September;
- localization and cutting of invasive species;
- formation of “educational stripes” (1,0-1,5 m width), which would serve as a path for the visitors to enter the meadow (Bebrene park example) (Figure 4).



Figure 4. Formation of “educational stripes” in meadows of Bebrene manor park

Other measures, such as grazing with cattle for nature management, educational or economic purposes or sowing of special meadow seed mixtures are also a favorable management method. However, in case of grazing it is necessary to ensure the protection of trees growing in the grassland area against possible damage to livestock.

All things considered semi natural meadows, which are located in the central part of the Preili park are maintained in a proper way to ensure their favorable conservation status. For raising the public awareness about importance of natural meadows special informational boards are installed, which provide information about meadow biodiversity and give answers why these habitats are mowed only in the second part of summer. In the area adjacent to the meadow, bee hives made of wood are placed, thus the importance of pollinators is emphasized (Figure 5). To protect careless visitors from bee bites, signs “pay attention to bees” are placed. To make such a meadow even more attractive for the visitors it is recommended to mow “educational stripes” not only in the edges of the meadow but to make one additional in a center as well (Figure 4).



Figure 5. Informational board about the importance of semi natural meadows and bee hive located nearby this meadow in Preili park.

2.3. Recommendations for maintenance of veteran trees and trees valuable for biodiversity

By creating the habitats for huge variety of species, old trees are one the most valuable element of Preili park. In order to ensure longevity and favorable conservation status of these trees several measures might be taken. These management measures and their description are provided in table 1. Maintenance of old veteran trees requires special skills and knowledge. Thus, it should be taken into consideration, that these actions should be implemented after the consultation with professional arborist or dendrologist.

Table 1. Recommendations for maintenance of veteran trees and trees valuable for biodiversity

Management measures	Purpose and description of the measure	Remarks
Tree cutting	When the danger posed by a tree is high or extreme. Near recreational infrastructure, buildings, etc. cases. Healthy invasive trees and shrubs are also removed.	Not recommended in Preili park
Preservation of dead trees	To preserve the dead trees valuable for biodiversity or their stems without cutting them. The measure is applied in places which are not overcrowded by visitors. In this case visitors must be informed about the importance of dead trees. Leaving the timber of dead trees (branches, stems) on a ground as much as possible is also very important (Figure 6)	Recommended in Preili park only in some cases
Marking with special sign	Trees important for biodiversity are inventoried and marked with a special sign. These signs can be put not only on the trees but on the dead timber, which is left on the ground as well (Figure 6).	Recommended in Preili park only in some cases
Surrounding the trees stems with the special fence	The stems of the trees are surrounded by a mesh fence (height of 2 meters) to protect the trees from the negative activities of visitors and beavers.	Not the first priority in Preili park
Tiding the tree crown	Tiding up the tree crown might help to avoid tree splitting and thus prolong the tree life	Not recommended in Preili park
Cutting of branches	Reductions of tree crown - even small dry branches breaking and falling down break other branches and pose a threat to humans. Therefore, the crown should be thinned periodically by cutting up to 20% of all branches. These actions might also help to prolong the tree life.	Recommended in Preili park only in some cases



Figure 6. Example of leaving the dead timber in Bebrene manor park (left) and special sign which explains the value of dead timber for the visitors in Verkiai manor park (Lithuania) (right).

21 veteran trees valuable for biodiversity were inventoried during the investigations. However, almost all of them were managed by professional arborists previously or grows in the remote sites of the park and thus do not pose significant danger for the visitors. Therefore, we recommend to make minor management actions only for 3 of all inventoried old veteran trees (Table 2) and one group of oak trees

Table 2. The list of veteran and dangerous trees, which requires management in Preili manor park

Species name	Coordinates, WGS	Height (m), age (years), diameter (cm)	Conservation status	Natural value	Measures
<i>Quercus robur</i>	56.284078, 26.727752	Group of five trees. 22, 160, 80-112.	Satisfactory	Trees important for biodiversity	Cutting the shrubs and young trees around the trees
<i>Tilia cordata</i>	56.284844, 26.722935	18, 110, 70.	Bad (dead tree)	Tree important for biodiversity	To leave the dead tree valuable for biodiversity
<i>Quercus robur</i>	56.287270, 26.729869	22, 120, 105	Good	Tree important for biodiversity	To mark with the special sign
<i>Quercus robur</i>	56.285812, 26.735355	24, 189, 146	Satisfactory	Tree important for biodiversity	Cutting the shrubs and young trees around the tree

2.4. Controlling the invasive species

Within the framework of the studies of natural values carried out in Preili park, the inventory of invasive plant species has been performed. The further uncontrolled spread of these species may pose danger to the natural values found in the park. In order to reduce the risks of uncontrolled spread of invasive plant species several measures might be taken:

- Identification and localization of invasive species distribution;
- Constant mowing;
- Grazing with special cattle breeds;
- Do not allow the formation of seeds;
- Biomass removal;
- Using chemical or phytopathogenic measures.

During the field studies 7 invasive species were found in Preili manor park (Figure 7, Table 3). The general information about localization, habitat and control measures of invasive species identified in Preili park is provided in table 3.

Table 3. Invasive species inventoried in Preili park and measures to control their distribution

Species name Latin (Latvian)	Habitats	Coordinates, WGS	Measures
<i>Lupinus polyphyllus</i> Daudzlapu lupīna	Meadows	56.283902 26.724889	Individuals can easily be removed by cutting or removal of the whole plant. Where <i>L. polyphyllus</i> occurs in masses and threatens native wildlife, the herbicide Round-up will probably give the best and quickest result, but may not be allowed nor recommended due to the effect on native species. Regular mowing or grazing (depending on if it is a pasture or a meadow) gradually reduces the number of populations and individuals. Mowing should occur twice a year for 3-5 years, before flowering and two months later. Then, the mowing can be reduced to once a year, before flowering or at least before the seeds are ripe, to prevent further spread.
<i>Heracleum sosnowskyi</i> (Sosnovska latvānis)	Meadows	56.284389 26.724678	The most effective way of controlling the distribution of this species is constant cutting 3-4 times a year not allowing to produce the seeds. Small groups of <i>Heracleum sosnowskyi</i> can be destroyed by digging them out. For more information see annex 5.
<i>Impatiens glandulifera</i> (Puķu sprigane)	Shores of water bodies, forest edges, ruins of old buildings	a) 56.283450, 26.726997 b) 56.285372, 26.728162 c) 56.285430, 26.727488 d) 56.285276, 26.734603	As most of the seeds germinate in the first spring, cutting and pulling of the plants in their flowering phase before seed-set may be an effective control measure

<i>Impatiens parviflora</i> (Sīkziedu sprigane)	Forest edges	a) 56.278607, 26.727855 b)56.283443, 26.727095	As most of the seeds germinate in the first spring, cutting and pulling of the plants in their flowering phase before seed-set may be an effective control measure
<i>Rumex confertus</i> Baltā apse	Meadows	56.285458, 26.728419	Mowing in early summer, by the end of June at the latest, to prevent ripening of seeds. To dig up individual plants
<i>Populus alba</i>	Forest edges	56.285543, 26.729594	<i>Physical/mechanical control.</i> Girdling of the parent tree and any suckers over 5 cm in diameter can be effective although dense resprouting can still occur. <i>Chemical control.</i> Triclopyr is effective as a basal bark or cut-stump treatment, and is best used in the dormant season to lessen damage to non-target species, and glyphosate can also be used as a foliar-applied spray.
<i>Reynoutria japonica</i> (sin. <i>Fallopia japonica</i>)	Forest edges	56.284675 26.728182	Significant reductions in abundance can be achieved by short term application of a) glyphosate, b) imazapyr, c) imazapyr + glyphosate, d) cutting followed by filling stems with glyphosate, and e) cutting followed by spraying with glyphosate



Figure 7. Invasive plant species *Lupinus polyphyllus* (A), *Acer negundo* (B), *Impatiens glandulifera* (C) in the territory of Preili park (Photo: U. Valainis)

2.5. Creating habitats for birds, bats, insects and other species

Creating the artificial habitats for birds, bats, insects and other species might significantly improve biodiversity status in the parks as well as making the parks more attractive for the visitors. These measures include installment of nesting boxes for the birds and creating artificial habitats for bats, insects and other species.

Preili manor park hosts a big variety of bird species. This is partly determined by the big amount of nesting boxes. However, currently most of them are constructed for the small insect eating birds. It should be noted that species such as owls, woodpeckers, common merganser (*Mergus merganser*), common goldeneye (*Bucephala clangula*) commonly breeds in the parks as well. Therefore, in order to improve their conservation status, it is recommended to create artificial habitats or construct nesting boxes. In Annex 4 we provide the main parameters of nesting boxes for some bird species, which includes: nesting

box height, board width, hole diameter, etc (Source: Lithuanian Ornithological Society). For more guidelines how to construct these nesting boxes see the following link: <http://www.birdlife.lt/kokie-turetu-buti-inkilu-matmenys>

In Preili Park, as in many other dendrological plantations, there is a lack of hollow trees, which reduces the suitability of the park for the species of insects and other organisms inhabiting the cavities. In order to improve the conditions for the species living in the cavities, it is recommended to create and place artificial habitats imitating the cavities in the park. An experimental artificial habitat has been developed in Sweden and has also been tested in Lithuanian conditions. The man-made habitat is a wooden box about 3.5 m high, the upper part of which is adapted for nesting birds and bats, while in the middle and lower part is filled with decaying wood material characteristic of the interior of a wooden cavity and serves as a good habitat for insects (Figure 8).



Figure 8. Artificial habitat for bats, insects and birds in the Verkiai Regional Park in Lithuania, created within the framework of the LIFE project LIFE OSMODERMA (Photo: A. Banelienė (right), Scheme by M. Jasnauskaitė (left)).

For creation of artificial habitats suitable for insects, other alternatives such as insect hotels are also appreciated. These hotels are simply man-made replicas of the natural habitats these organisms search for in the wild. The most important feature of the hotel should be to keep it as natural as possible. A wooden frame can be filled with natural materials for nesting sites. Building items includes: sawn logs or wooden blocks with pre-drilled holes, bamboo or reed stems, dry leaves, sticks, strips of bark.

For the improvement of amphibian conservation status additional measures such as **installment of hibernation places** might be carried out. The location of hibernation place is chosen a little further away from the water body, necessarily in an open and slightly higher place, so that it is not flooded when the water level rises. At a selected location, 0.5 m deep hollows are dug and stumps, branches, stones and 30 cm of soil are laid. Then the stumps are loaded again and another layer of soil is filled in. Such a measure was already implemented in Preili (September, 2021) by the experts of Foundation for Peatland

Restoration and Conservation (Figure 9). Successful continuation of such hibernation place installment would significantly improve amphibian population status in Preili park.



Figure 9. General scheme amphibian hibernation place and installment of it in Preili park (September, 2021).

2.6. Other recommendations

Saving amphibians and reptiles. Parks are often represented by small ponds, which provides habitats for amphibians and other species. During the spring migratory season amphibians become very active and vulnerable. Protective fence for amphibians and reptiles can be used to protect these animals during the migration season by isolating their migratory paths. In addition, restrictions for vehicles traffic might be initiated or special signs informing about speed limiting might be installed (Figure 10). Except the car parking place, vehicle traffic is not very intensive in Preili manor park, therefore these measures are not the first priority.



Figure 10. Special signs informing about speed limiting might save amphibians, which are very vulnerable during the migratory season

Improving conservation status of bats. Water bodies, such as ponds, rivers and canals, are particularly important feeding habitats for bats. For species specialized in the hunting of insects above the surface of the water, it is important that the surface is not covered by vegetation. It is also recommended to have trees on the banks of rivers or canals that create dark feeding habitats for bats in the evening. Most bat

species avoid artificially lighted places during their night flights. From the point of view of bat protection, the less artificial lighting, the better. According to current knowledge, bat-friendly types of lighting don't exist. In areas where lighting is required for human safety reasons, such as park tracks, it must be fitted in such a way as to minimize its impact on the wider surroundings. The lamps must be as low as possible and the lighting shall only be facing downwards. A good solution is sensor-equipped lanterns, for which the lighting is switched on only when people are approaching. Often in parks, lighting is switched off in the middle of the night. Yet our earlier experience and data from this study show that, just at the beginning of the night, bat activity in the parks is the highest. Lūznava park is excellent sites for organizing educational events, or so-called bat nights. Informing the public about bat ecology and their conservation needs is one of the priorities for improving their overall conservation status

Annexes

Annex 1. The localities of trees valuable for biodiversity in Preili manor park.



Annex 2. The localities of the recorded rare and/or protected invertebrate and lichen species in Preili manor park.



Annex 3. The list of protected species inventoried in Preili manor park

Latin name	Latvian name	Red data book of Latvia	Other status
Invertebrates			
<i>Aeshna isoceles</i>	Rudā dižspāre	3	
<i>Aromia moschata</i>	Zaļais vītolgrauzis	4	
<i>Dorcus parallelipedus</i>	Blāvā briežvabole	2	+
<i>Helix pomatia</i>	Parka vīngliemezis		+
<i>Lasius fuliginosus</i>	Spožā skudra		+
<i>Leucorrhinia pectoralis</i>	Spilgtā purvuspāre		+
<i>Myctophagus quadripustulatus</i>	Četrplankumu sēņgrauzis		+
<i>Osmoderma barnabita</i>	Lapkoku praulgrauzis	1	+
<i>Papilio machaon</i>	Čemurziežu dižtauriņš	2	
<i>Pseudocistela ceramboides</i>	Koksngraužveida praulvabole		+
<i>Prionychus ater</i>	Melnā praulvabole		+
Birds			
<i>Dendrocopos medius</i>	Vidējais dzenis		+
<i>Dryocopus martius</i>	Melnā dzilna		+
<i>Picus canus</i>	Pelēkā dzilna		+
Bats			
<i>Myotis dasycneme</i>	Diķu naktssikspārnis	2	+
<i>Nyctalus noctula (Schreber)</i>	Rūsganais vakarsikspārni		+
<i>Vespertilio murinus L.</i>	Divkrāsainais sikspārnis	3	+
<i>Pipistrellus nathusii</i>	Natūza sikspārnis		+
<i>Pipistrellus pygmaeus</i>	Pīgmejsikspārnis		+
<i>Plecotus auritus (L.)</i>	Brūnais garusainis		+
Lichens			
<i>Chaenotheca phaeocephala</i>	Brūngalvainā henotēka		+
<i>Inoderma byssaceum (Syn. Arthonia byssacea)</i>	Sīkpunktainā artojjja		+
<i>Pleurosticta acetabulum</i>	Kausveida pleirostikta	2	+
<i>Sclerophora pallida</i>	Sklerofora		+
<i>Sclerophora pallida</i>	Sklerofora		+
Mosses			
<i>Homalia trichomanoides</i>	Tievā gludlape		+
<i>Neckera pennata</i>	Īssetas nekera	2	+
Fungi			
<i>Fistulina hepatica</i>	Parastā aknene	3	+

Annex 4. Main parameters for some bird species nesting boxes

Bird species	Nesting box height, cm	Nesting box height (till the hole), cm	Board width, cm	Hole diameter, cm	The height in the tree (from the ground), m
<i>Parus major</i>	30	23	16	3-3,2	3-5
<i>Parus caeruleus</i>	27	20	15-16	2,8	3-5
<i>Parus cristatus</i>	25	18	14-15	2,8	3-7
<i>Ficedula hypoleuca</i>	28	21	15-16	2,8	3-5
<i>Phoenicurus phoenicurus</i>	23	14	18	5	4-6
<i>Picus viridis</i>	45	31	25	9	5-10
<i>Picus canus</i>	45	31	25	9	5-10
<i>Coracias garrulus</i>	45	34	24	6	5-10
<i>Upupa epops</i>	40	29	24	6-7	3-7
<i>Sitta europaea</i>	30	22,5	16	3,4-3,5	4-7
<i>Sturnus vulgaris</i>	35	26	19	5	4-7
<i>Apus apus</i>	35	26	19	5	6-15
<i>Strix aluco</i>	55	37	28	13	5-10
<i>Aegolius funereus</i>	45	31	28	9	5-10
<i>Athene noctua</i>	30	18	24	8	3-7
<i>Glaucidium passerinum</i>	40	29	24	6-6,5	5-7
<i>Tyto alba</i>	55	38	37-38	17*17	4-8
<i>Bucephala clangula</i>	55	38	28	12	2-10
<i>Mergus merganser</i>	65	42	37-38	18	2-10
<i>Strix uralensis</i>	65	45	37-38	20	5-10
<i>Coloeus monedula</i>	40	26	25	9	5-10

Annex 5. Measures to control invasive species *Heracleum sosnowskyi*. Source: Nielsen et al. 2005

Population size	Control options	Estimated time effort	Notes
Few plants, 5-100 individuals	Root cutting	100 plants/hour (plants in their second growing season)	Labour expensive, but an effective and efficient method
	Mechanical cutting	100-200 plants in less than one hour when using a scythe	Less labour expensive than root cutting, but less effective
	Chemical control, spot treatment	100-200 plants/hour	Needs to comply with national rules and guidelines for herbicide use
Small colony, 100-1000 plants	Root cutting	100 plants/hour (plants in their second growing season)	Labour expensive, but efficient
	Mechanical mowing or cutting	Mechanical mowing by flail mower: 0.25-1 ha/hour Mechanical cutting by scythe: High density: 1500 plants/hour Medium density: 1,000 plants/hour Low density: 500 plants/hour	Machinery is required
	Chemical control	300 m ² /hour	Hand-held equipment
	Grazing	(see below for scale of effort)	Should be considered if neighbouring areas are grazed
Large colony, >1000 plants	Ploughing, milling or mechanical mowing	Mechanical mowing by flail mower: 0.25-1 ha/hour	Machinery is required. Not all stands are accessible for heavy machinery
	Chemical control	0.5-1 ha/hour	Machinery is required
	Grazing	1000 hours per year for daily inspection and moving of 170 sheep distributed on 10 different areas	Total cost depends on the price of fencing, maintenance and inspection of the animals