7. Biological diversity

Biological diversity (biodiversity) denotes the variety of life (living organisms, species, communities, habitats, etc.). Biodiversity is the result of millions of years of evolution. It forms a complex, closely intertwined network of which humans are just one small part. While humans are completely dependent on the network of biodiversity, they interfere more and more with its functioning, oblivious to the consequences of their activities. The best indicators of the integrity and health of this network are ecosystems — the systems created by the components of biodiversity. An ecosystem is a self-regulating and developing community of organisms interdependent through food webs and food chains, along with the surrounding environment (such as a hardwood forest, wooded meadow, field, park, sea, lake, etc.) If these systems are sound and intact, the self-regulation is aimed at ensuring sustainability and balance, but if they are disturbed, the balance can easily be irreversibly damaged. Biologically more diverse ecosystems tend to be healthier, i.e. the food webs of an ecosystem that is richer in species are more sustainable.

Biodiversity provides a range of benefits — known as ecosystem services, sometimes also referred to as ecosystem goods — to humanity. A more detailed overview of these services is provided in Chapter 7.5. This Chapter is about the state of the Estonian terrestrial biodiversity, its trends, major factors threatening biodiversity and the measures taken to maintain biodiversity.

7.1 Legal background

Estonia signed the **Convention on Biological Diversity** in 1992, together with 193 countries worldwide, and ratified the convention in 1994. The 10th Conference of Parties (COP) to the Convention on Biological Diversity in 2010 in Nagoya, Japan, adopted a revised and updated **Strategic Plan for Biodiversity 2011–2020**, which is similar to the strategy of the previous decade but also differs from it in several aspects. The previous strategic objective — to 'halt the loss of biodiversity by 2010' — was not achieved, mainly because the representatives of all economic sectors were not involved. The new strategy foresees extensive inclusion and ecosystem approach in **all sectors of economy**. The mission of the Strategic Plan is to "take effective and urgent action to halt the loss of biodiversity in order to ensure that by 2020 ecosystems are resilient and continue to provide essential services, thereby securing the planet's variety of life, and contributing to human well-being, and poverty eradication." The Strategic Plan includes 20 targets organised under five strategic goals, and the measures to be taken to achieve these targets. The parties to the Convention commit to incorporating these targets and measures into their strategies. Every two years there is a Conference of the Parties (COP) to review the implementation of the strategy.

In the summer of 2011, the European Union (including Estonia) adopted, at the level of the Council, the **EU Biodiversity Strategy to 2020**. The overall objective of the strategy is to halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and to restore them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss. The strategy includes six priority targets, and 20 actions to help Europe reach its goal.

In the summer of 2012, Estonia approved the **Nature Conservation Development Plan 2020**. This plan is in accordance with the global biodiversity strategy of the Convention on Biological Diversity and the EU biodiversity strategy and its objective for ten years. The Nature Conservation Development Plan is also in line with the national strategy for the sustainable development of Estonia ("Sustainable Estonia 21") and the Estonian Environmental Strategy 2030 and it contributes towards the achievement of the nature protection objectives set out in these instruments. The Nature Conservation Development Plan is a strategic document for the development of the fields related to nature conservation and the use of nature up to 2020.

The strategic targets of the Nature Conservation Development Plan are:

- To ensure that people know, appreciate and protect nature and can use their knowledge in everyday activities.
- To ensure a favourable status of species and habitats as well as landscape diversity and the functioning of habitats as a uniform ecological network.
- To ensure long-term sustainability of natural resources and to use resources according to the principles of the ecosystem approach.

The primary objective of the **EU Habitats Directive** (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) and the **Birds Directive** (Council Directive 79/409/EEC on the conservation of wild birds) is to introduce a coherent network of protected areas in EU member states (**Natura 2000**). The network must ensure that the species and habitats listed in the annexes to the directives are protected and remain vital. The requirements of the directives have been integrated into the **Nature Conservation Act** under which nature conservation is organised in Estonia. According to the Act, Estonia had 3,786 protected natural objects as of 1 January 2013.[1] 18% of the Estonian mainland and 31% of the water area are subject to a nature conservation regime.

1 excluding the sites of protected species, fossils and minerals.

7.2 The status of biological diversity

There are almost 400 species of birds (nearly 300 of them are breeding birds), around 75 species of fish, five species of reptiles, 11 species of amphibians and close to 70 species of mammals registered in Estonia. We have about 1,450 species of vascular plants, 550 species of mosses and 2,500 species of algae. According to the web portal eBiodiversity[2], the number of species registered in Estonia as of autumn 2013 is 23,476.

In general, biodiversity is richer in coastal areas, on islands and in South Estonia (Figure 7.1). The areas richest in species are the western coasts of the Saaremaa and Hiiumaa islands as well as vicinity of the Puhtu-Laelatu, Alam-Pedja and Nigula nature reserves and Matsalu National Park. The fact that rich biodiversity is also recorded in areas surrounding Tartu, Tallinn and Viljandi, is probably caused by the nature of the dataset — these are the areas where nature observers live or have their permanent observation points. Areas that are less rich in species, however, overlap with the areas of more intensive agriculture — the southern part of West and East Viru counties, the northern part of Jõgeva County and Järva County.

The nature conservation status of habitats of European concern (habitat types listed in Annex I to the EU Habitats Directive, for the protection of which a network of protected areas — Natura 2000 — was established) has improved over the past five years (Figure 7.2). While the status of less than half (42%) of habitats was favourable in 2009, in 2013 the share of such habitats was 52%. It is also significant that while the status of 12% of habitats in 2009 was unknown, in 2013 there were no such habitats. Also, the share of habitats with the bad status (15% in 2009) has decreased to 3% of all habitats in 2013. However, the status of nearly one-half of all habitats is still bad or inadequate; therefore, the preservation of such habitats is not guaranteed.

The nature conservation status of species of European concern (species listed in annexes to the EU Habitats Directive) has significantly improved over the past five years (Figure 7.3). While the status of about one quarter (24%) of nearly hundred species was favourable in 2009, the share of such species was 54% in 2013. The number of species that need to studied for their status has also decreased significantly. While the status of about one third (27%) of species was unknown in 2009, the share of such species had dropped to 11% by 2013. Unfortunately, the status of more than a third of species is still bad or inadequate, i.e. the preservation of their vital populations in Estonia is not guaranteed.

2 http://elurikkus.ut.ee

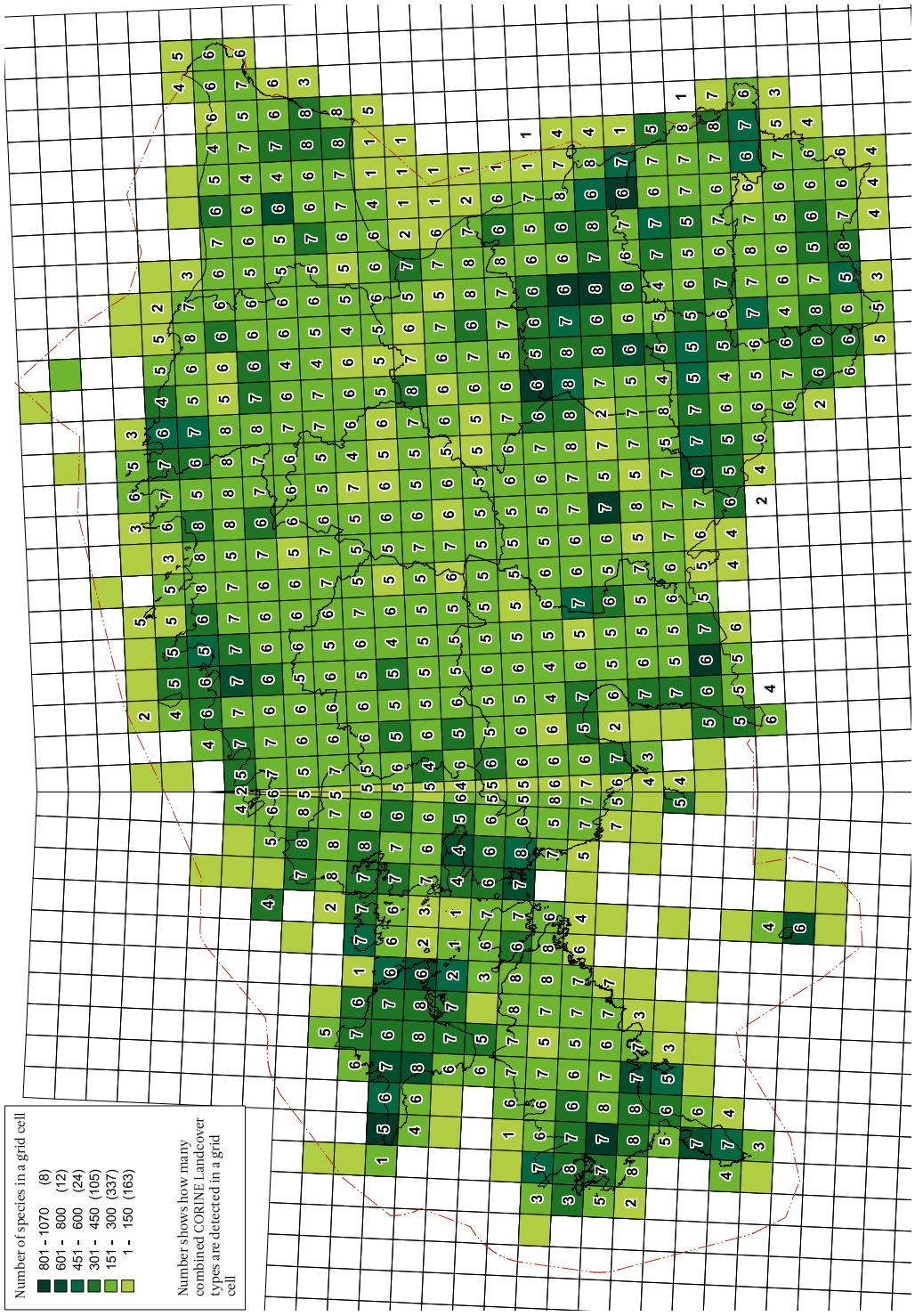


Figure 7.1. Distribution of biodiversity in Estonia. Number of species in 10 × 10 km UTM grid, linked to potential habitat diversity (number of combined CORINE land cover types (forest, meadow, artificial, etc.) in a square). Sources: Extract from the Estonian National Environmental Register (as of December 2012); extract from the Estonian Nature Information System (EELIS) (as of December 2012); extract from the Nature Observations Database (LVA) (as of December 2012); extract from the eBiodiversity database (as of February 2013); Distribution Atlas of Estonian Breeding Bird (2000–2005); Distribution Atlas of Estonian Mammals (1980–1990); Distribution maps of Estonian fungi (Parmasto, 1993, 1999, 2004); Distribution maps of Estonian invertebrates (Kesküla, 1992; Süda, Miländer, 1998; Voolma, Õunap, Süda, 2000; Martin, Luig, Ruusmaa, Heidemaa, 2008).

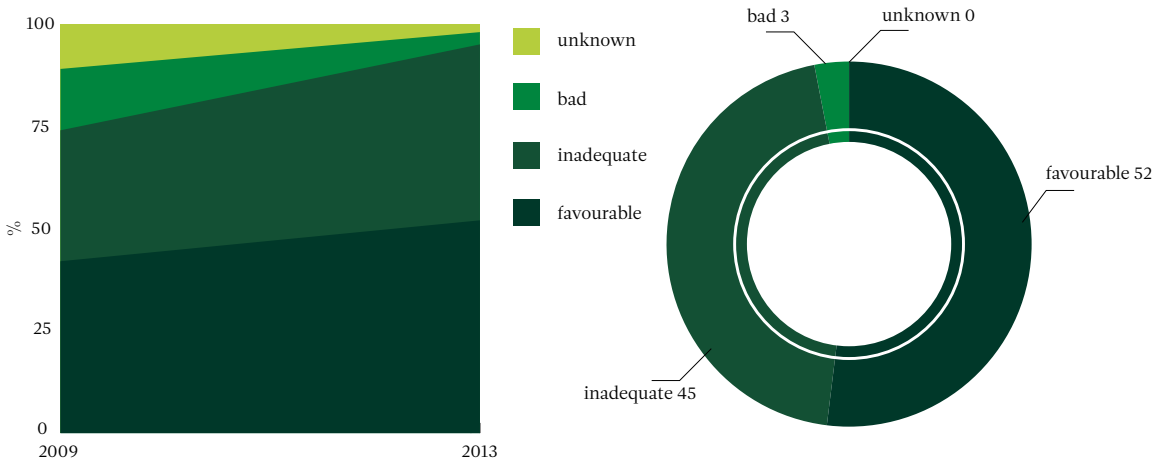


Figure 7.2. The overall nature conservation status of habitat types listed in Annex I to the EU Habitats Directive in Estonia in 2013. Source: Nature Conservation Department of the Ministry of the Environment (a report prepared under Article 17 of the Habitats Directive).

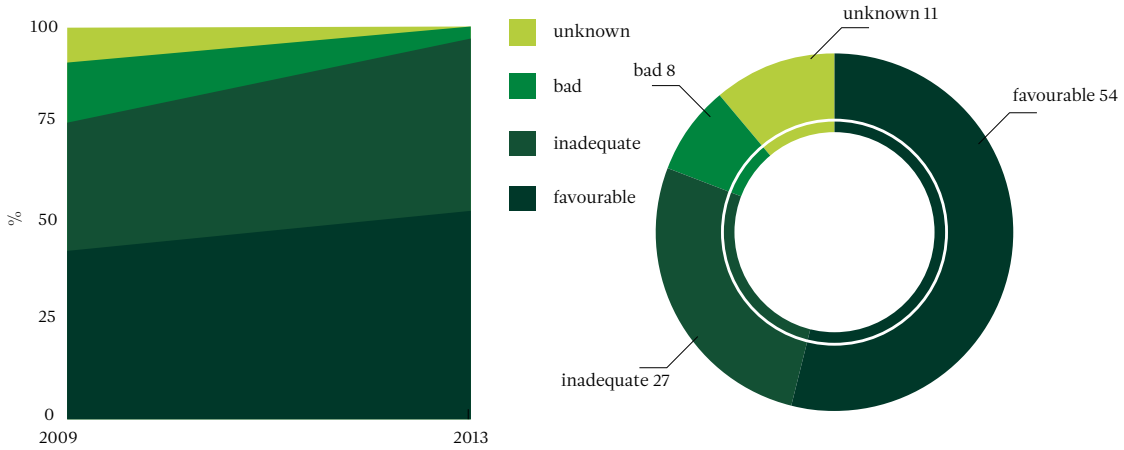


Figure 7.3. Overall nature conservation status of species listed in annexes to the EU Habitats Directive in Estonia in 2013. Source: Nature Conservation Department of the Ministry of the Environment (a report prepared under Article 17 of the Habitats Directive).

7.2.1 Mires

A **mire** is an area or ecosystem where a large part of organic matter does not decay and accumulates as peat[3]. The main mire types include fens (low bogs), raised bogs and transitional mires[4]. A mire is an area where the thickness of peat is 30 cm or more and the accumulation of peat has not stopped. A **fen** is a type of mire that is fed by groundwater. A **raised bog** is a type of mire where the layer of peat is so thick that the bog domes above the surrounding landscape and the plants only get nutrients from rainwater and water-sodden dust particles. A transition mire is a type of mire where plants draw their nutrients from both groundwater and rainwater: those growing on higher hummocks and ridges are exclusively dependent on nutrients from precipitation; the roots of those plants that grow in hollows between hummocks reach the groundwater[5].

Contrary to the popular belief that mires constitute 22.3% (or 1,009,101 ha) of the territory of Estonia, the wetland inventory 2010 indicated that the share of mires is just **5.5%** or **240,000 ha**. The remaining 17% are paludified forests and grasslands as well as degraded bogs, i.e. all peat-forming areas, irrespective of the thickness of the peat layer and whether the accumulation of peat continues or is decreasing. Major part of the habitats in these 17% of areas have likely been influenced by the extensive network of drainage ditches created in the 20th century. Of all mire habitat types listed in the EU Habitats Directive, 14 are found in Estonia (Table 7.1; Figures 7.4 and 7.5).

The largest proportion of mires in Estonia (also by counties) consists of raised bogs. The share of mires is the biggest in Pärnu County and the smallest in Lääne-Viru, Valga and Võru counties where the distribution of bog types is more even and raised bogs do not dominate (Figures 7.4 and 7.5).

Around 60% of Estonian mires (approximately 140,000 ha) have very high nature conservation value, with no or low drainage impact. Figure 7.6 illustrates the distribution of such mires by type. About 10% of mires of high nature conservation value are such that the drainage impact is partially either missing or very low and partially medium or strong. These are large raised bogs that in some areas are strongly affected by drainage and in some parts are entirely natural. For 5.5% of Estonian mires, their nature conservation value and/or the extent of their drainage impact have not been estimated or is unknown.

Table 7.1. EU Habitats Directive mire types found in Estonia

Type name (Natura code)	**Type name (Natura code)**
Humid dune slacks (2190)	Depressions on peat substrates of the *Rhynchosporion* (7150)
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410)	Fennoscandian mineral-rich springs and springfens (7160)
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)	Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210*)
Northern boreal alluvial meadows (6450)	Petrifying springs with tufa formation (*Cratoneurion*) (7220*)
Active raised bogs (7110*)	Alkaline fens (7230)
Degraded raised bogs still capable of natural regeneration (7120)	Fennoscandian deciduous swamp woods (9080*)
Transition mires and quaking bogs (7140)	Bog woodland (91D0*)

3 Masing, V., ed. (1992). Ökoloogia leksikon. Loodusteaduslik oskussõnastik. Eesti entsüklopeedia-kirjastus. Tallinn.
4 Orru, M. (1995). Eesti turbasood. Teatmik. Eesti Geoloogiakeskus. Tallinn.
5 Paal, J., Leibak, E., ed. (2013). Eesti soode seisund ja kaitstus. Eestimaa Looduse Fond. Tartu.

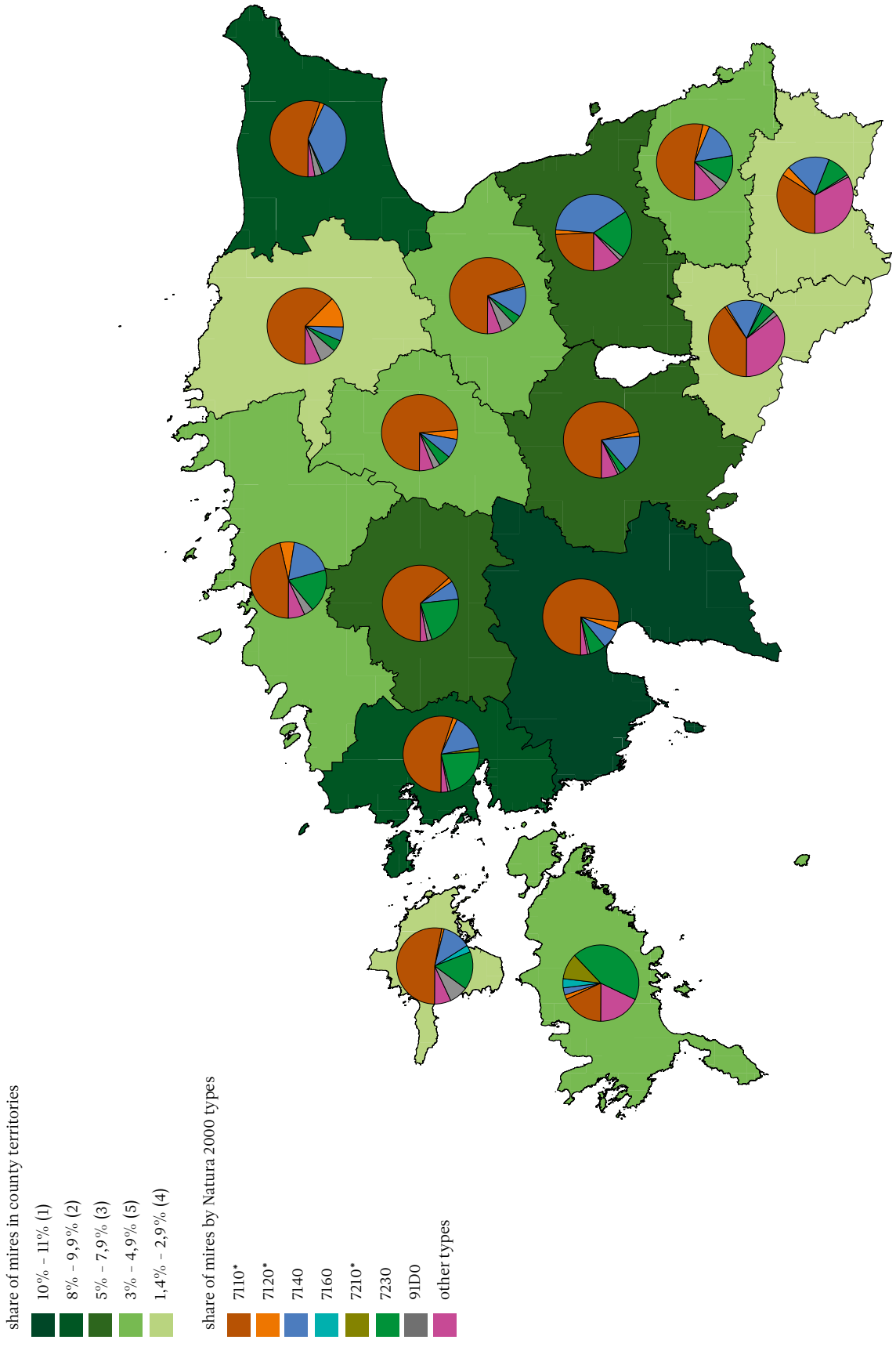


Figure 7.4 The share of Natura 2000 mire types in Estonia. Source: ESTEA (the Estonian Environmental Agency).

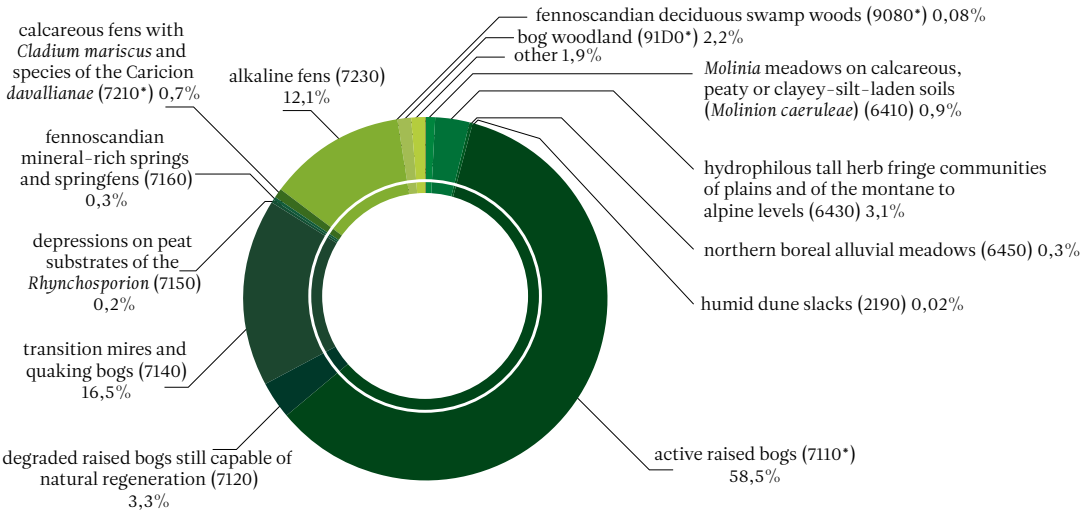


Figure 7.5 The share of Natura 2000 mire types in Estonia. Source: ESTEA.

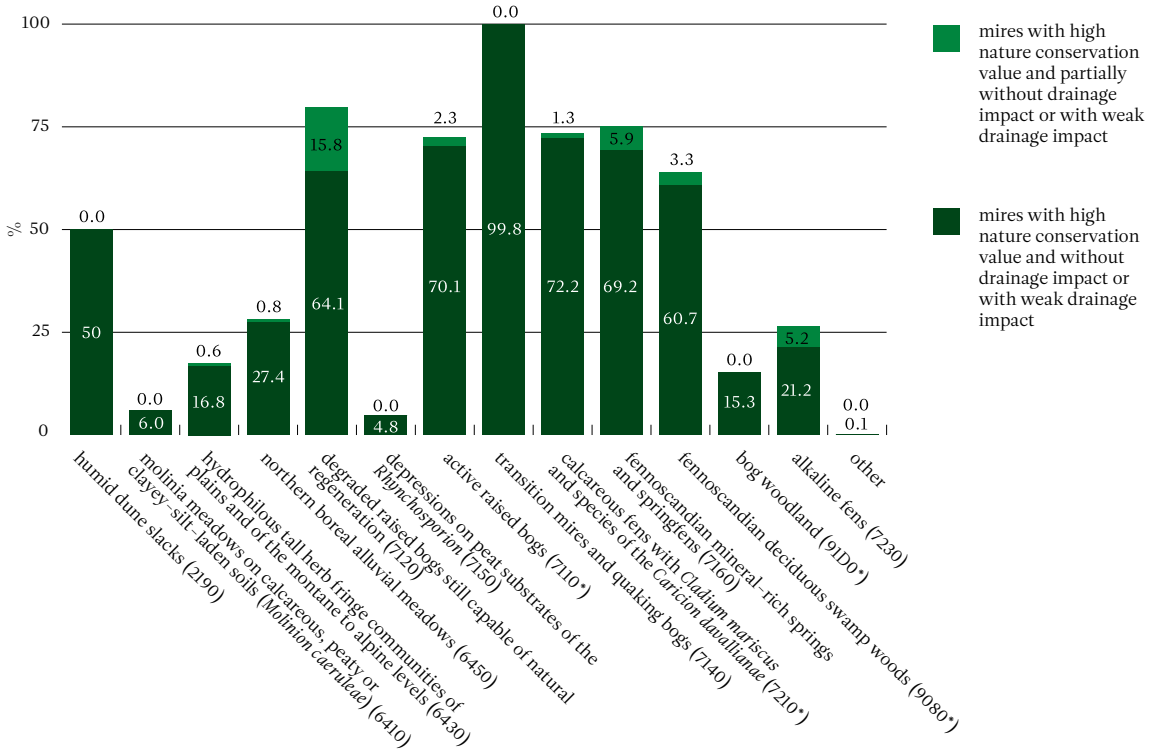


Figure 7.6 The share of Natura 2000 mire types with high nature conservation value and without drainage impact or with weak drainage impact in Estonia. Data: Inventory of Estonian Mires 2010.

7.2.2 Meadows

A **meadow** refers to an ecosystem vegetated primarily by grasses and perennials that need some moisture in the ground throughout the growing season[6]. A meadow with groups of trees or sparsely growing individual trees is called a **wooded meadow**. Meadows are divided into **primary**, or natural, meadows and **secondary**, or anthropogenic meadows. Primary meadows in Estonia are only found in exceptional ecological conditions where something prevents bushes, trees and shrubs from growing **(flooded alluvial and coastal meadows; limestone pavement meadows)**. Secondary meadows are formed from forests and shrubbery as a result of human activity (felling, burning, grazing, mowing). Primary meadows are habitats for natural communities; secondary meadows are habitats for semi-natural or cultivated communities[6]. As the overwhelming part of Estonian meadows are secondary, they need constant maintenance – mowing or grazing.

According to the meadow database of the Estonian Seminatural Community Conservation Association and the eligible semi-natural communities database of the Estonian Nature Information System (EELIS), there were 112,000 ha meadows registered in Estonia as of the beginning of 2013 (2.5% of the territory of Estonia). The highest distribution of semi-natural communities in Estonia was in the late 19th and early 20th centuries when these types of meadows constituted about 40% of the territory of Estonia within its current boundaries. Of all meadow habitat types of European concern listed in the EU Habitats Directive, 14 are found in Estonia (Table 7.2; Figures 7.7 and 7.8).

A total of 35.6% of Estonian meadows have a high nature conservation value. Figure 7.9 illustrates the distribution of such meadows by type. However, the nature conservation value of as much as 21.9% of the Estonian meadows registered in 2007–2012 has not been estimated or is unknown. In the same period, 30.6% of Estonian meadows were maintained at least once. 34.4% of meadows of high nature conservation value have been maintained.

Table 7.2. EU Habitats Directive meadow types found in Estonia

Type name (Natura code)	**Type name (Natura code)**
Boreal Baltic coastal meadows (1630*)	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410)
Dry sand heaths with *Calluna* and *Empetrum nigrum* (2320)	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)
European dry heaths (4030)	Northern boreal alluvial meadows (6450)
Juniperus communis formations on heaths or calcareous grasslands (5130)	Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) (6510)
Semi-natural dry grasslands and scrubland facies on calcareous substrates (6210*)	Fennoscandian wooded meadows (6530*)
Fennoscandian lowland species-rich dry to mesic grasslands (6270*)	Limestone pavements (8240*)
Nordic alvar and precambrian calcareous flatrocks (6280*)	Fennoscandian wooded pastures (9070)

6 Masing, V., ed. (1992). Ökoloogia leksikon. Loodusteaduslik oskussõnastik. Eesti entsüklopeediakirjastus. Tallinn.

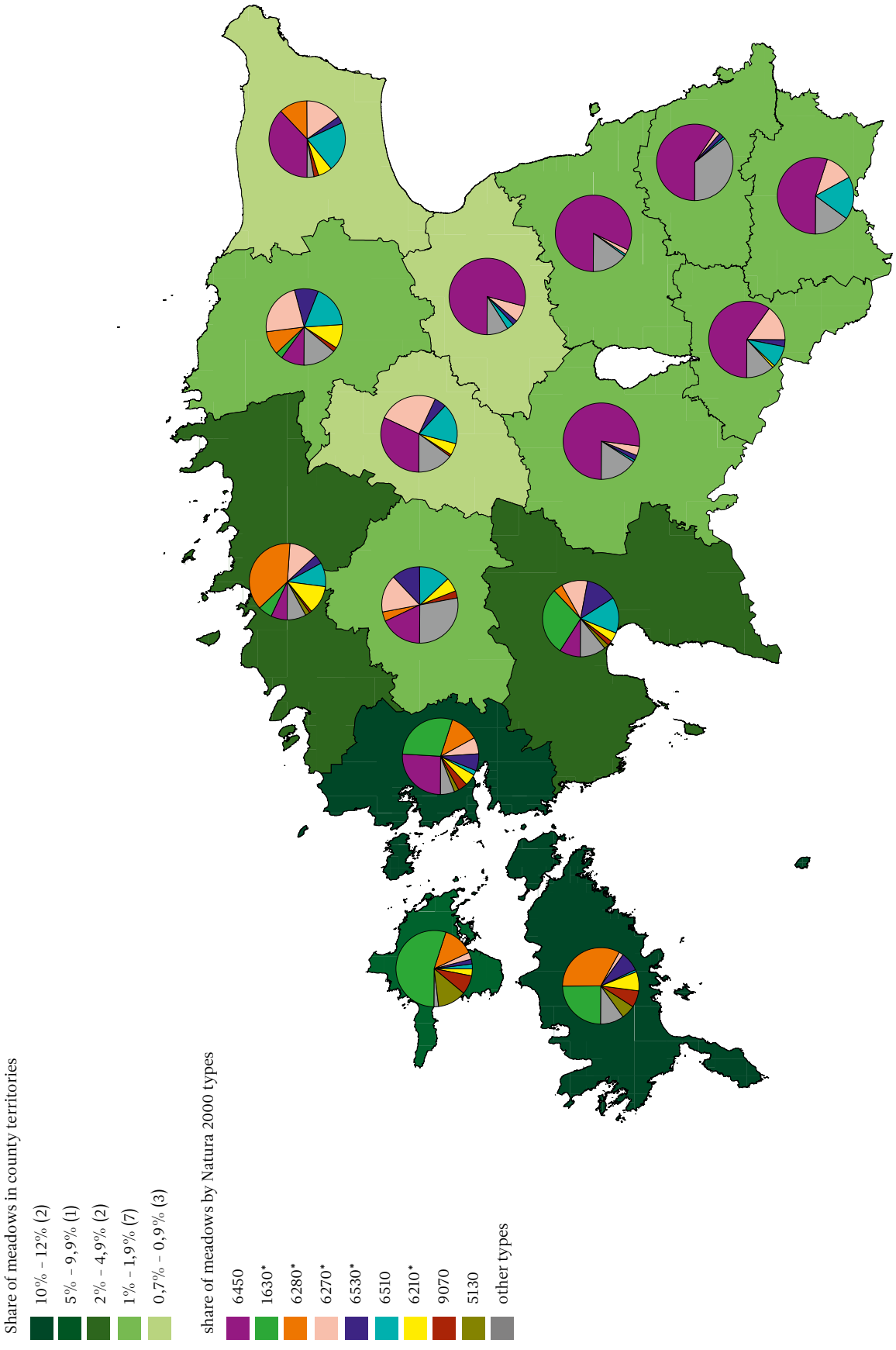


Figure 7.7. The share of Natura 2000 meadow types in Estonia. Source: ESTEA.

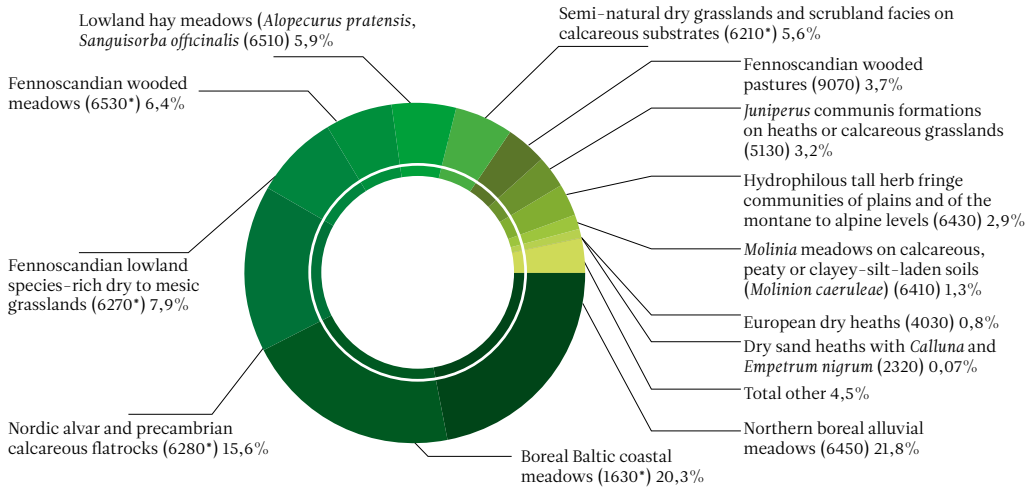


Figure 7.8. The share of Natura 2000 meadow types in Estonia. Source: The meadow database of the Estonian Seminatural Community Conservation Association and data from the EELIS database on semi-natural communities.

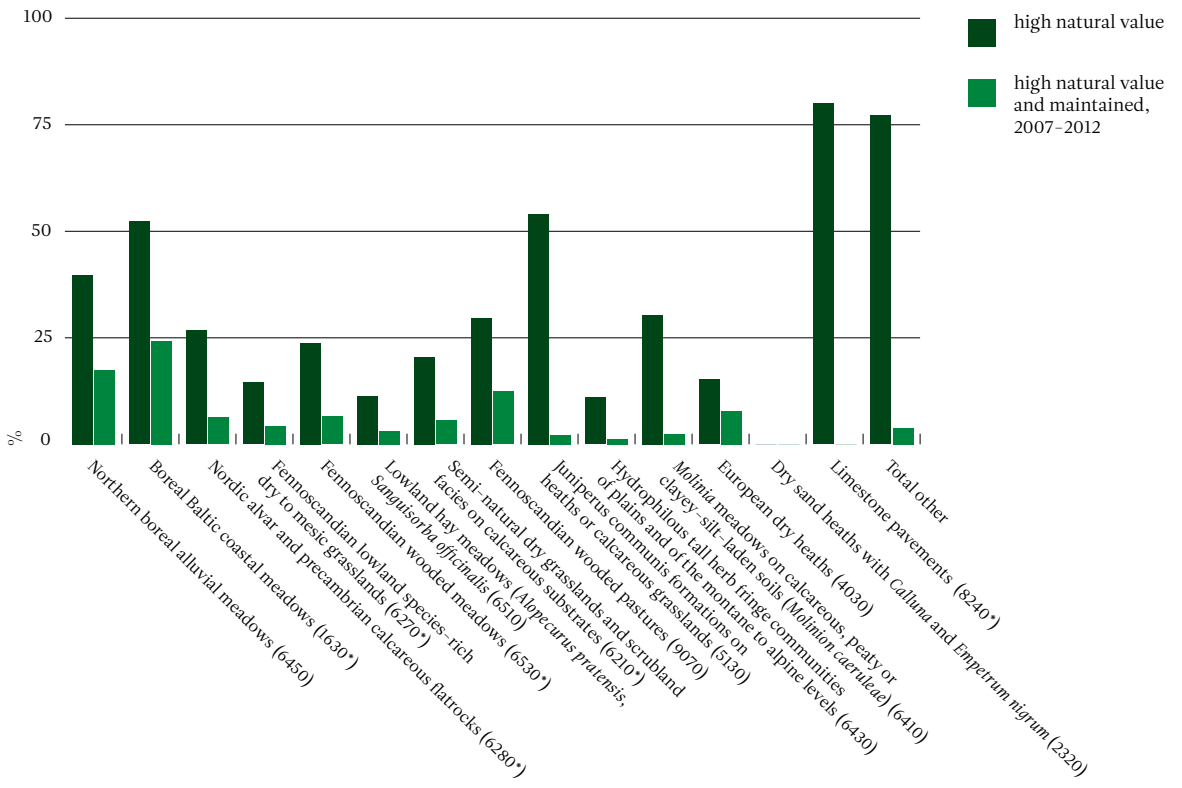


Figure 7.9. The share of Natura 2000 meadows with high natural value within the same type and the share of maintained meadows with high natural value within the same type. Source: The meadow database of the Estonian Seminatural Community Conservation Association and data from the EELIS database on semi-natural communities.

7.2.3 Forests

A **forest** is an ecosystem dominated by trees. Forests as plant communities with the highest biomass levels are important because they regulate the gaseous composition of the atmosphere. By affecting the amount and distribution of precipitation as well as the runoff and evaporation, forests regulate the water regime and climate of both the forest area and the surrounding area. In similar climatic conditions, the structure of forest communities is determined by soil: soil types are used to differentiate between different types of forest areas[7].

A forest refers to an ecosystem consisting of **forest land** and the associated vegetation and wildlife. Forest land refers to a land parcel that is registered in the land cadastre as forest land, or a piece of land with an area of at least 0.1 ha, dominated by woody vegetation with a height of at least 1.3 m and with canopy density not less than 30%. Yards, residential land, parks, cemeteries, green areas, berry gardens, orchards, forest nurseries, garden centres, arboreta, and plantations of trees and shrubs are not considered forest land (the Forest Act).

Estonia's forest cover is 50.6% of the total land surface area. Of all forest habitat types of European concern listed in the EU Habitats Directive, 11 are found in Estonia (Table 7.3). However, the range of forest types is only determined for slightly more than one tenth of forests. The dominating forest types in Estonia are bog woodlands, Western Taïga and deciduous swamp woods. Western Taiga dominates clearly in East and West Viru, Valga and Võru counties; with bog woodlands and deciduous swamp forests in Tartu, Viljandi, Rapla and Lääne counties. Hiiu County boasts an abundance of wooded dunes; Jõgeva and Tartu counties have large areas of alluvial forests, while western Estonia has many hemiboreal natural old broad-leaved deciduous forests and wooded pastures (Figures 7.10 and 7.11).

Table 7.3. EU Habitats Directive forest types found in Estonia

Type name (Natura code)	**Type name (Natura code)**
Western Taïga (9010*)	*Tilio-Acerion* forests of slopes, screes and ravines (9180*)
Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus*, *Tilia*, *Acer*, *Fraxinus or Ulmus*) rich in epiphytes (9020*)	Bog woodland (91D0*)
Fennoscandian herb-rich forests with *Picea abies* (9050)	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0)
Coniferous forests on, or connected to, glaciofluvial eskers (9060)	Riparian mixed forests of *Quercus robur*, *Ulmus laevis and Ulmus minor*, *Fraxinus excelsior or Fraxinus* (91F0)
Fennoscandian wooded pastures (9070)	Wooded dunes of the Atlantic, Continental and Boreal region (2180)
Fennoscandian deciduous swamp woods (9080*)	

7 Masing, V., ed. (1992). Ökoloogia leksikon. Loodusteaduslik oskussõnastik. Eesti entsüklopeediakirjastus. Tallinn.

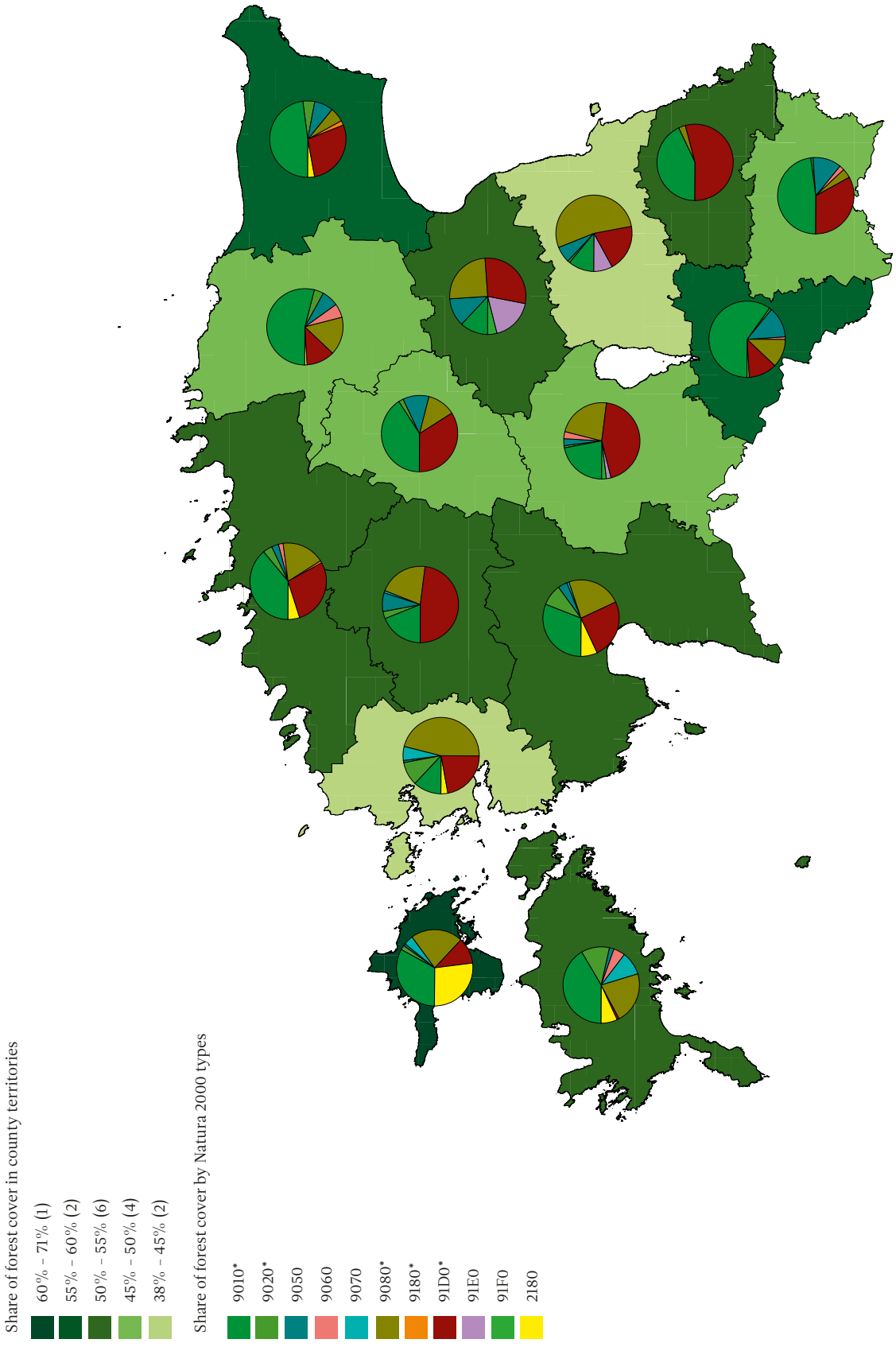


Figure 7.10 The share of forest cover and Natura 2000 forest types in Estonia. Source: ESTEA. Forest cover percentage in counties according to Statistical Forest Inventory 2010; distribution of forest types according to the Habitats Directive (June 2013).

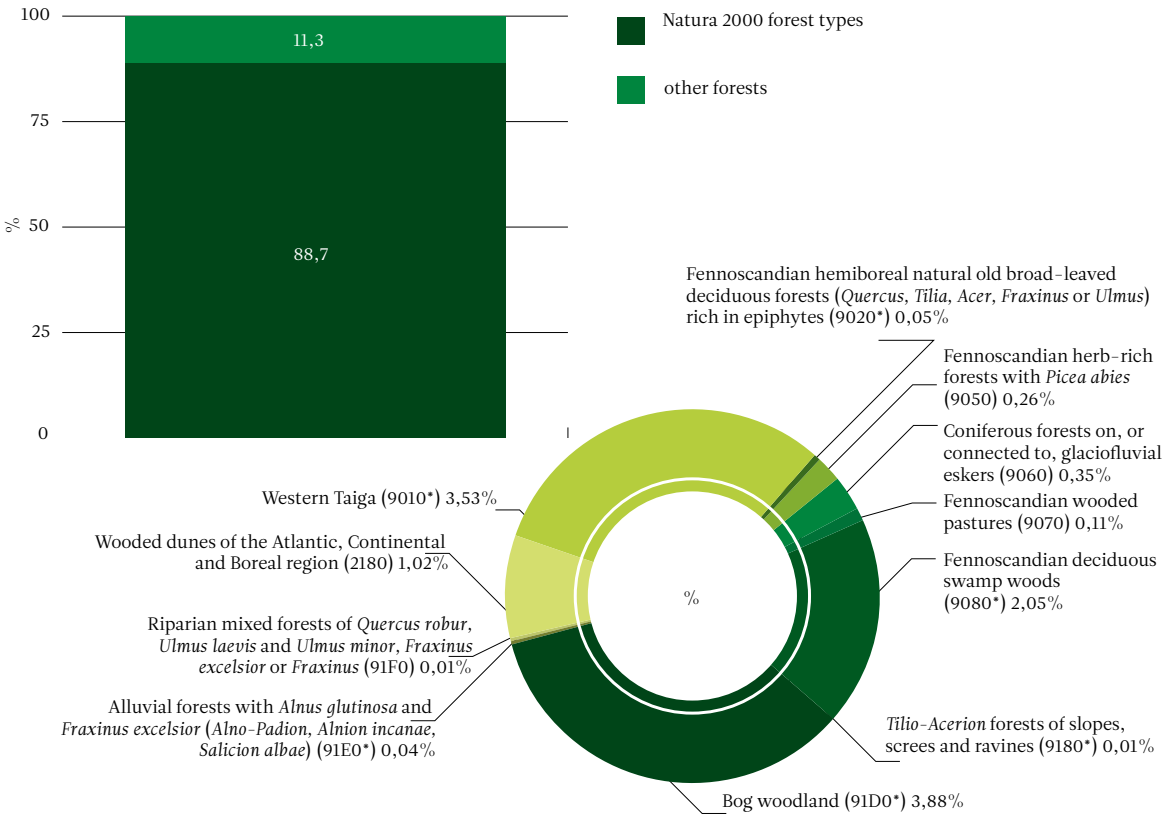


Figure 7.11. The share of forest land in Estonia and its share between Natura 2000 forest types. Source: Statistical Forest Inventory 2010. There are no data on rare types of forest (9180, 91E0, 91F0) or the assessment error is relatively big.

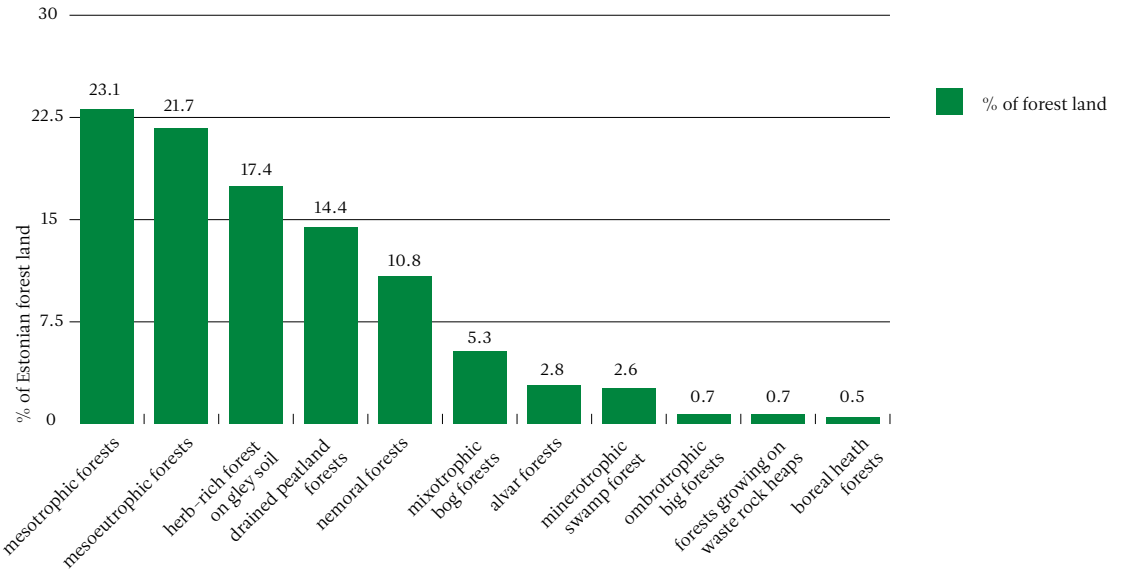


Figure 7.12. Forest site types according to the National Forest Inventory (2008).

7.3 Pressures on species and habitats

Of all species registered in Estonia, 81 of bird species (21%), 10 species of fish (13%); one species of reptiles (20%); four species of amphibians (36%) and seven species of mammals (10%) have been entered in the list of threatened species (classified according to the Red List as near threatened (NT), vulnerable (VU), endangered (EN), critically endangered (CR) and regionally extinct (RE)). Estonia has 391 threatened species of vascular plants (27%), 213 threatened species of mosses (39%) and 23 threatened species of algae (1%). According to the Red List, about one third of the assessed species and 3% of all species registered in Estonia are threatened. Figure 7.13 illustrates the known distribution of threatened species in Estonia.

As shown on Figure 7.13, the spatial distribution of threatened biodiversity corresponds to the known distribution of total biodiversity in Estonia. The majority of threatened species are found in coastal areas and on islands as well as in South Estonia. Highest number of threatened species have been registered on the western coasts of Saaremaa and Hiiumaa islands as well as the vicinity of the Matsalu National Park and Puhtu-Laelatu, Alam-Pedja and Nigula nature reserves — the species have retrieved to these areas due to human activity that has rendered their previous habitats unsuitable. The big number of threatened species in the surroundings of Tartu and Tallinn is probably caused by the nature of the dataset — these are the areas where nature observers live or have their permanent observation points and where the development activities are concentrated; therefore, biota are more extensively studied. Biodiversity is poorer in Central Estonia (Järva County) and Viljandi County — no threatened (rare) species are found in these areas of intensive human activity (agriculture) any more.

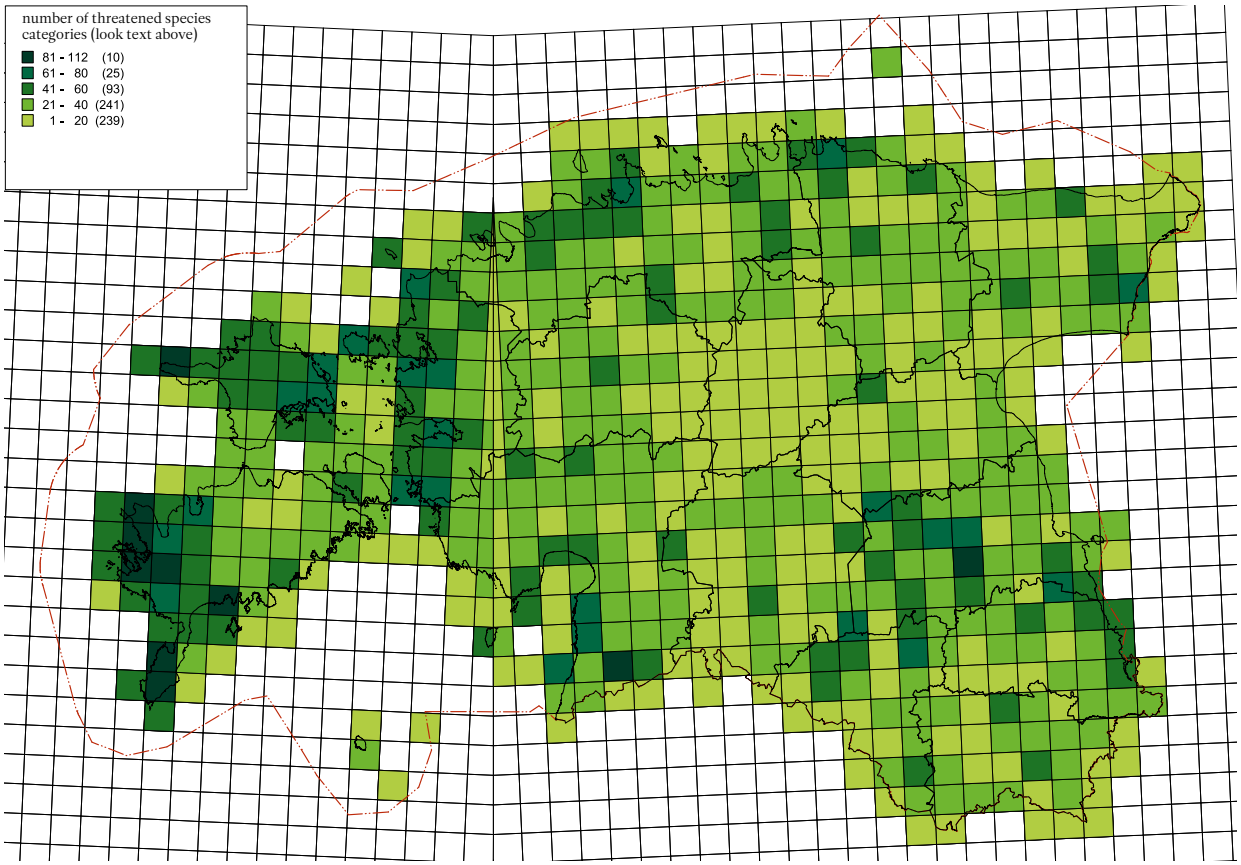


Figure 7.13. Distribution of threatened biodiversity in Estonia. Number of species classified according to the Red List as near threatened (NT), vulnerable (VU), endangered (EN), critically endangered (CR) and regionally extinct (RE) in UTM 10 × 10 km grid. Sources: Extract from the Estonian National Environmental Register (as of December 2012); extract from the Estonian Nature Information System (EELIS) (as of December 2012); extract from the Nature Observations Database (LVA) (as of December 2012); extract from the eBiodiversity database (as of February 2013); Distribution Atlas of Estonian Breeding Birds (2000–2005); Distribution Atlas of Estonian Mammals (1980–1990); Distribution maps of Estonian fungi (Parmasto, 1993, 1999, 2004); Distribution maps of Estonian invertebrates (Kesküla, 1992; Süda, Miländer, 1998; Voolma, Õunap, Süda, 2000; Martin, Luig, Ruusmaa, Heidemaa, 2008).

7.3.1 Mires

A major pressure factor affecting biodiversity in Estonian mires is draining (land improvement) and also peat extraction to lesser extent. According to the Estonian Red List, the number of threatened species of vascular plants, mosses and algae in mires is growing. The main risk factor for that is habitat change caused by draining. The majority of the drainage ditches created decades ago are still operational and continue to have an impact on protected mires. While the share of mires directly impacted by land improvement in the total area of Estonian mires is just 5%, the share of such mires in the territories of nature conservation objects is already 30%. Peat extraction also posed a threat to the biodiversity of mires. The volume of extracted peat considerably exceeds the peat regeneration rates in Estonia. Considering that between 400,000 and 500,000 tonnes of peat is regenerated each year, the extraction volumes exceed the accumulation almost two-fold. The extraction of undecayed peat (the peat used in landscaping) has also increased. Despite the fact that undecayed peat constitutes about 15% and well-decayed peat constitutes about 85% of total peat resources, the extraction volumes of both types of peat are nearly equal, i.e. strongly disproportionate.

Mires with medium or strong drainage impact constitute 12% of Estonian mires. Mires with partially medium or strong drainage impact constitute 12.4% of Estonian mires. The drainage impact of 5% of mires has not been assessed/is unknown (This parameter value is biggest in the case of alluvial meadows/floodplain fens — 21.8%, and smallest in the case of depressions on peat substrates of the Rhynchosporion — 0.2%).

Of the mire types listed in the Habitats Directive, degraded raised bogs still capable of natural regeneration have suffered most due to drainage — more than 60% are affected. Molinia meadows on calcareous, peaty or clayey-silt-laden soils and deciduous swamp woods follow with 45% and 40%, respectively. Drainage has not affected humid dune slacks and depressions on peat substrates of the Rhynchosporion (Figure 7.14). There may be some drainage impact in the case of the latter because they are found in large bogs. It should be noted that the drainage impact is also strong in the case of northern boreal alluvial meadows, springfens and alkaline fens — 28%, 17% and 12%, respectively.

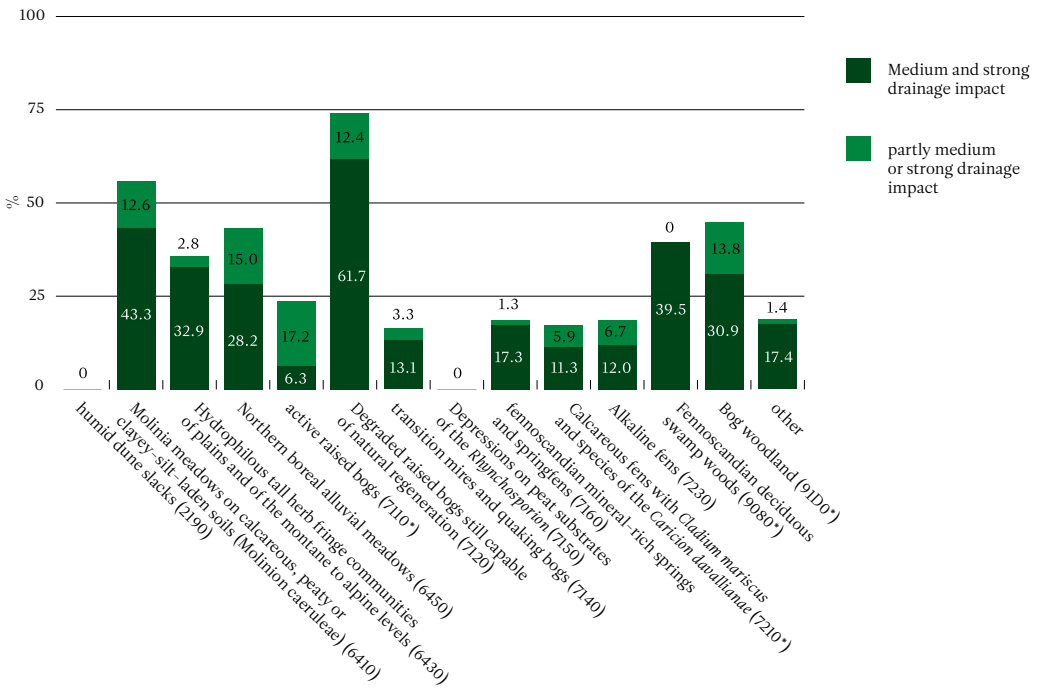


Figure 7.14 The share of Natura 2000 mire types with medium and strong drainage impact in Estonia. Source: Inventory of Estonian Mires 2010.

7.3.2 Meadows

Due to human activity the land cover type has changed for more than one fifth of the 50,000 ha of Estonian natural meadows during the period 2001–2012. The most important pressure factor affecting the biodiversity of Estonian meadows is lack of maintenance and the resulting overgrowth with shrubs — more than 60% of meadows for which the land cover type has changed have become forests or shrubberies (Figure 7.15). Cultivating natural meadows and turning them into fields or gardens (20% of meadows for which the land cover type has changed) and new development projects on the outskirts of cities and towns (5% of meadows for which the land cover type has changed) is also an important and growing pressure factor.

According to the Estonian Red List, the number of endangered species of vascular plants, mosses and algae on meadows is growing. The main pressure factor is the disappearance of small farms and traditional extensive rural management. Although the surface area of meadows for which maintenance support is paid is growing, more measures are needed to ensure the sustainable maintenance (mowing and grazing) of meadows.

The share of the area of land improvement systems (affected by drainage operations) in Estonian meadows is 4.3%. The meadow types affected most are lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis), hydrophilous tall herb fringe communities of plains, Fennoscandian lowland species-rich dry to mesic grasslands and northern boreal alluvial meadows (Figure 7.16). This is quite logical because these habitats are found on the banks of watercourses, including ditches. It is important to note that these habitats are changing due to changes in the natural water regime and their nature conservation value is decreasing.

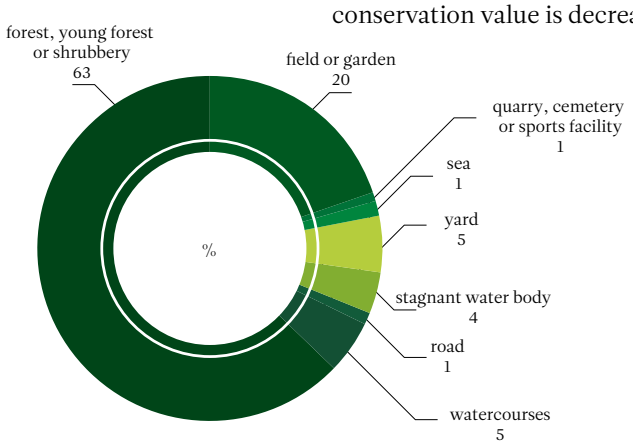


Figure 7.15 The share of land cover types to which Estonian natural meadows have changed in 2001–2012. Source: ESTEA.

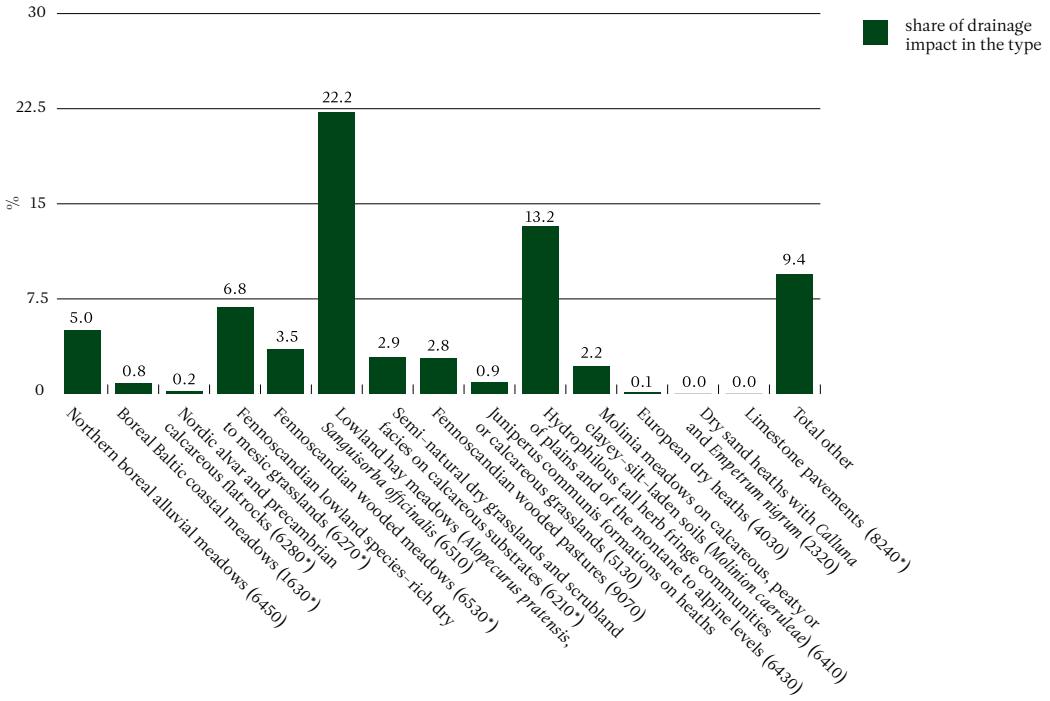


Figure 7.16. The share of the area of land improvement systems in Estonian meadows. Data: ESTEA.

7.3.3 Forests

One of the most important pressure factors affecting the natural state and biodiversity of forest ecosystems is regeneration cutting, so called clear-cutting, (which makes forests both younger and destroys and fragmentises their natural structure) and forest draining. The impact of cutting is evident not so much in the volumes cut (which are clearly smaller than the volume increment) as in the age of trees cut, the breaking up of natural habitat structures and the fragmentation impact of regeneration cutting. Natural forests constitute only 2.4% of total forest land, while 95% of forests outside of nature reserves are located closer than 1 km from the nearest (forest) roads[8].

The main problem related to mature commercial forests is that they have become homogeneous age-wise and there is lack of very large trees, particularly of late-successional deciduous species. Such trees are crucial for the preservation of biodiversity and food chains and for the creation of microhabitats. A solution is to change forest felling technigue so that such trees remain untouched[9].

In general we can say that Estonian forest ecosystems are becoming younger and their structure as habitats is shifting away from being natural. As biodiversity in old natural forests is richer than in mature commercial forests, regenerating forests and cutting areas[10], the disappearance of old forests has an adverse effect on biodiversity and on the health of food chains, which affects the ecosystem services provided by forests. The disappearance of old forests has also resulted in the disappearance of species characteristic of forest ecosystems, because many of them can only thrive in a narrow range of environmental conditions (the so-called specialist species, such as the Lungwort (Lobaria pulmonaria), the Black Stork (Ciconia nigra), the Western Capercaillie (Tetrao urogallus), the Siberian Flying Squirrel (Pteromys volans), etc.) and they are less able to adapt to new conditions than more tolerant species (the so-called generalist species, such as the White-tailed Eagle (Haliaeetus albicilla), the Common Buzzard (Buteo buteo), etc.). This, in turn, changes the food chains of forest ecosystems and therefore, significant changes can be expected to occur in the ecosystem services provided by forests. Another important impact of felling is the fragmentation of forests massifs by clear-cut areas and roads, which can destroy the entire population of some species (such as the flying squirrel).

Nearly 30% of Estonian forests are affected by drainage. Slightly more than 10% of such forests are located on areas under protection. Drainage activities have affected most mixed forests, followed by conifer forests and deciduous forests. Drainage activities have created a secondary forest site type — drained peatland forests — which previously did not exist naturally and the biota, food chains and ecosystem services of which are not fully established yet and are unpredictable. Another reason why draining reduces biodiversity is that ditches alter the previous water regime in a forest. Natural water bodies disappear and the diversity of water bodies as habitats decreases. This, in turn, reduces the number of species associated with water bodies, such as amphibians, and destroys an important link in the food chains.

As a result, many ecosystem services provided by forests are damaged or destroyed. Therefore, it is very important to restore the natural water regime in forests by blocking runoff from drainage ditches and turning the ditches into forest streams and ponds[11]. The latter is essential for protecting the black stork — a top predator in Estonian forest ecosystems[12].

8 Lõhmus, A. (2002). The lack of old-growth forest – a threat to Estonian biodiversity (Vanade metsade vähesus – oht Eesti bioloogilisele mitmekesisusele). Proc. Estonian Acad. Sci. Biol. Ecol., 51, 2, 138–144.
9 Lõhmus, A. (2010). Stand structure of hemiboreal old-growth forests: Characteristic features, variation among site types, and a comparison with FSC-certified mature stands in Estonia. Forest Ecology and Management 260 155–165.
10 Lõhmus, A. & Lõhmus, P. (2011). Old-forest species: the importance of specific substrata vs. Stand continuity in the case of calicioid fungi. Silva Fennica 45(5): 1015–1039.
11 Suislepp, K; Rannap, R; Lõhmus, A. (2011). Impacts of artificial drainage on amphibian breeding sites in hemiboreal forests. Forest Ecology and Management 262 1078–1083.
12 Kotkaklubi (the Eagle Club). Must-toonekure (Ciconia nigra) kaitse tegevuskava aastateks 2009–2013 (Action plan for protecting the Black Stork (Ciconia nigra) in 2009–2013). (2009) Otepää.

7.4 Measures

There are 116 bird species (30% of all bird species), seven fish species (9%), five species of reptiles and 11 species of amphibians (100%) and 21 species of mammals (30%) under protection in Estonia. 215 species of vascular plants (15%) and 46 species of mosses (8%) are also under protection. Estonia has a total of 570 protected species of plants, fungi and animals, i.e. about 2% of all registered species whose distribution is shown on Figure 7.17.

Figure 7.17 shows that the spatial distribution of protected species corresponds to the distribution of overall biodiversity and threatened species (Figures 7.1 and 7.13). The areas most rich in species are in western Estonia and the western parts of Hiiumaa and Saaremaa islands as well as the area surrounding Tartu; central Estonia, on the other hand, is less rich in species. The areas with the biggest number of protected species coincide with protected areas, such as Lahemaa National Park in northern Estonia, Endla nature reserve in central Estonia, Luitemaa nature reserve and Matsalu National Park in western Estonia and Viidumäe nature reserve and Vilsandi National Park on the island of Saaremaa. The high number of protected species in the areas surrounding Tartu and Tallinn is partially caused by the fact that these areas have been examined in greater detail.

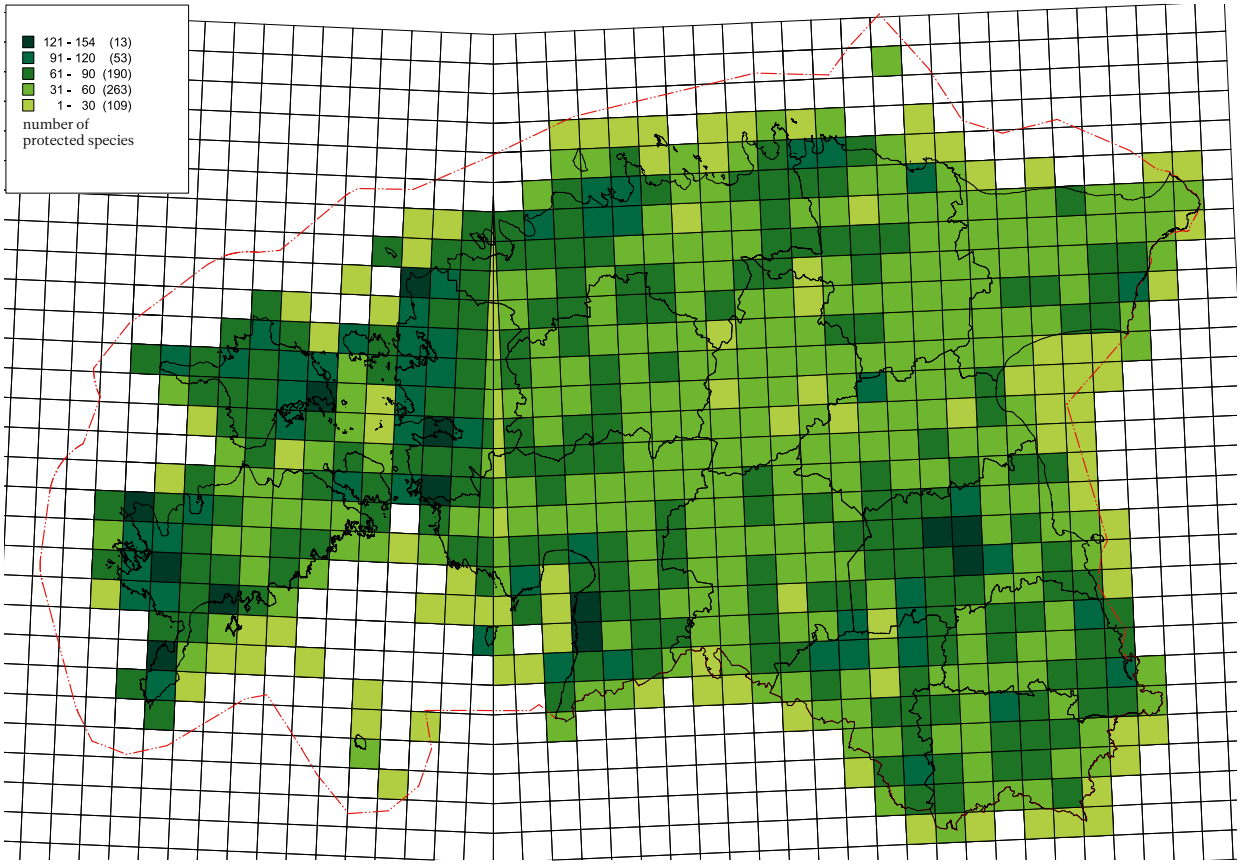


Figure 7.17. Distribution of protected biological diversity in Estonia – Number of protected species in UTM 10 × 10 km grid according to the Nature Protection Act. Source: Extract from the Estonian National Environmental Register (as of December 2012); extract from the Estonian Nature Information System (EELIS) (as of December 2012); extract from the Nature Observations Database (LVA) (as of December 2012);extract from the eBiodiversity database (as of February 2013); Distribution Atlas of Estonian Breeding Bird (2000–2005); Distribution Atlas of Estonian Mammals (1980–1990); Distribution maps of Estonian fungi (Parmasto, 1993, 1999, 2004); Distribution maps of Estonian invertebrates (Kesküla, 1992; Süda, Miländer, 1998; Voolma, Õunap, Süda, 2000; Martin, Luig, Ruusmaa, Heidemaa, 2008).

7.4.1 Protection

Estonia's national strategy for sustainable development "Sustainable Estonia 21" (up to 2030) sets forth the target of placing 5% of Estonia's territory out of any economic use by 2010. As of 2012, the share was still 4.1% (Figure 7.18). To achieve this target, it is necessary to place an additional 39,000 hectares of land under the same protective regime. The current trend, on the contrary, is towards decreasing the share of land that is not used for economic purposes.

The Estonian Environmental Strategy 2030 defines the target level of areas with conservation restrictions on land at 18%, which was achieved in 2005, after the creation of the Natura 2000 areas, and has remained at around the same level in recent years (figure 7.19). On the other hand, the share of protected marine areas has continued to increase after the initial surge following the creation of the Natura 2000 network.

Management plans are prepared in order to organise the protection of protected areas and limited-conservation areas. A management plan includes a list of important environmental factors, actions aimed at preserving, restoring and promoting the values of the relevant area, time schedule for actions, volumes of work and budget. According to the nature conservation development plan, management plans will have to be prepared for all Natura 2000 areas by 2014 and for all other protected areas and limited-conservation areas (a total of 1,000 areas covering about 1/3 of the territory of Estonia) by 2020. As of 1 June 2013, the number of valid management plans was 147, covering a total area of nearly 600,000 ha, i.e. about 40% of the target to be achieved by 2020 (Figure 7.20).

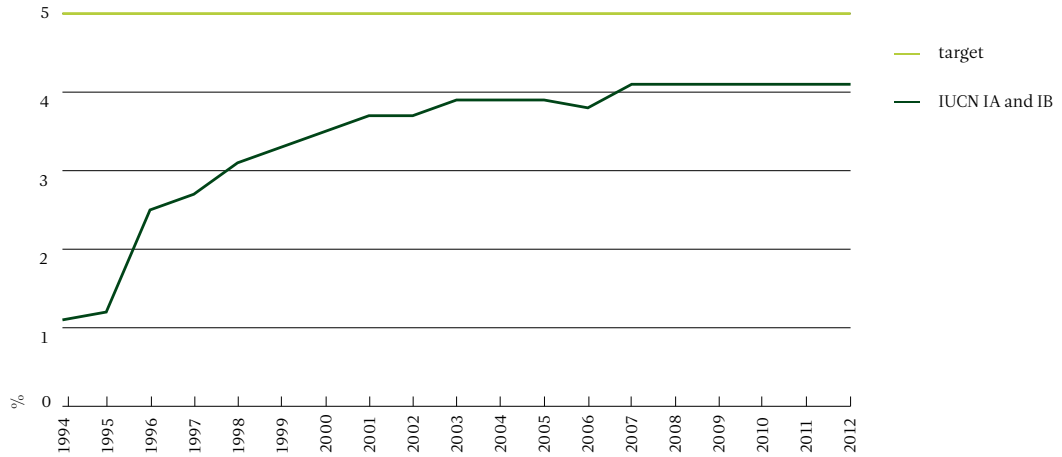


Figure 7.18. Areas under a protection regime that restricts the economic use of the land, 1994–2012 (the environment is maintained without human intervention, only for scientific research and monitoring purposes — IUCN categories Ia and Ib).

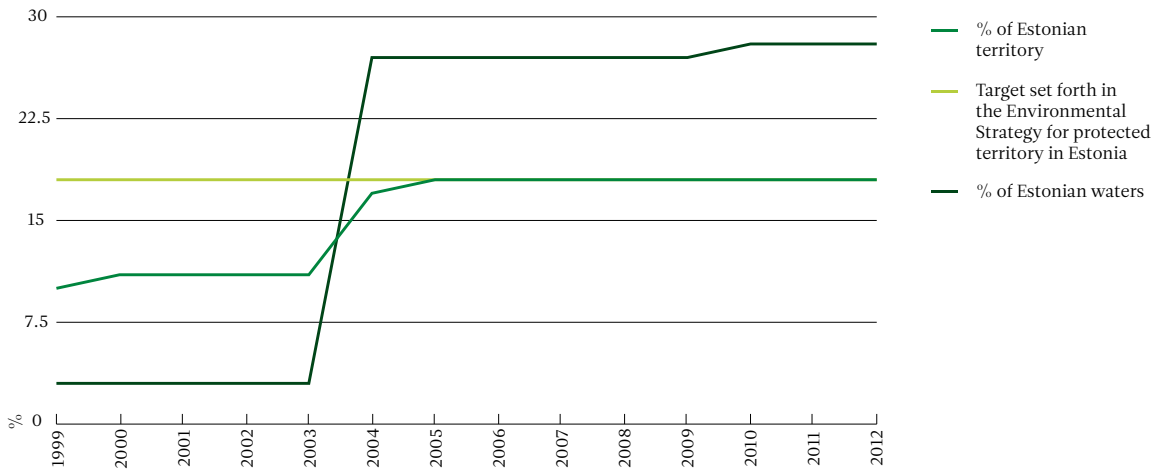
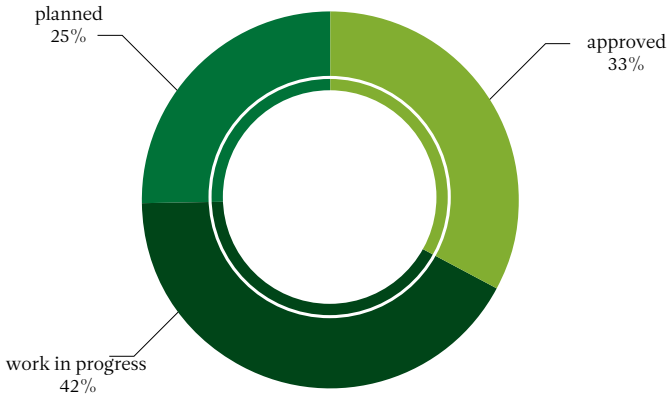


Figure 7.19. Protected area in Estonia in 1999–2012.



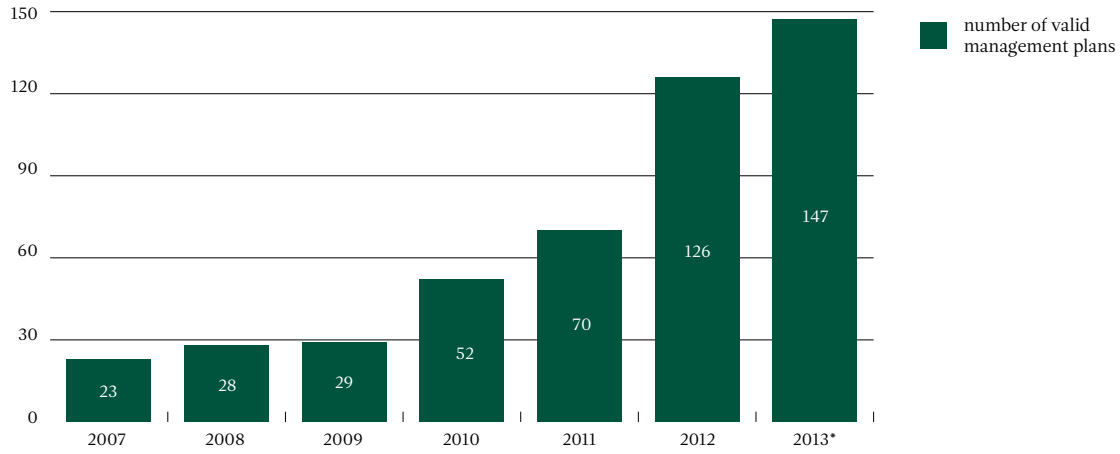


Figure 7.20. Number of valid management plans for the protection of protected areas by years and the share of areas covered by management plans by plan status. * as of 1 June 2013

7.4.2 Subsidies and compensations

The nature conservation development plan sets forth the following target for the protection of **semi-natural communities:** to increase the surface area of maintained wooded meadows to at least 3,300 ha, the area of alvars to at least 7,700 ha, the area of coastal meadows to at least 10,800 ha, the area of alluvial meadows to 12,200 ha and to maintain 1,650 ha of wooded pastures and 6,290 ha of grassland on mineral soil by 2020.

The maintained area of semi-natural communities is increasing year by year and the size of the area to be restored has been stable (Figure 7.21). However, an increase in the figures showing the surface area of maintained area does not reflect the actual situation — whether the semi-natural communities are continuously maintained and in a favourable status. The achievement of the objectives of the subsidies granted for maintaining semi-natural communities would be easier to assess if new areas were included in the subsidies scheme, which requires the analysis of whether it is possible to restore the communities and which economic methods are implemented on supported areas.

The following subsidies and compensatory measures – Natura 2000 compensation for agricultural land; Natura 2000 compensation for private forest land; subsidies for the maintenance of semi-natural communities – are granted under the Estonian Rural Development Plan (RDP) 2007–2013 and are funded from European Agricultural Fund for Rural Development (EAFRD) and co-financed from the state budget of Estonia (Table 7.4).

Natura 2000 compensation for agricultural land — the target to be achieved by the end of RDP 2007–2013 is 1,500 beneficiaries and 38,000 ha of land for which area-related compensation is granted. While the target for the number of beneficiaries for 2011 was almost achieved (99.6%), the target for the area for which compensation is granted was missed (60.5%). According to the monitoring report prepared under RDP 2007–2013, this means that Natura 2000 agricultural land is scattered between lands owned or used by different producers.

Natura 2000 compensation for private forest land — the number of applicants and the amount of compensation paid have increased by each application round. According to the monitoring report 2011 prepared under RDP 2007–2013, the information campaign and training targeted to forest owners was very successful[13].

Subsidies for the maintenance of semi-natural communities — the number of beneficiaries and the area for which support is granted have increased year by year. The targets for the end of RDP 2007–2013 are 1,500 applicants for support for the maintenance of semi-natural communities and 35,000 ha of the area for which support is granted. According to the monitoring report prepared under RDP 2007–2013, 61% of the target for applicants and 69% of the target for area for which support is granted were achieved by 2011.

Although the number of applicants, the surface area for which support is granted and the amount of support have increased year by year or remained at the same level, it should be noted that the amounts paid under the RDP are increasing faster than the amounts paid for the maintenance of semi-natural communities (see Chapter 1.2.4).

Before starting to maintain semi-natural communities, it is possible to apply to the Environmental Board for **nature conservation support**, which is intended to support the restoration of semi-natural communities located in protected areas, limited-conservation areas or species protection sites by removing shrubs and reed, reducing canopy density and building stock yards. Besides paying nature conservation support, the Environmental Board is carrying out **maintenance works** in order to preserve and maintain natural objects.

The share of amounts paid for restoring and maintaining semi-natural communities in all environmental charges received by the State Treasury is below 10%. This is not much and raises the question about whether the payment of environmental charges should be reviewed and reorganised (Figure 7.22).

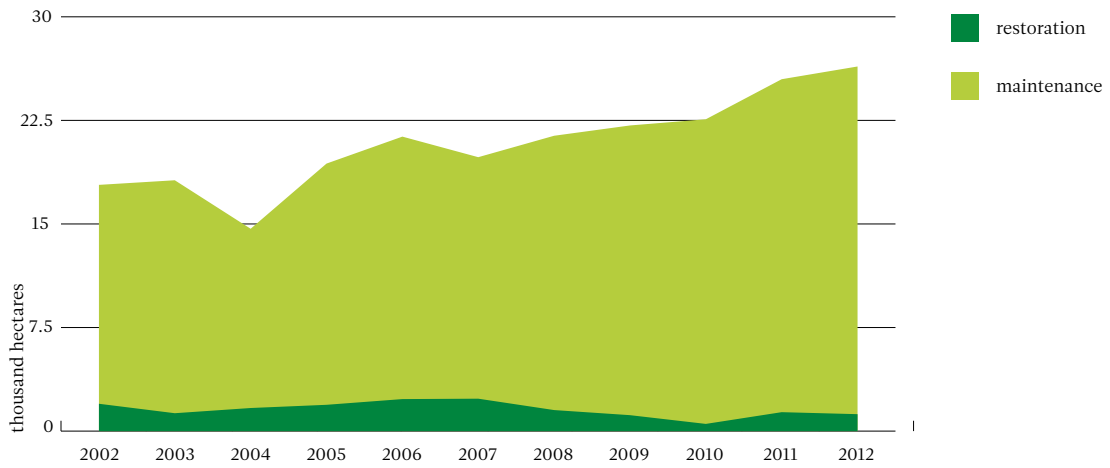


Figure 7.21. Restoration and maintenance of semi-natural communities in Estonia in 2002–2012.

13 http://www.agri.ee/seirearuanded

Table 7.4. Natura 2000 compensation granted for agricultural land, private forest land and subsidies for the maintenance of semi-natural communities. Amounts and share in total paid under the Rural Development Plan in 2004–2006 and 2007–2012. Source: Ministry of the Environment, Environmental Board, the Foundation Private Forest Centre, Estonian Agricultural Registers and Information Board

Year	Natura 2000 compensation for agricultural land (€)	% of amounts paid under the RDP	Natura 2000 compensation for private forest land (€)	% of amounts paid under the RDP	Natura 2000 subsidies for the maintenance of semi-natural communities (€)	% of amounts paid under the RDP	Amounts paid under the RDP 2004–2006 and 2007–2013 (€)
2007	864,275	1.7		0.0	2,770.313	5.5	50,204,722
2008	661,965	0.7		0.0	3,351,987	3.6	92,355,314
2009	674,240	0.6	1,640,150	1.5	3,821,391	3.5	109,367,186
2010	697,745	0.6	2,414,290	1.9	4,089,001	3.3	125,307,490
2011	712,425	0.5	3,104,327	2.0	4,442,776	2.9	152,094,731
2012	717,160	0.4	3,724,042	2.2	4,344,562	2.6	166,884,553

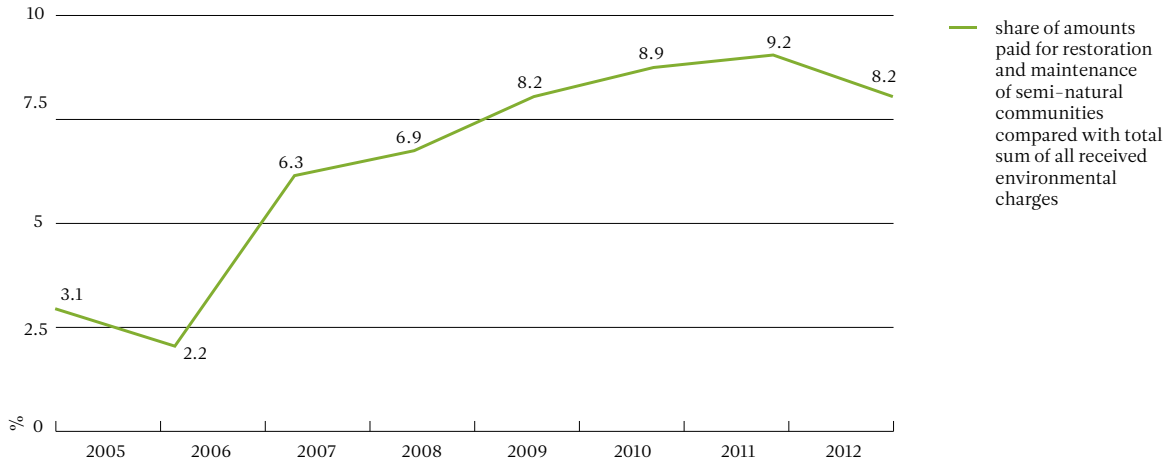


Figure 7.22 The share of amounts paid for restoration and ma intenance of semi-natural communities compared with total sum of all received environmental charges in 2005–2012 (Source: Ministry of the Environment, Environmental Board).

Further reading:

- eBiodiversity web page. *[www] http://elurikkus.ut.ee*
- Information page of the Estonian Nature Information System (EELIS). *[www] http://loodus.keskkonnainfo.ee/eelis*
- Nature Observations Database (LVA). *[www] http://loodus.keskkonnainfo.ee/lva*
- The Estonian Environment Agency. "Estonian Nature Conservation in 2011." (2012). *[www] http://www.keskkonnainfo.ee/publications/lka_uus12.pdf*
- The Estonian Environment Agency. "Estonian environmental indicators 2012." (2012). *[www] http://www.keskkonnainfo.ee/failid/kk_naitajad2012.pdf*

7.5 Ecosystem services

Biodiversity provides a range of benefits — known as **ecosystem services**, sometimes also referred to as ecosystem goods — to humanity. In 2001–2005, over 1,300 of the world's leading biological scientists were involved in preparing the Millennium Ecosystem Assessment (MEA) 2005. The report analyses the state of the Earth's ecosystems and describes ecosystem services. In the course of preparing the assessment, a scientific basis for the classification of ecosystem services and their protection was developed. The Millennium Ecosystem Assessment defined ecosystem services as various environmental, social and economic benefits that people obtain from ecosystems.

As our wellbeing depends not only upon material, but also on non-material aspects, such as good health, clean living environment, good social relations, sense of security, freedom of choice and action, ecosystem services are divided into multitude of benefits that ensure the wellbeing of mankind[14]. The Millennium Ecosystem Assessment 2005 identifies four groups of ecosystem services:

1. Supporting services — the services such as nutrient dispersal and cycling, soil formation, photosynthesis, habitats.

2. Regulating services — the services that regulate the climate and the quality of water, air and soil, water resources, flooding and pollination.

3. Provisioning services — the products obtained from ecosystems, including food, water, wood and other materials.

4. Cultural services — the non-material benefits people obtain from nature through aesthetic and spiritual enrichment, recreational experiences and scientific discovery.

Biodiversity is a foundation of the long-term vitality of agriculture, forestry, fishery and other economic sectors as well as a source of raw materials. Ecosystems function thanks to complex interrelations between species and the environment in which they exist. If we interfere with these relations, we have to ensure that our interference does not threaten the lives of these species and the provision of ecosystem services. In other words, we should take care not to shoot ourselves in the foot. **Biodiversity often provides the same services that are provided by high-tech solutions, but for a considerably smaller price.** We can save a lot of money by protecting and restoring ecosystems. Restoring 1 ha of rainforest costs 3,500 USD. The benefits from that 1 hectare — rainforests act as carbon sinks, help to prevent floods and erosion — are twofold (between 6,000 and 16,000 USD). The value of services provided by coral reefs is estimated at 115,000–1,140,000 USD per year. A good example is a decision by the heads of the State of New York to protect ecosystem services. The 8 million inhabitants of the state receive their drinking water from the Catskill watershed. By 1996, the pollution from agriculture and urban sprawl had reached such levels that wetlands were not able to filter water any more. Instead of building an expensive water treatment system, the heads of the state decided to place the Catskill watershed under protection, limiting the development activities and the amount of waste. The State of New York spent between 1 and 1.5 million US dollars on restoring ecosystems. A new wastewater treatment plant would have cost between 6 and 8 million US dollars plus annual maintenance costs. **Biodiversity must be protected and preserved because our very lives depend on it.** Healthy ecosystems guarantee our wellbeing. We should bear in mind, however, that biodiversity is a value by itself. Decision-makers are often faced with the question of how much the protection and conservation of biodiversity will cost. What is the cost to society of protecting a species or an ecosystem and of giving up short-term economic profit for long-term environmental gain? Instead, we should ask what the cost is of giving up protecting the environment and pursuing short-term benefits.

Sources:

• Sall, M., Uustal, M., Peterson, K. (2012). Ökosüsteemiteenused. Ülevaade pakutavatest hüvedest ja nende rahalisest väärtusest. SA Säästva Eesti Instituut/ Stockholmi Keskkonnainstituudi Tallinna keskus. Tallinn: SEI issue No 18.

14 MEA — Millennium Ecosystem Assessment. (2005). Ecosystems and Human Wellbeing: Synthesis. Island Press. Washington, DC.