PRIORITISED ACTION FRAMEWORK (PAF)

FOR NATURA 2000 in FINLAND including the Province of Åland

pursuant to Article 8 of Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive)

for the *Multiannual Financial Framework* period 2021 – 2027

Contact address: Ministry of the Environment
P.O. Box 35, 00023 GOVERNMENT, Finland
Kristiina.niikkonen@ym.fi (Milka.Parviainen@ym.fi)

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A. Introduction

A.1 General introduction

Prioritised action frameworks (PAFs) are strategic multiannual planning tools, aimed at providing a comprehensive overview of the measures that are needed to implement the EU-wide Natura 2000 network and its associated green infrastructure, specifying the financing needs for these measures and linking them to the corresponding EU funding programmes. In line with the objectives of the EU Habitats Directive[1] on which the Natura 2000 network is based, the measures to be identified in the PAFs shall mainly be designed "*to maintain and restore, at a favourable conservation status, natural habitats and species of EU importance, whilst taking account of economic, social and cultural requirements and regional and local characteristics*".

The legal basis for the PAF is Article 8 (1) of the Habitats Directive[2], which requires Member States to send, as appropriate, to the Commission their estimates relating to the European Union co-financing which they consider necessary to meet their following obligations in relation to Natura 2000:

- *to establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans,*
- *to establish appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types in Annex I and the species in Annex II present on the sites.*

Prioritised action frameworks shall therefore focus on the identification of those financing needs and priorities that are directly linked to the specific conservation measures established for Natura 2000 sites, in view of achieving the site-level conservation objectives for those species and habitat types for which the sites have been designated (as required by Article 6(1) of the Habitats Directive). Given that the Natura 2000 network also includes the Special Protection Areas (SPAs) designated pursuant to the EU Birds Directive 2009/147/EEC[3], the financing needs and priority measures associated with bird species in SPAs are therefore also considered here.

Member States are invited to also present in their PAFs additional measures and their financing needs related to wider green infrastructure (GI)[4]. Such green infrastructure measures are to be included in the PAF where they contribute to the ecological coherence of the Natura 2000 network, including in a

[1] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01992L0043-20130701

[2] Article 8 (1): "In parallel with their proposals for sites eligible for designation as special areas of conservation, hosting priority natural habitat types and/or priority species, the Member States shall send, as appropriate, to the Commission their estimates relating to the Community co- financing which they consider necessary to allow them to meet their obligations pursuant to Article 6 (1)."

[3] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009L0147

[4] Green Infrastructure is defined as 'a strategically planned network of natural and semi-natural areas with environmental features designed and managed to deliver a wide range of ecosystem services'.

cross-border context, and to the objective of maintaining or restoring favourable conservation status of the targeted species and habitats.

In its Special Report N° 1/2017 on Natura 2000[5] the European Court of Auditors concluded that the first completed PAFs (for the MFF period 2014-2020) did not present a reliable picture of the actual costs of the Natura 2000 network. The report therefore highlighted the need for updating the PAF format and providing further guidance for improving the quality of information that Member States provide in their PAFs. The recent EU Action plan for nature, people and the economy[6] commits to this process, with a view to ensuring that Member States provide more reliable and harmonised estimates of their financing needs for Natura 2000.

In its conclusions on this action plan[7], the Council of the European Union recognises the need for further improving the multiannual financial planning for investments in nature and agrees that there is a need to update and improve the PAFs. The importance of better forecasting the financing needs for Natura 2000 ahead of the next EU Multiannual Financial Framework is also recognised in a resolution by the European Parliament[8].

A.2 Structure of the current PAF format

The current PAF format is designed to provide reliable information about the priority Natura 2000-related financing needs, with a view to their incorporation in the relevant EU funding instruments under the next Multiannual Financial Framework (MFF) 2021-2027. To this aim, the PAF requires a level of breakdown of financing needs that would allow for an effective allocation of the Natura 2000 funding under the relevant EU funds for the MFF 2021-2027. With a view to that goal, the PAF also takes into consideration the experience that EU Member States and regions have gained so far with the MFF 2014-2020.

An essential component of the current PAF format is the required breakdown of the Natura 2000- and green infrastructure-related conservation and restoration measures per broad ecosystem category. The proposed ecosystem typology of 8 classes is very largely based on the MAES typology, which was established as a conceptual basis for an EU wide ecosystem assessment[9]. A comprehensive database allocating individual species and habitat types of EU importance to the MAES ecosystems is available for download from the European Environment Agency website[10]. It is recommended that the allocation of measures and costs to ecosystem types should largely follow this typology.

The presentation of priority measures and costs of the current PAF requires a distinction between running costs and one-off expenditure. Whereas running costs are typically associated with recurring measures that need to be continued in the long term (f. ex. staff costs for site management, annual

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[5] Special Report No 1/2017: More efforts needed to implement the Natura 2000 network to its full potential https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=40768

[6] COM(2017) 198 final: An Action Plan for nature, people and the economy http://ec.europa.eu/environment/nature/legislation/fitness_check/action_plan/communication_en.pdf

[7] http://www.consilium.europa.eu/en/press/press-releases/2017/06/19/conclusions-eu-action-plan-nature/

[8] European Parliament resolution of 15 November 2017 on an Action Plan for nature, people and the economy (2017/2819(RSP)) http://www.europarl.europa.eu/sides/getDoc.do?type=TA&language=EN&reference=P8-TA-2017-0441

[9] https://biodiversity.europa.eu/maes

[10] Linkages of species and habitat types to MAES ecosystems https://www.eea.europa.eu/data-and-maps/data/linkages-of-species-and-habitat#tab-european-data

payments to farmers for agri-environmental measures on grasslands, etc.), one-off expenditures are typically related to non-recurring actions such as habitat restoration projects, large infrastructural investments, purchase of durable goods, etc. The correct allocation of costs to either category ("running" versus "one-off") will be highly relevant for a correct allocation of measures under different EU funds.

Finally, priority measures under this PAF will not only contribute to the specific objectives of the EU nature directives, but will also provide important socio-economic and ecosystem service benefits to the society. Examples of benefits may include climate mitigation and adaptation, or other ecosystem services such as those related to tourism and culture. The Commission has already provided an overview of ecosystem services benefits related to Natura 2000.[11]

This aspect should be emphasized where possible, with a view to promote and communicate the wide societal benefits of funding nature and biodiversity.

A.3 Introduction to the specific PAF of Finland including the Province of Åland

Natura 2000 network in Finland

The Prioritized Action Framework (PAF) covers the entire Natura 2000 (N2000) network in Finland, totalling 1,866 approved sites. Of these, 1,779 are in mainland Finland and 87 in the independently governed Province of Åland in SW Finland. Mainland and Åland site numbers and surface area are indicated separately but are reported in total. Prioritized measures are also mentioned independently for Åland, where appropriate.

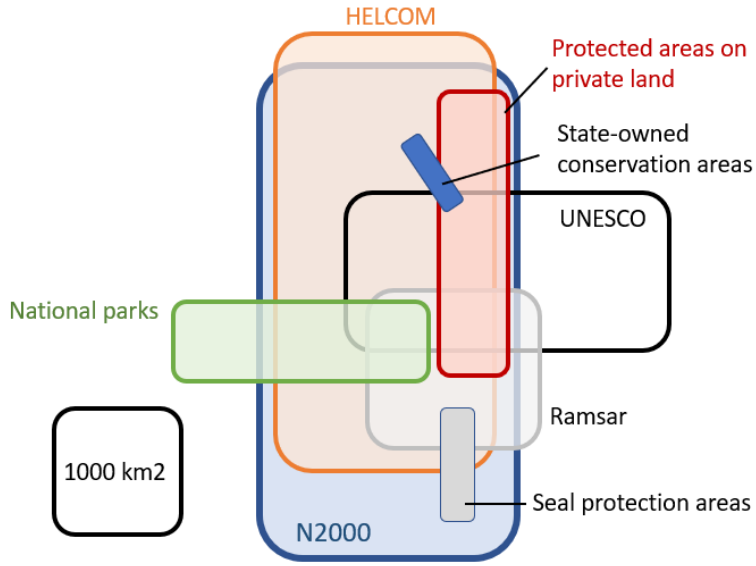
The N2000 network surface area in Finland is 5.2 million hectares; equalling circa 12,6% of total national surface area. Three quarters of the area is terrestrial and one quarter marine. The N2000 network of Finland covers about 4,2% of the total extent of the present network across the European Union (according to Natura 2000 barometer 12/2019 for EU27). Several extensions to marine areas of existing sites and supplementary sites were proposed by a Government resolution in December 2018. Proposed extensions to Sites of Community Interest (SCI) remain to be approved by the Commission.

The areas originally proposed in 1998 for the Natura 2000 network in Finland largely coincide with the sites of the national protected area system, although boundaries of national sites may differ from those of N2000 sites. The national network consists of established nature reserves, including 40 national parks, and other sites already designated in national Nature Conservation Programmes (approved as Government resolutions 1976-1996), as well as 12 extensive wilderness reserves in Northern Finland. The Programmes aim to protect most valuable forest, mire, shoreline and waterfowl habitats as well as remaining natural eskers and rapids. Some of the sites designated for conservation are in a process of final enactment as statutory nature reserves. Establishment of site provisions is part of completing necessary measures to secure favourable conservation status of the habitats and species of community interest.

The N2000 network in Finland helps to protect also natural habitats that had previously been inadequately protected, including especially aquatic ecosystems in coastal waters and archipelagos, lakes, major rivers, smaller water features, rocky habitats, and cultural landscapes. About 15% of the Finnish N2000 network area is situated outside of the national protected area designations and the conservation objectives in these areas are realised by other measures. Such areas may form only part of any N2000 site (typically waters were left out of older national protected area designations) or constitute the site entirely.

[11] http://ec.europa.eu/environment/nature/natura2000/financing/

Natura 2000 sites in Finland overlap also with international protected area designations, namely the marine protected areas designated under the Convention on the Protection of the Marine Environment of the Baltic Sea (HELCOM MPAs), wetland protection sites designated under the Ramsar Convention and UNESCO natural world heritage site designated under the World Heritage Convention. The complicated overlaps of different designations in coastal and marine zone of Finland area depicted in the below.



An indicative presentation of the extent and overlaps of different marine protected area types in the Finnish sea areas. (Joonas Hoikkala, Metsähallitus)

Green infrastructure supporting coherence of the Natura 2000 network

In Finland, the N2000 sites and their conservation objectives are markedly supported by national protected areas and other area-based conservation measures sites (OECMs) that lay outside of the N2000 network. The work on defining OECMs is still ongoing in Finland at the time of writing. Several OECM area types in agricultural and forest environments have been defined and possible area types under discussion for the marine environment are for example fishing restriction and boating restriction areas that are set to protect fish spawning sites or migratory ways.

The protected areas outside of the N2000 network cover in total over 400,000 ha (4,000 km2) and include sites on state owned and private lands that were designated outside of the original Nature Conservation Programmes or after proposal of first N2000 sites. About half of this nationally designated surface is marine area, where habitats and species of community value had not yet been comprehensively surveyed when sites were originally proposed for the N2000 network at the end of the 1990's and thus were left out. After extensive underwater inventories, marine N2000 sites have since been supplemented several times (most recently in 2012 and 2018). Very large marine areas have also been included in recently established or extended national parks (e.g. Bothnian Sea and Archipelago Sea National Parks).

New national nature conservation programmes have also been realized in the past decade, especially aiming to protect and restore forests and mires in Southern Finland. As part of the Forest Biodiversity Programme METSO (2008–2025) and Supplementary Mire Conservation Programme in 2014-2015, the protected area network in state-owned lands has been systematically expanded by more than 50,000 ha, supported by GIS-based Zonation conservation prioritization software analysis.

Furthermore, systematic and comprehensive landscape ecological planning of state-owned lands and regional land use planning have also helped to extend the ecological network and green and blue infrastructure around Natura 2000 sites. A total of 475,500 ha of valuable biodiversity-based sites have been set aside in state-owned commercial forests and another 98,200 ha of special areas for other reasons. Forestry operations are restricted in these areas, or they are excluded entirely from commercial forestry use. Conservation and habitat management measures that are supported by environmental subsidies in privately-owned forests and cultivated agricultural areas, are important elements of the national ecological network.

Enhancement of green infrastructure especially in urban areas is one of main the goals in regional land use planning. Provincial and municipal plans are updated regularly. Areas are indicated for recreation and reserved for conservation. Ten national urban parks that are based on the Land Use and Building Act, have been established in Finland to protect and maintain the beauty of the cultural or natural landscape, biodiversity, historical characteristics or related values concerning the townscaping, social, recreational or other special values.

Marine spatial plans likewise aim to advance the development of blue infrastructure in the entire coastal zone of Finland. Maps and descriptions of Finnish ecologically significant marine underwater areas (EMMA) have been produced under the Finnish Inventory Programme for the Underwater Marine Environment VELMU, for the Finnish marine spatial planners[12]. In addition, recommendations on how to take into account conservation and other objectives of existing protected areas were compiled by marine experts of Parks & Wildlife Finland [13].

Administrative setup and organisation of management

Almost 80% of the total area of the Natura 2000 network in mainland Finland is owned by the state and governed by the national agency Metsähallitus. Protected areas are managed by Parks and Wildlife Finland and multi-use forests by Metsähallitus Forestry Ltd. The remaining 20% of the N2000 area is owned by municipalities, organizations and private landowners. The regional environment administration (presently organized in 13 Centres for Economic Development, Transport and the Environment or ELY Centres) is responsible for the coordination of conservation and management measures of N2000 sites in mainland Finland, although municipalities and Metsähallitus Parks and Wildlife Finland are involved in planning and operational management work in cooperation with landowners and other stakeholders. The independent government of Åland (Åland landskapsregering) is responsible for the N2000 sites within the Province.

The Ministry of the Environment (MoE) has top responsibility for implementation, monitoring, evaluation and reporting of the Natura 2000 network. The Finnish Environment Institute (FEI, Biodiversity Centre) is also involved in site-based information management (Standard Data Forms), monitoring and reporting of the N2000 sites. Parks & Wildlife Finland, the ELY Centres and FEI are all directed and financed mainly by the MoE.

The Ministry of Agriculture and Forestry also has an important role, especially in coordinating and financing actions that involve issues of sustainable use of land and natural resources, inside and outside of protected areas, including N2000 sites. These involve measures in agriculture and forestry, fishery and game management, reindeer husbandry and nature tourism. The Ministry also has a coordinating role in the national combat against harmful effects of invasive alien species.

[12] Reference to the publication J. Lappalainen, L. Kurvinen, L. Kuismanen 2020. Suomen ekologisesti merkittävät vedenalaiset meriluontoalueet (EMMA). Suomen ympäristökeskuksen raportteja 8/2020. http://hdl.handle.net/10138/312221

[13] Reference to the publication Arnkil Anna, Hoikkala Joonas, Sahla Matti (toim.) 2019. Suojelualueet merialuesuunnittelussa - suositus suojelualueiden huomioimiseksi. Metsähallitus. https://julkaisut.metsa.fi/julkaisut/show/2396

PAF process in Finland

The MoE has coordinated formulation of the PAF. Representatives of the Åland government have taken part in the work. Active consultation and involvement of many other stakeholders has taken place during the drafting process. A stakeholder seminar was arranged in November 2018 in cooperation with FRESHABIT LIFE IP project[14] leader Metsähallitus Parks and Wildlife Finland and representatives of EC. Many of the consulted organizations and experts are or have previously been involved in relevant projects financed by the EU.

In November 2020 a stakeholder webinar to present the state of the PAF process and activate an intensive PAF update work with stakeholders was organised by the MoE.[15]The webinar was open for all stakeholders to participate Around 100 people representing the environmental and nature resource administration, NGOs, research institutes and regional councils participated the webinar and gave comments to the PAF draft. In the webinar the stakeholders got a possibility to ask and comment on the issues they consider are relevant for the Finnish PAF. The main outcome of the webinar was to deliver basic information on what is PAF, why it is prepared and to whom and to shortly present the state of the different sections of PAF. What comes to the content of the PAF, especially the section E.2.2. Heathlands and shrubs were updated based on the comments received.

Metsähallitus Parks and Wildlife Finland, together with members of the Finnish Board on Ecological Restoration FBER, and other experts from the Ministries, research institutes (Finnish Environment Institute, Natural Resources Institute Finland) and regional environment administration, have collectively formulated the prioritized habitat restoration and management measures and calculated related costs estimated for the coming financing period 2021-2027. Prioritization was done with help of sophisticated spatial analysis (see below).

The FBER is a nationwide cooperation body for ecological restoration and management that brings together experts in nature management. It consists of a steering group and three expert groups:

- Finnish Expert Group for Forest Restoration: FBER Forest Group
- Finnish Expert Group for Semi-natural Grasslands: FBER Grassland group
- Finnish Expert Group for Peatland Restoration: FBER Peatland Group

Members in the working groups include actors in the management of Finland's natural environments and semi-natural grasslands, researchers and other experts. Its activities cover habitats on land and in freshwaters, in protected areas, in forests and on agricultural land, whether state-owned or in private ownership.

Challenges encountered in completing the PAF

One particular challenge encountered in completing the PAF in Finland has been lack of personnel resources dedicated for the PAF preparation within the Ministry of the Environment as well as within other organisations, especially the Ministry of the Agriculture and Forestry, The Government of Åland and Finnish Environment Institute. The PAF requires information that cannot be produced or collected by one organisation because e.g. the information from other EU financing is administrated and coordinated by other sectoral ministries.

[14] FRESHABIT LIFE IP is a LIFE integrated project, funded from the 2014 call and coordinated by National Parks Finland. The project has a focus on freshwater habitats and species but being a Nature IP -project the target of the project is a roadmap to full implementation of the PAF. In FRESHABIT there are many encouraging examples of complementing the LIFE funds with funding from other sources. In total, the amount of realized complementary funding exceeds 86 M € by the end of year 2018, with complementary actions ranging from exchange of knowledge and methodology to complementary restoration and monitoring activities in target sites. In addition, a significant part of the work is done outside the target Natura 2000 sites, in the catchments of the target water bodies. The project combines the expertise of all relevant sectors for the improvement of the target areas and has gained lots of attention and positive publicity.

[15] The webinar "Kick-off webinar for SNaP preparation" was organised by LIFE preparatory project LIFE IPpromo and mainstreaming, which was granted in 8/2020.

Prioritization of ecosystem improvement measures

Two major prioritization approaches have been applied to maximize ecosystem improvement cost-effectiveness in Finland. The aim was to identify areas, which, when restored or managed, would result in highest increase in ecological value of the Finnish N2000 network.

In the Finnish Restoration Prioritization -project approximately 100 habitat experts were involved to determine habitat specific cost-efficient methods within and outside protected areas to cost-efficiently improve ecosystems' status in Finland. In addition, the findings of the Finnish Restoration Prioritization expert group were applied in spatial prioritization analysis (Zonation approach) where protected N2000 areas were prioritized according to their potential with respect to cost-effective ecosystem restoration and management. Data of several databases have been used for prioritization, especially biotope data of SAKTI (System for management of protected area biotope information) and data of Hertta (Database for threatened species).

These prioritization approaches led to identification of priority habitats, priority methods, and priority areas. In addition, experts were able to analyze trade-offs related to prioritizing habitats and areas with differing restoration and management costs and outcomes. In other words, it was possible to identify qualitative and quantitative ecosystem restoration and management potential both within and outside the Finnish N2000 network. However, freshwater habitats were not involved in this prioritization due to lack of comparable data.

These results were now further applied here in the process of determining the PAF measures in Finland for the period 2021-2027. The Zonation approach was applied in prioritization of following habitat groups: Bogs, mires and fens (E.2.3.), Woodlands and forests (E.2.6.) and Rocky habitats, dunes & sparsely vegetated lands (E.2.7.).

Coordination of PAF measures with ongoing habitat programmes

The HELMI habitats programme, a joint programme, led by the Ministry of the Environment and the Ministry of the Agriculture and Forestry, aims to strengthen Finland's biodiversity and safeguard the vital ecosystem services that nature provides for us. At the same time, the programme is working to curb climate change and promote adaptation to it.

Through the programme, Finland is taking effective action on behalf of biodiversity by:

- protecting and restoring mires.
- rehabilitating aquatic bird habitats, wetlands and coastal areas.
- managing semi-natural grasslands.
- managing forest habitats, such as herb-rich forests and sun-exposed esker forests.
- managing and rehabilitating coastal and aquatic environments, such as sandy beaches.

The programme's actions will provide help to hundreds of endangered species and most of the endangered habitats in our country, in N2000 sites as well as other protected areas and OECMs. The Helmi programme is based on both measures by government agencies, municipalities and voluntary action by landowners and other stakeholders.

The Finnish Parliament has allocated 42 million euros for habitat restoration and conservation in 2020 and over 50 million euros for 2021. The actions taken in 2020 include action plans, surveys and inventories, as well as conservation, restoration and rehabilitation of habitats. Almost 5 000 hectares of mire habitats have already been conserved. In the long run the budget will rise and expand to the MAF administration.

In addition, long-term objectives for the Helmi programme are prepared. The Ministry of the Environment has appointed a broad-based steering group and a working group to prepare the objectives and content of the programme until 2030. The groups should complete their work by the end of March 2021. Based on the outcome of this work, the Ministry of the Environment will draw up a decision on the Helmi programme to be submitted to the Government for approval during spring 2021.

The aims and actions as well as financial needs to fully execute the Helmi habitat programme both inside and outside the N2000 network will be unified with the PAF throughout the MFF. Habitat-specific aims of the Programme are presented in section E2.

The Water protection programme 2019-2023, also led by the MoE, aims to enhance effectiveness of conservation actions by allocating funds, strengthening cooperation and introducing new practices and methods both within waters and the surrounding catchment areas. These include innovative water management measures in agriculture and forestry as well as watercourse restoration, urban waste management and reduction of discharges of harmful substances, restoration of potentially risky shipwrecks in Finland's territorial waters, and production of research data to support protection of the Baltic Sea and inland waters. Also the measures of this Programme will be integrated with this PAF.

The Forest Biodiversity Programme METSO 2008–2025 is a joint programme led by the Ministry of the Environment and the Ministry of the Agriculture and Forestry. The programme aims to halt the ongoing decline in the biodiversity of forest habitats and species, and establish stable favourable trends especially in Southern Finland's forest ecosystems. The main goals are to improve protected area network and to increase biodiversity in commercial forests.

In METSO programme landowners can voluntarily offer their forests to permanent or fixed-term conservation and to receive full monetary compensation for that. The nature management projects come at no cost to the forest owner.

The site selection criteria used in METSO programme are based on the ecological structure of forests as well as on forest habitats important for biodiversity and ecosystem services. Sites where habitats are in their natural state or could easily be restored are especially favoured. Rare or endangered species or good ecological connectivity increases the ecological value of the site.

The objectives for METSO are to have 96,000 hectares of forest established as permanently protected areas and to safeguard biodiversity on 82,000 hectares of forest habitats in commercially managed forests by means of fixed-term environmental forestry subsidy agreements and nature management projects by the year 2025. With these goals METSO is an important tool in fulfilling the targets set in the national, EU and global biodiversity strategies and action plans. The METSO programme is implemented mainly outside the N2000 network. The aims and actions of METSO programme will be included in the actions and financial needs of section E.2.6. Woodlands and Forests.

Marine Strategy Framework Directive Programme of Measures

To achieve good environmental status for marine areas, a programme of measures according to Marine Strategy Framework Directive has been prepared for Baltic Sea. The Programme of Measures includes existing and new measures to achieve and maintain a good environmental status. The implementation of the Programme is ongoing between 2016 and 2021.The next update of the Programme of Measures for 2022-27, is to take place in 2021.

Maritime spatial plan

Finland's coastal regions have developed three maritime spatial plans and Åland Islands will compile its own plan, according to Maritime Spatial Planning Directive. The administrative authorities of each coastal regional council will approve the Maritime spatial plans in terms of their own jurisdictions by the end of 2020. Maritime spatial plans have been prepared in cooperation with stakeholders. Maritime spatial planning promotes sustainable development and growth for different marine uses, the sustainable use of natural resources, and the achievement of the good status of the marine environment.

HELCOM

In a Baltic wide context, the work done in marine and coastal environment is related to work done within HELCOM. There are e.g. so-called recommendations, that all the contracting parties have agreed to follow, that cover topics such as MPAs and threatened species and habitats, which have linkages to HD and BD. Furthermore, the Baltic Sea Action Plan, which is being updated at the time of writing, will likely include new actions related to e.g. MPA coverage and effectiveness and marine restoration.

B. Summary of priority financing needs for the period 2021-2027

		Priority financing needs 2021-2027	
1.	**Horizontal measures and administrative costs related to Natura 2000**	Annual running costs (Euros / year)	One-off / project costs (Euros / year)
1.1.	Site designation and management planning	3 000 000	52 628 000
1.2.	Site administration and communication with stakeholders	117 560 000	1 715 000
1.3.	Monitoring and reporting	3 066 286	3 710 000
1.4.	Remaining knowledge gaps and research needs	790 000	2 015 000
1.5.	Natura 2000-related communication and awareness raising measures, education and visitor access	1 450 000	4 070 000
	Sub-total	**125 866 286**	**64 138 000**

2.a	**Natura 2000 site-related maintenance and restoration measures for species and habitats**	Annual running costs (Euros / year)	One-off / project costs (Euros / year)
2.1.a	Marine and coastal waters		885 000
2.2.a	Heathlands and shrubs	200 000	
2.3.a	Bogs, mires, fens and other wetlands	140 000	1 560 000
2.4.a	Grasslands	16 675 884	3 752 858
2.5.a	Other agroecosystems (incl. croplands)	303 720	
2.6.a	Woodlands and forests	70 000	840 000
2.7.a	Rocky habitats, dunes & sparsely vegetated lands	1 291 000	43 650
2.8.a	Freshwater habitats (rivers and lakes)		413 000
2.9.a	Others		
	Sub-total	**18 680 604**	**7 494 508**

2.b	**Additional "Green infrastructure" measures beyond Natura 2000 (further improving coherence of the Natura 2000 network, including in a cross-border context)**	Annual running costs (Euros / year)	One-off / project costs (Euros / year)
2.1.b	Marine and coastal waters	69 060 000	
2.2.b	Heathlands and shrubs	100 000	
2.3.b	Bogs, mires, fens and other wetlands	280 000	5 840 000
2.4.b	Grasslands	26 635 088	6 703 122
2.5.b	Other agroecosystems (incl. croplands)	6 800 000	
2.6.b	Woodlands and forests	560 000	1 940 000
2.7.b	Rocky habitats, dunes & sparsely vegetated lands	1 140 000	
2.8.b	Freshwater habitats (rivers and lakes)	500 000 000	3 770 500
2.9.b	Others (caves, etc.)		
	Sub-total	**604 575 088**	**18 253 622**

3.	**Additional species-specific measures not related to specific ecosystems or habitats**	Annual running costs (Euros / year)	One-off / project costs (Euros / year)
3.1	Species-specific measures and programmes not covered elsewhere	6 747 352	7 928 540
3.2.	Prevention, mitigation or compensation of damage caused by protected species	7 650 000	1 076 500
	Sub-total	**14 397 352**	**9 005 040**

	Annual total	**763 519 330**	**98 891 170**
	Total (2021-2027)	**6 036 873 500**	

C. Current state of the Natura 2000 network

C.1. Area statistics of the Natura 2000 network

In Finland, 5.2 million hectares are presently covered by the Natura 2000 network. Three quarters of the area is land and one quarter is water. The overall number of individual areas is 1,866, of which 87 are in the independently governed island province of Åland. The northernmost part of Lapland is part of the Alpine Region, whereas rest of Finland is part of the Boreal Region. Finland's coastal and marine N2000 sites are a part of the marine protected area network of the northern Baltic Sea (MBAL Region).

There are 1,721 SAC areas pursuant to the Habitats Directive in Finland. They cover an area of 4.3 million hectares, which is about 12.5% of the overall area of Finland. There are 470 SPA sites pursuant to the Bird Directive, and they cover an area of 3.2 million hectares, i.e. around 7,3% of Finland's overall area. 320 SAC and SPA areas are completely overlapping, several others overlap partly. (Natura 2000 Barometre 12/2019, EU27)

The size of Natura 2000 sites in Finland varies from those under one hectare to ten northern sites of over 100,000 ha (1,000 km2), which together form over 40% of the total network area. 80% of the sites are under 1,000 ha.

Coastal and marine Natura 2000 sites

There are presently altogether some 230 Natura 2000 sites (SAC & SPA) with marine areas in Finland, including Åland. All together, they cover over 8100 km2 of marine waters, equalling 9,9% of Finnish marine areas including the EEZ.

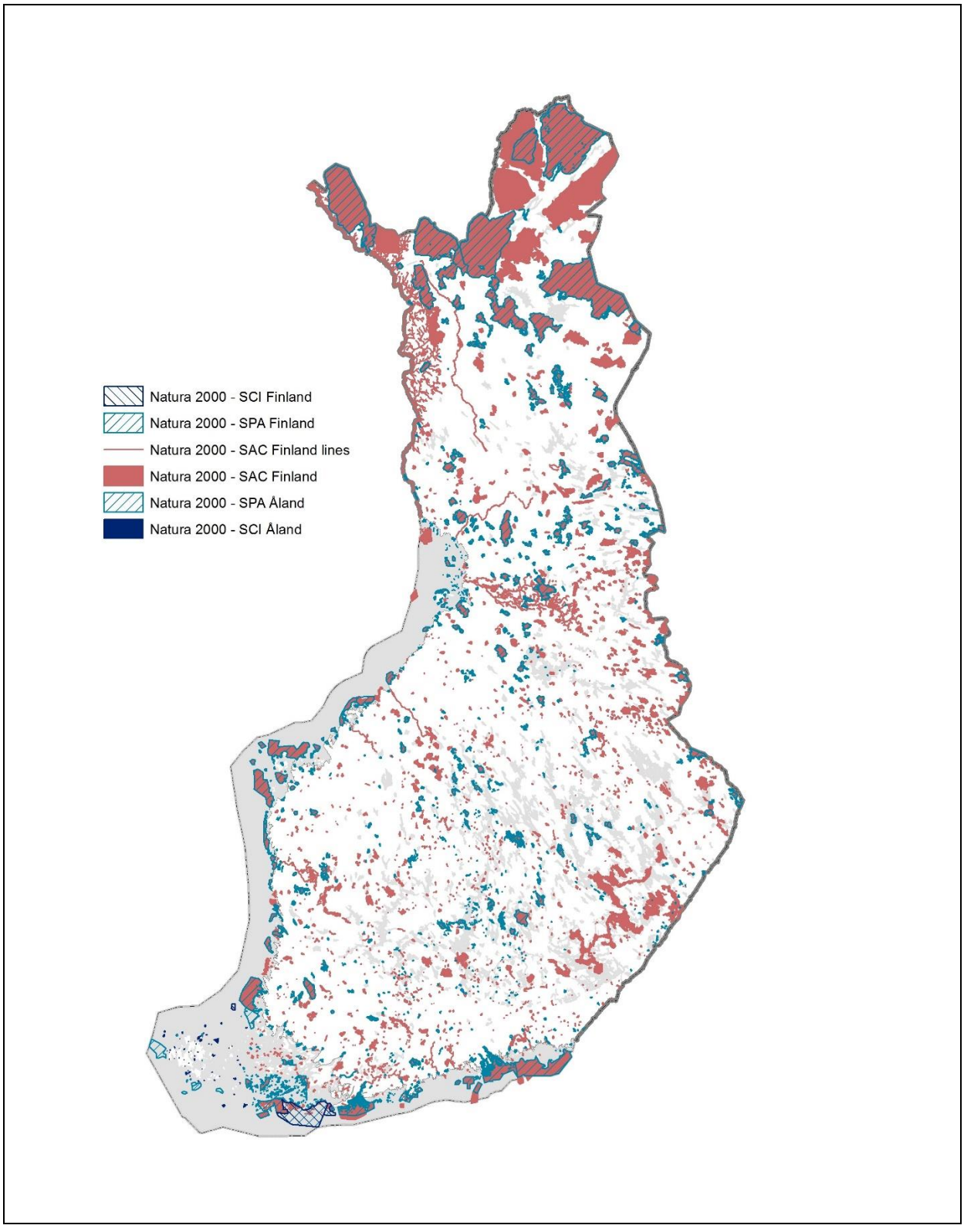
Finland's territorial coastal waters and the sea floor in these areas are mostly state-owned. The main exception are waters surrounding Åland, which are the property of the autocratic municipality. In the inner archipelago on Finland's seacoast there are also internal private waters.

Of the marine Natura 2000 sites, 32 are also designated in the HELCOM MPA network. Six HELCOM MPAs are in the Åland Sea area, and one of these is not in the N2000 network. In all, 49 Finnish N2000 sites are designated as Ramsar sites. There are several bird-rich estuaries on the coast as well as inland bird waters and important breeding areas in peatlands. A few N2000 sites are designated in both networks. Most of IBA/FINNIBA sites coincide with N2000 sites.

	Natura 2000 area data per EU Member State (in km²)						Proportion (in %) of the land area covered by:		
	Terrestrial			Marine					
Name of region	**SCI**	**SPA**	**N2K**	**SCI**	**SPA**	**N2K**	**SCI**	**SPA**	**N2K**
Total	42,197	24,550	43,002	7,676	7,402	8,141	12,5	7,3	12,6

Reference: Natura 2000 Barometre 12/2019

C.2. Map of the Natura 2000 network in Finland



D. EU and national financing of the Natura 2000 network during the period 2014 – 2020

This section provides a comprehensive overview of the funding allocated to Natura 2000, protection of species of EU interest and green infrastructure during the period 2014-2020. This data should help the Commission and national/regional authorities assess to what extent the financial needs of Natura 2000 are currently met and what the funding gap is.

D.1 European Agricultural Fund for Rural Development (EAFRD)

Total allocation from the EAFRD to the Member State/region: **8 209 131 757 €**

Measure	**Total current allocation to the EAFRD measure**		**Current allocation to actions or sub-measures relevant for Natura 2000**		**Current spending on actions or sub-measures relevant for Natura 2000**		**Comments** (relevance, experience to-date, challenges for the next period)
	EU	**National**	**EU**	**National**	**EU**	**National**	
M4 Investments in physical assets	181860000	907140000					M4 has included non-productive investments (M4.4) aimed for restoration of semi-natural grasslands (total expenditure 1,49M€ in 2015-2018) and establishing small wetlands (4,45M€, respectively). These sub-measures have been evaluated as highly beneficial for biodiversity.
M7 Basic services & village renewal in rural areas	33600000	46400000	2100000	2900000	285170,52	393806,92	Part of the funded projects in M7 have focused on ´preparing local or regional management plans to enhance either landscape or biodiversity values (M7.1). However, it seems that N2000-related financing is mainly composed from measures 7.6 Culture and natural heritage and 7.5 Spare time and tourism investments. 12 projects related to N2000 identified.
M8 Investments in forest area							Measure has not been applied in Finland
M10 Agri-environment climate measures	695659338	960672419			15 000 000	20 000 000	N2000-areas include ca. 1 % of UAA in Finland. As over 90 % of Finnish UAA is receiving M10 support, roughly similar proportion of the M10 funding is applied on N2000-areas. However, most sub-measures of M10 have not been specifically targeted towards N2000-areas. One exception is the 5-year environmental management contracts aimed for maintaining semi-

							natural grasslands. Over 30 % of the area under these contracts are located in N2000-areas. Put differently, around 60 % of semi-natural grasslands in N2000-areas are covered by these contracts. These contracts have been evaluated as one of the most beneficial measure for biodiversity. Overall, M10 Agri-Environment Climate measure (AECM) is by far the most effective measure for biodiversity in agro-ecosystems.
M12 Natura 2000 payments							Measure has not been applied in Finland due to the small area of UAA in N2000-areas. Measures for N2000 are available through M10.
M13 Payments to areas facing natural or other specific constraints	749700000	2903100000					Measure is not targeted towards N2000-areas but may include such areas. Funding is delivered to all applicable agricultural area in Finland, with no specific goals in nature conservation. Permanent grasslands are applicable for M13, which may enhance their continued management by grazing/mowing.
M15 Forest-environmental and climate services and forest conservation							Measure has not been applied in Finland.
Other measures							
Subtotal	1660819338	4817312419			15285170,5	20393806,9	
TOTAL	**6 478 131 757**				**35 678 977**		

Reporting period is 2014-2020.

D.2 European Regional Development Fund (ERDF) / Cohesion Fund (CF)

Total allocation from ERDF to the Member State/region: **1 470 000 000**

Total allocation from Cohesion Fund to the Member State/region: **-**

Category of intervention	**Allocation to measures relevant for Natura 2000**		**Current spending on measures relevant for Natura 2000**		**Comments** (relevance, experience to-date, challenges for the next period)
	EU	**National**	**EU**	**National**	
85 Protection and enhancement of biodiversity, nature protection and green infrastructure					Not available in our OP
86 Protection, restoration and sustainable use of Natura 2000					Not available in our OP
Other categories	3 813 684	3 813 684	3 167 665	3 167 665	Mainly projects related to nature tourism located in Natura 2000 -areas; sustainable use of those locations.
Subtotal	3 813 684	3 813 684	3 167 665	3 167 665	
TOTAL	**7 627 368**		**6 335 330**		

Reporting period is 1/2014- 3/2021.

D.3 European Maritime and Fisheries Fund (EMFF)

Total allocation from the EMFF to the Member State: **74 800 000 €**

Measure	**Allocation to measures relevant for Natura 2000**		**Current spending on measures relevant for Natura 2000**		**Comments** (relevance, experience to-date, challenges for the next period)
	EU	**National**	**EU**	**National**	
Article 40 Protection and restoration of marine biodiversity and ecosystems and compensation regimes in the framework of sustainable fishing activities (art. 40.1.b-g)	1796272,0	2006220,0	1436573,6	2053464,1	EU co-financed projects included projects for removing obstacles for fish migration recommendations in the field of marine construction and constructing wetlands. Including. Art. 44 inland fisheries.
Promotion of the protection of the marine environment, in particular its biodiversity and marine protected areas such as Natura 2000 sites… (art. 80.1.b)	1439340,0	2503728,0	1122083,8	1687876,6	Including projects supporting maritime spatial planning by providing tools and guidance on how to take protected area conservation criteria into account, studying underwater noise, studying marine litter, improving the information related to key habitats and promoting their inclusion in complementing the network of protected areas.
Art. 54					Not in use in Finland.
Subtotal	3235612,0	4509948,0	2558657,3	3741340,7	
TOTAL	**7 745 560**		**6 299 998**		

D.4 LIFE Programme

Type of project or financing instrument	Current allocation to measures relevant for Natura 2000 (2014-2020)		Comments (number of projects, relevance, experience to-date, challenges for the next period)
	EU	National	
Traditional projects	26892636	6 294 216	8 projects
Integrated projects	11976286	12 454 963	1 project FRESHABIT LIFE IP (LIFE14 IPE/FI/000023). FRESHABIT focuses on fresh- and groundwater dependent habitats, coastal and estuarine habitats and species depending on water in several Natura 2000 network sites across Finland.
Others (NCFF etc.)			NCFF project partners in coalitions: 1. European Rewilding Network: The project area Finland (Jukajoki Restoration Project), 2. Project under appraisal: Finland Conservation Services. Allocations not available in public (EIB loans included).
Subtotal	38 868 922	18 749 179	
TOTAL	**57 618 101**		

Covers also figures for Åland Islands. The period covered is 2014-2020.

D.5 Other EU funds, including Interreg:

Total EU co-funding allocated from other EU programmes for the implementation of EU nature policy and associated green infrastructure in the Member State/region: **28 808 141 €.**

Total national/regional funding allocated for the co-funding of these measures: **7 371 622€.**

The EU allocation includes EU-allocation for Interreg, ENI CBC and ESF programmes.

For Interreg programmes and ENI CBC programmes the source is www.keep.eu. For Interreg programmes and national allocation of nine included projects is 3 448 361 € and ENI CBC programmes national allocation of 49 projects is 2 599 717 €.

For ESF, the national allocation is 1 323 544€.

D.6 Other (mainly national) funding for Natura 2000, green infrastructure and species protection in 2014-2020:

Total financing allocated to implementation of EU nature policy and associated green infrastructure, for measures or projects not benefiting from any EU co-funding: **322 155 000 €**

Composing from the following national financing included under MoE and partly MAF`s budged lines:

Metso programme financing in 2014-2020: 185 600 000 €

Financing for Natura 2000 from Government budget in 2014-2020 (including some older conservation programmes related to N2000 and green infrastructure): 53 300 000 €

Helmi programme financing in 2019-2020: 42 000 000 €

Financing for directive species, inventories and N2000 from Government budget in 2014-2020: 21 000 000 €

Velmu programme financing in 2014-2020: 10 255 000 €

Mitigation and restoration measures of Water Protection Programme in (supporting N2000 and related green infra) 2019-2020: 10 000 000 €

E. Priority measures and financing needs for 2021 – 2027

E.1. Horizontal measures and administrative costs related to Natura 2000

E.1.1. Site designation and management planning

Current status and progress made so far in terms of site identification, designation and management planning

Identification of Natura 2000 sites

The Government submitted initial proposals for Finland's Natura 2000 network to the EU in 1998, and supplementary proposals were added in 1999, 2002 and 2004. The EU Commission made a final decision in December 2003 on areas to constitute the Alpine Region of the Natura 2000 network, including 19 areas in northern Finnish Lapland, with a total extent of 1.79 million hectares.

Other parts of Finland lie within the Boreal Region. The Commission made the initial decision on Boreal sites in 2005 (for both mainland and Åland). The network has been further supplemented in 2005, 2006 and 2012. Finland's present N2000 network consists of 1,866 sites that meet the criteria stated within the Birds Directive or the Habitats Directive.

In December 2018, the latest supplementary proposal was made by Government Resolution. This will extend the SAC network by 1,135 km2 and has supplemented the SPA network by 1 115 km2. Most of this surface is overlapping marine area. Two new SPA sites were also been identified.

The Natura 2000 site identification and designation process are now considered to be completed for most habitats, but there is a further need to elaborate the sufficiency of the marine Natura 2000 network for both mainland and Åland. As underwater nature inventories in the marine areas are still ongoing, and data becomes more accurate, new sites should be proposed according by the targets set by the EU biodiversity strategy 2030.

Legal site designation

In Finland, the EU Habitats and Birds Directives are primarily implemented by the Nature Conservation Act (NCA 1096/1996, which is now in the process of reformation). The NCA includes provisions pertaining to the Natura 2000 network. Most of the established nature reserves, wilderness reserves, and pending sites designated in the Nature Conservation Programmes are also designated as Natura 2000 sites. Consequently, the provisions of the directives must be adhered to and be considered in management of the N2000 sites, and also in land use activities outside the sites.

The administrative and procedural provisions are mainly included in the chapter 10 in the Nature Conservation Act. The general rules of the protection provisions of different kind of protected areas are included in the chapter 3 of the NCA. In addition, there are several site-specific acts and regulations. Recent amendments (in 2014) to the Nature Conservation Act have specified administrative procedures to control activities potentially significantly harmful to the natural features for which the Natura 2000 sites have been designated.

The approved SCIs were all established as SACs in spring 2015 by the Ministry of the Environment Decree on Areas Designated in the Natura 2000 Network (354/2015). To be clear, Natura 2000 sites designated as SPAs were also listed in the Decree. Updated maps (based on digitalized boundaries) were included in the published statute. Also, all approved SCIs in Åland have been established as SACs.

Setting of site level conservation objectives

The necessary conservation measures for each Natura 2000 site are primarily based on the legislation chosen for its implementation. This has been documented in the Government proposals for the N2000 sites.

The majority of the sites designated in the N2000 network are already designated as national protected areas based on the Nature Conservation Act and the Wilderness Act. Area-based protection is the most important conservation measure on over 85% of the Natura 2000 surface in Finland (see table).

In over 90 % of all N2000 sites, established state or private nature reserves, or areas designated to be established as such, are the sole or main means to implement conservation objectives on these sites. Of state-owned sites, almost 70% are implemented based only on the NCA. However, the process of establishing statutory nature reserves of remaining sites that have been designated is still ongoing.

National hiking areas are established on basis of the Outdoor Recreation Act, and also contribute to the N2000 network. Only five national hiking areas remain, as two have been incorporated into national parks recently statutorily established (Teijo NP in 2015 and Hossa NP in 2017).

Outside of national protected area designations, the Natura 2000 conservation objectives will also be implemented by provisions of other legislation. In some 15% of the N2000 area, the Water Act, Land Use and Building Act, Forest Act, Land Extraction Act, Off-Road Traffic Act, Water Traffic Act and Act on the Protection of Rapids have relevance. Conservation objectives are implemented through regulation of land use permits and contracts with owners of lands, water and fishing rights. In these areas, and especially in marine and inland water environments, large-scale assessment of pressures and coordinated measures to mitigate impacts are needed. The Programme of Measures of Finland's Marine Strategy and the River basin management plans 2016–2021 tackle with these issues.

Also, in Åland most N2000 sites are conserved as nature reserves, though some only by contract with the land owner. About one third of land area and about one tenth of water area of the Natura 2000 network in Åland is privately owned.

Statutory base of implementation	**ha**	**%**
Nature reserves on State-owned land	1 894 088	38
Sites reserved for nature conservation on State-owned land	409 359	8
Other protected areas on State-owned land	219 577	4
Private nature reserves and other protected sites on private land	268 307	5
Nature reserves and sites reserved for nature conservation (based on NCA)	**2 790 973**	**56**
Wilderness reserves	1 436 190	29
Statutory protected areas, total	**4 247 871**	**85**
National hiking areas	20 350	< 1
Other legislation	765 927	15
Natura 2000 total	**5 013 798**	**100**

Setting of specific site-level objectives conservation and restoration measures

According to the Nature Conservation Act, the site-specific conservation objectives are based on the Natura 2000 Standard Data Form (SDF). When establishing nature reserves or making other decisions on relevant activities, the authorities must promote activities targeted at maintaining or improving the ecological requirements of the habitat types and species listed in the forms (in the Natura 2000 database).

In connection to updating the site-specific Standard Data Forms (SDF) in 2014-2015, general site-level conservation objectives were defined for each of the Natura 2000 sites using one or more of the following statements:

1. The prevailing state of habitat types and species, as well as their environments, will be preserved by securing site development by natural processes.

2. The prevailing state of habitat types and species, as well as their environments, will be preserved by directing site use.

3. The prevailing state of habitat types and species, as well as their environments, will be preserved by active management measures.

4. The extent of a habitat type, species' living environment or population will be increased by restoration and management measures.

For most of Finland's Natura 2000 sites, the main conservation objective is to maintain the naturalness of the site and no active intervention or management measures are needed. Establishing statutory nature reserves and securing natural development by site provisions is considered sufficient, in addition to the site condition monitoring and assessment (NATA, described in the following). However, in the marine parts of the network, further work is still needed on how to define a baseline for naturalness, as most of the marine areas are being affected by eutrophication.

In management planning and other decisions concerning the Natura 2000 sites, emphasis must be placed on the ecological requirements of the specific habitat types and species for which the sites are established. The general conservation objective of any N2000 site is to support the maintenance of favourable conservation status of these features within the site. More specifically, site conservation objectives focus on the need to pinpoint active measures to maintain or improve the state of habitat types or species. The quality of a habitat type or species' living environment, or the vitality of a species' population will be enhanced by restoration and management measures.

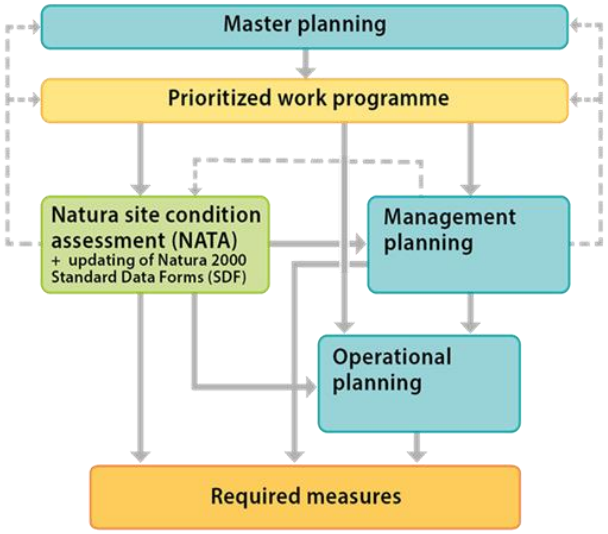
At each Natura 2000 site, the detailed conservation objectives are set and necessary measures established for each of the habitat types and species of Community interest significantly present, in connection to site condition assessments (NATA) and consequent strategic and/or operational management planning, as needed. The NATA assessment is conducted for all Natura 2000 sites (in mainland Finland) on a regular basis. The need for further site-specific management planning is defined during the assessment process, according to necessary measures established. The implementation and effectiveness of measures (including prescribed plans) on each site is (re)assessed and the conservation objectives and necessary measures are updated, if needed.

<u>Management planning</u>

Management planning at different levels is a tool to reconcile multiple interests and ensure sustainability in future use of the planning area. However, time and resource consuming participatory (strategic) management plans are not required for all protected areas regardless of type, size and use. Consequently, a management planning system has been developed in Finland that consists of several levels of planning and different planning tools to suit varying needs (see figure).

The planning system focuses on requirements of the Nature Directives and the Natura 2000 network (as defined by the Commission[16]), but practical management planning is done in a very integrated manner, taking into account overlapping national and international designations and objectives (i.e. national parks, wilderness reserves, Ramsar sites, HELCOM marine protected areas).

[16] Commission notice 2018: "Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC"



Master planning of the Natura 2000 network involves comprehensive and formalized review of main site management objectives, key conservation values, threats and pressures, and defining of consequent needs for conservation measures and planning or site condition assessment (NATA) for all Natura 2000 sites at regional level. The procedure is led by the ELY Centres in each of their regions in cooperation with regional units of Metsähallitus Parks and Wildlife Finland.

Natura 2000 network-level assessment was first done nationally in 2007 and the N2000 master plans were completely renewed in 2016-2017. As result of the process, a prioritized work programme for management planning and NATA assessments was formulated for the next 2-3 years. The prorgramme has mostly progressed as planned.

Planning tools were/are chosen by protected area type:

* participatory management plan for large protected areas with multiple values and objectives

* operational plan for protected sites with need only for habitat measures

* other area-based development plan for lands and waters outside of designated protected areas

* Natura 2000 site condition assessment (NATA) for all sites where it had not yet been completed.

Natura 2000 site condition assessment (NATA) involves defining the status of the key natural, cultural and use values as well as significant pressures and threats affecting them. Specific and detailed conservation objectives are defined for those features of Community interest that are significantly present at the site (i.e. maintaining or restoring their favourable status), and measures needed to reach these goals are established (or updated). Previously implemented measures are evaluated, if there have been any.

Conceptually the NATA is much like a mini management plan and is considered a sufficient tool for documenting conservation objectives and necessary measures for those N2000 sites without mentionable threats and no need for (extensive) habitat/species management measures and thus no need to draft management or even operational plans. Some 40% of all Natura 2000 sites, covering about 10% of the total network area in mainland Finland, have been evaluated as such areas.

NATA site condition assessments were first piloted in 2010 and are ultimately meant to cover all N2000 sites (in mainland Finland). In all, 1470 sites have already been assessed (at the end of 2020), counting almost 83% of total number of sites. The total area covered by the assessments is over 93% of the N2000 network. Almost all of the sites under management of Metsähallitus are assessed by the end of 2020, and the aim of ELY Centres is to have the remaining sites assessed by the end of 2021. These include many inland bird water sites and other demanding sites on the coast.

The NATA site condition assessment is intended also as a monitoring and evaluation tool for all N2000 sites. Monitoring is a continous process and NATA reassessments are programmed according to pre-set criteria. Assessments that were done before 2015, when the assessment process became data-based, are being renewed during years 2019-2021. These cover some 160 N2000 sites. Preliminary programming for reassessment of all other sites is done by the end of 2021. The assessment interval is in most cases one or two reporting periods (i.e. 6-12 years), but is adjusted according to different types of areas, targeted habitats and species, development of pressures, implemention of necessary measures and the time span of expected impacts.

Participatory management plans are statutorily required for all national parks and certain other nature reserves, wilderness reserves and national hiking areas. These cover only about 20% of Natura 2000 site number, but more than 75% of the network area. Most of these plans have been completed, although the plans of those national parks that were most recently established, are still being finalized or have not yet been approved by the Ministry of the Environment. Some of the most popular national parks encounter increasing pressures from growing nature tourism or otherwise need updating of management plans.

Operational plans are often needed as supplementary plans for e.g. specifying forest restoration, grassland management or measures for species environment management as well as direction of visitor infrastructure. Habitat management plans are sufficient tools on their own in N2000 sites where active conservation measures are needed, but there is little visitation or other use pressure. Some 40% of sites, covering c. 13% of N2000 network area, have been evaluated as such areas. Many of these habitat restoration and management plans are needed urgently, in both state-owned and privately-owned sites. Especially coastal habitats and bird wetlands need new or updated plans. Much of this work is foreseen within the Helmi habitat programme. These measures have been elaborated also in sections E.2 and E.3 of this PAF.

Other area-based development plans may include forestry plans, land use plans or WFD river basin management plans, where securing conservation objectives of the relative Natura 2000 sites are included. Forestry plans are often needed as supplementary plans in larger sites, that are mostly implemented as nature reserves. These include many forested esker areas. Specified measures to mitigate harmful land use, especially on many shore habitats are also needed.

River basin management plans have been systematically drafted for all of Finland´s eight river basins (of which is Åland). There are c. 450 Natura 2000 sites registered as having habitats and species depended on surface or ground waters. Many of these have previously not been sufficiently integrated into the present river basin plans and conservation measures for the sites need to be specified. Planning processes are led by the Centres for Economic Development, Transport and the Environment (ELY Centres) and organised through joint working groups. The Government of Åland is responsible for the river basin district that covers the autonomous Åland Islands province. Plans for the years 2022-2027 have now been drafted and are presently under public consultation.

<u>Åland</u>

Most of the N2000 sites in Åland are small and have few use pressures, so there has not been acute need for management plans. The Government (Landskapsregering) has drafted the necessary management and use plans for most provincial and N2000 sites based on provisions of the establishing resolution and in cooperation with landowners, as many N2000 sites have parts owned by both the Government and private land owners. Also, most of the necessary restoration and habitat management plans have been finished.

		Number of sites with:		
Sites of Community Importance (SCIs) under the EU Habitats Directive	**Number of sites**	**legal site designation (SAC or equivalent)**	**specific site level conservation objectives**	**specific site-level conservation measures**
Mainland Finland	1642	1642	1353 approved/ completed + 154 under work (NATA)*	1353 + 154 under work (NATA)*
Åland	79	77	77 finished/work ongoing	77 finished/work ongoing
Total	**1721**			

		Number of sites with:		
Special Protection Areas (SPAs) under the EU Birds Directive	**Number of sites**	**legal site designation (SAC or equivalent)**	**specific site level conservation objectives**	**specific site-level conservation measures**
Mainland Finland	458		342 approved/ completed + 83 under work (NATA)*	342 + 83 under work (NATA)*
Åland	12	12	All finished	All finished
Total	**470**			

*) situation 12/2020

Further measures needed

Land purchase or compensation

Some 200,000 ha of privately-owned land designated as Natura 2000 sites will still be established as private nature reserves, or the land will be acquired by the state for protection. Voluntary protection may be compensated to landowners. This applies for the marine areas as well. There are over 250,000 ha of privately-owned sea areas within the N2000 network that has not been established as statutory nature conservation areas. Not all of these are intended to be established as such. Further work is needed to identify the most valuable areas for consideration whether they could be established as private nature reserves, or if the land could be acquired by the state for protection.

Site enactment and provisions

Since 2014, new nature reserve enactments have been formulated for a total of 250 000 ha of state-owned conservation designations in different parts of the country. Regional enactment packages for 300 000 ha are being prepared and provisions for several hundred hectares remain to be enacted. The Ministry of the Environment aims to have the programme completed in the coming few years. Also, newly established private nature reserves need appropriate provisions and numerous old site regulations need updating to better accommodate conservation objectives of N2000 designations.

Real estate formation and marking boundaries

In the years 2016-2018 there has been supplementary Government financing for protected area real estate formation and statutory marking of boundaries. This is required by the Nature Conservation Act, but costs of real estate formation are considerable. Single site costs may be several tens of thousands or even more than 100,000 euros, depending on the size of the site and the complexity of operations involved. Most urgent property formation procedures, including appropriate boundary demarcation, have been completed in the programme, but a lot of work remains to be done.

Management and operational planning

According to regional master plans (2016-2017) 58% of the 5 million hectares of the N2000 had comprehensive and up to date management plans. Some 7% had no need for planning, because maintaining habitats in their natural state is a sufficient conservation measure. When assessed by number of sites, 37 % of sites do not need a plan, and on 23% plans were comprehensive and up to date.

According to the regional master plans, about 25% of the N2000 network surface and 31% of number of sites required new management plans or significant updating of old ones. Small updates are needed in 10% of the network surface and 9% of sites. Over 70% of needed participatory management plans are up to date. Thus, operational plans are most needed for concrete habitat restoration or management actions.

For the marine areas, 34% of the 927 000 hectares sea areas have up to date management plans and for 53 % the need of a new or an updated management plan is urgent. For 3% of the areas, there is no need for a management plan. Often, even if the N2000 with marine areas have a management plan, the underwater parts have been considered inadequately. Historically this has simply been because a lack of proper data. Now we have more data, largely owing to the Finnish Inventory Programme for the Underwater Marine Environment (VELMU), so in future management plans we have the possibility to take the underwater parts better into account. Since this is quite new and we e.g. need to clarify which activities should be restricted and should no-take zones be applied, we need to work on creating a model of operative management planning for the marine areas. Furthermore, a thorough assessment of the sufficiency of the entire (marine) N2000-network, in the light of the new underwater data, should be conducted, also taking into account the effects of climate change and other pressures and EU biodiversity strategy targets.

Site condition (re)assessment (NATA) to update conservation objectives and measures

After completion of the first round of N2000 site condition assessments for all sites, the assessments are to be iterated regularly as a way of monitoring and evaluating implementation of conservation measures and updating specific conservation objectives and establishing further measures (if needed). Reassessment of each N2000 site is scheduled according to preset criteria and changing needs.

As all the assessments follow a formalized framework and are performed with the aid of a common database, it is possible to analyze and monitor status of the entire Natura 2000 network.

Maintaining and opening of N2000 data

All existing relevant data on the N2000 sites (and other designations) in Finland is found in the national GIS-based protected area information system. This integrated system (ULJAS) is open to all authorities responsible for the governance and management of the sites and maintained and developed by Metsähallitus Parks and Wildlife Finland. It is the aim of Parks and Wildlife Finland to develop and open a public interface to part of this information. Nevertheless, there is a need to further develop existing databases, and in some cases create new ones, to be able to manage efficiently e.g. sea bird census data and data on underwater HD habitats.

The ULJAS system needs to be technically updated during the MFF, which also requires a significant investment.

Identification of data gaps and inventories in Åland offshore areas

In the autonomic Åland province, MPAs currently cover only ca. 3% of the marine area. The area is bathymetrically complex and holds rich biodiversity including numerous species and habitats listed in HD and BD, as well as species listed as endangered or data deficient in the national red list assessments. The government of Åland is motivated to improve the conservation status of the marine area in their governance, however the insufficient data and lack of resources to survey and identify the most important and suitable areas for efficient conservation measures complicates the implementation.

Knowledge has been recently improved in some areas, but especially the southern offshore area, most probably including e.g. offshore reefs, sandbanks, important bird areas and regular harbour porpoise presence, is virtually uncharted. In the data deficient offshore area, extensive geological and biological inventories are needed to produce the necessary information for selecting and establishing new N2000 areas. This is expected to lead in improved conservation status of Åland marine area and improves the coherence and connectivity of N2000 network (with a first phase target to increase MPA coverage from 3% to ca. 10% of the Åland marine area), also between mainland Finland and adjacent Swedish archipelago area.

Identification of new marine and terrestrial Natura 2000 sites in mainland Finland

The inventories for identifying new terrestrial Natura 2000 sites in mainland Finland are needed for the 2 insect species of Annex II of the Habitats Directive, that are insufficiently represented in the network so far, namely Phryganophilus ruficollis (4021)*and Lycaena helle (4038).

Compiling a roadmap for further development of the MPA network in Finnish marine area.

Climate change and other pressures in marine areas

To achieve adaptive management in the protected areas, it is necessary to develop scenarios concerning climate change and other pressures, such as eutrophication, offshore construction, maritime traffic, fishing, and aquaculture, (see section E.1.4.2. for more), affecting species and habitats, and pinpoint when, where and how conditions will change. In practise, the scenarios should be made for the key environmental variables (e.g. temperature, salinity, nutrients, water transparency) that are the most crucial for species populations and the state of key habitats. This information can be taken into account in developing on-site management plans and in mitigating pressures both within and outside MPAs.

Prioritization of measures to be implemented during the next MFF period

Prioritization of the habitats of Natura 2000 sites:

We have prioritized all the Habitats directive habitat types from Annex I that were last (2019) reported in unfavourable conservation status and in need of active management measures. Particular attention was paid to habitats & species for which Finland has a particular responsibility, regarding their range in Europe.

List of prioritized measures to be carried out, and estimated costs for these measures

1. Completing all necessary establishing measures: land purchase, site establishment as statutory nature reserves, formation of protected area real estate units, boundary demarcation. Land purchase is a priority measure both within the Natura 2000 network and beyond it (METSO and Helmi) to improve the conservation status of the important habitats and species of Community interest.

2. Drafting and updating of the most urgent participatory management plans (incl. several national parks and wilderness reserves). Creating a model of operative management plan for a marine area that takes the underwater values into account. In addition, for sites or parts of sites implemented by other means than site protection, drafting of forest plans, land use plans or defining necessary conservation measures for N2000 sites in WFD River Basin Management Plans.

3. Drafting of most urgent operational species, habitat and other management and restoration plans. Those especially for bird wetlands as well as coastal and agricultural sites with red-listed habitats are in Section E.2

3. Updating N2000 site condition assessments (NATA) in order of urgency, i.e. before management planning and when pressures or threats are changing. Ultimately, the prescribed conservation measures need to be followed up and conservation objectives checked in all N2000 sites, but not necessarily all during the next MFF period. Scheduling of NATA assessments will be completed by the end of 2021 and allow estimation of the number of N2000 sites that will be reassessed during the MFF.

4. Management planning and site condition monitoring are time lined according to regional N2000 master plans. These plans also need updating at the end of the MFF period. Management plans taking as far as possible into account the underwater parts as well.

5. Analyse the sufficiency of the N2000-network and other protection areas and based on an analysis of sufficiency, filling in possible gaps in the N2000-network, especially in marine areas, also within Åland. Compiling a roadmap for further development of the MPA network in Finnish marine area.

* indicate whether the measure is recurring or one-off

Name and short description of the measures	Type of measure*	Estimated cost in Euros (annualised)	Possible EU co-funding source
Land purchase and compensations for nature reserves N2000	one-off	3 000 000	
Land purchase and compensations for nature reserves beyond N2000 (METSO and Helmi)	one-off	47 000 000	
Site establishment measures: site enactments, formation of PA real estate units, boundary demarcation	one-off	2 200 000	
Identification of marine Natura 2000 sites in Åland	one-off	285 000	
Identification of new marine and terrestrial Natura 2000 sites in mainland Finland (Includes compiling a roadmap for further development of the MPA network in Finnish marine area)	one-off	100 000	
Developing marine site management model	one-off	43 000	
		52 628 000	
Site management planning: NATA assessments, strategic management plans, forest plans, WFD RBMPs, land use plans	recurring	**3 000 000**	
TOTAL		**55 628 000**	

Expected results

The most urgent requirements stipulated in the Habitats (and Birds) Directive(s) for defining specific conservation objectives and implementing prescribed conservation measures will have been completed for most of the N2000 sites and NATA site condition monitoring and assessment will be a continuous iterating process that helps to prioritize future conservation actions. With updated regional master plans, the entire N2000 network is effectively managed.

The sufficiency of the protected area network has been evaluated and possible gaps filled by extending the network, especially in Åland, but also in other areas based on the results of the evaluation and other possible requirements arising from e.g. the EU Biodiversity Strategy. Specific conservation objectives and conservation measures are implemented both in terrestrial and marine sites in Åland.

The green infrastructure of national protected and conserved areas is supporting the coherence and connectedness of the N2000 network. The national programmes METSO and Helmi will improve the GI and the overall connectivity of protected areas.

E.1.2. Site administration and communication with stakeholders

Current status and progress made so far in terms of site administration and communication with stakeholders

Administrative setup and organisation of management of the Natura 2000 network

Almost 80% of the total area (almost 4 million ha) of the Natura 2000 network in Finland is owned by the state and governed by the national agency Metsähallitus, Parks & Wildlife Finland. The agency is organized in four regional units and manages all state-owned protected areas as an integrated network. The remaining 20% of the N2000 area is owned by municipalities, organizations and private landowners. Though N2000 sites may be composed of private lands entirely, private nature reserves or other lands and waters are often part of larger N2000 sites that contain mainly state-owned lands.

The regional environment administration (13 Centres for Economic Development, Transport and the Environment or ELY Centres) is responsible for the coordination of conservation and management measures of N2000 sites in mainland Finland, although municipalities and Metsähallitus Parks & Wildlife Finland are involved in planning and operational management work in cooperation with landowners and other stakeholders. The independent government of Åland (Åland landskapsregering) is responsible for the N2000 sites within the Province. In Åland a bigger amount of Natura 2000 -sites are private owned than in mainland Finland, about 40 per cent, some sites are owned by parishes and the rest is owned by the Government of Åland. The Real Estate Agency for the Government of Åland is involved in operational management work on order from the Environment Agency of Åland Government.

The Ministry of the Environment (MoE) has top responsibility for implementation, monitoring, evaluation and reporting of the Natura 2000 network. The Finnish Environment Institute (FEI, Biodiversity Centre) is also involved in site-based information management (Standard Data Forms), monitoring and reporting of the N2000 sites. Parks & Wildlife Finland, the ELY Centres and FEI are all directed and financed mainly by the MoE. In Åland the Environmental Agency of Åland Government is in charge for all these parts.

All data on state protected area real estates, habitats and species, as well as buildings and visitor infrastructure, is managed in an integrated GIS-based information system that is maintained by P&WF. Basic property and habitat data are available also for private nature reserves. N2000 site condition assessment, management planning of sites and operational measures, for nature conservation and visitor services alike, are all done within the database. This allows effective monitoring of the work at network level.

Åland Government also has several GIS-tools including all different kinds of data which are being used for management planning, monitoring N2000 site condition and other aspects.

Participatory approaches to promote stakeholder engagement

In general, participation of stakeholders and citizens in natural resource planning and protected area management planning (including Natura 2000) on state lands and waters has been standard procedure in Finland since the 1990s. Participation is made possible in many ways, often by establishing a cooperation group for the duration of the planning process (which may continue working afterwards). With this interactive way of working, Metsähallitus and other authorities are able to enhance knowledge of the surrounding environment and also to prevent possible conflicts.

In the northern regions of Oulu and Lapland, as well as in Northern Karelia (eastern Finland), the Ministry of Agriculture and Forestry has appointed advisory boards with representatives of various interest groups. Their task is to advise Metsähallitus on regionally significant land issues concerning state-owned lands. According to the Nature Conservation Act, such advisory boards can also be appointed for specific national parks. Urho Kekkonen National Park has an advisory board appointed by the Ministry of the Environment.

In Northern Lapland, there are also cooperation groups appointed for each larger municipality. Particularly within the Sámi Homeland, the Sámi Parliament is consulted on matters related to land use. In accordance with Article 8j of the Convention on Biological Diversity, the Akwé: Kon procedure was tested in 2010-2012 and developed in cooperation with stakeholders in connection with management planning of the Hammastunturi Wilderness Reserve. The procedure has since been used in participatory management planning of all sites within the Sámi Homeland area.
Protected area management planning should be as open and as interactive as possible. Planning procedures are to comply with the Participatory Planning Guide published by Metsähallitus. Management planning guidelines include a toolkit of participatory methods. The level of participation needed may be dependent on the number, variability, and importance of the protected areas included in the planning area, as well as on the fragmentation of land ownership or the number of stakeholders and the consequent quantity and quality of expected conflicts. Planning does not necessarily require any organised participatory events, while in some situations a whole spectrum of different methods, from public events to bilateral discussions, is needed. In the last few years, feedback has been collected using interactive GIS-based Internet tools. Posting information on planning projects on the Metsähallitus websites and in local newspapers is a basic part of participatory management planning.

The ELY Centres have a stronger role in protected area planning than other stakeholders, because of their statutory role as authorities responsible for the conservation measures at the Natura 2000 sites. Always, when private protected areas are included, participation of the ELY Centre is also justified. Where appropriate, planning is supported by cooperation groups, involving key stakeholders, or expert groups tackling specific themes. Especially in management planning projects involving national parks, the cooperation groups often have a significant role and cooperation can continue beyond the project.

When privately owned lands are included in planning projects, landowners are in a special position and need to be contacted at different stages. Public opportunities to participate in planning and to comment on plans are also arranged during the whole process. Operational planning of state lands usually involves specifying methods and timetables, and there is seldom a need for participation. However, operations on privately owned lands are always planned in cooperation with and implemented with the consent of landowners.

In addition to participatory planning, practical management work is also carried out together with stakeholders. Through associations organised as “friends” of national parks, people can get involved in activities for the benefit of the parks. Different local and regional organisations and volunteers support park management by organising work camps and events. Voluntary experts collect valuable information on threatened species in protected areas. For e.g. hunting associations help to eradicate harmful (invasive alien) predators from bird wetlands and the archipelago, and also to collect information on game populations. In addition, with the support of environment subsidies, traditional agricultural habitats are managed in cooperation with landowners. On the basis of an agreement between Metsähallitus and the Criminal Sanctions Agency, open prison work has been done, especially to construct recreational visitor facilities.

Altogether more than 40 national organisations and 130 local associations work together with Metsähallitus Parks and Wildlife Finland for the protected areas. Thousands of volunteers are involved in management of protected areas nation-wide.

In Åland, there is an established progress with stakeholder engagement. Landowners and municipalities as well as different stakeholder organisations and groups are widely heard and discussed with when establishing new Natura 2000 sites and management practises for them. When planning areas with strict protection, there is a similar progress too.

In marine areas, maritime spatial planning can be used as an arena to coordinate measures and to strengthen the stakeholder engagement. Cooperation between planning authorities and stakeholders worked well in the drafting process of Maritime Spatial Plan for Finland 2030[17]. However, the roles, responsibilities and procedures of different marine actors need to be clarified in order to strengthen the capacity building and efficiency of the marine conservation processes. Some reflections have been made during the Maritime Spatial Planning progress in Åland.

Further measures needed

Administration

Overall, the Finnish Natura 2000 site administration is working well, and the organisation needs to be maintained and financing secured. Development needs are recognised especially related to the organisation and roles of actors in the marine environment, and to enhancing communication with public.

The marine conservation implementation and enforcement system could be more effective, if the interfaces and synergies between the different political and legal instruments regulating the marine biodiversity were better understood by different marine actors. The Habitats and Birds Directives, as well as the Marine Strategy Framework and Maritime Spatial Planning Directives all regulate or support marine biodiversity conservation. The roles, responsibilities and procedures of different authorities and marine actors in implementing the different EU directives need further analysis and clarification to achieve effective management. Also, a more holistic view on the special features of different conservation areas is needed together with guidance and communication with stakeholders on what kind of activities can be allowed and what is restricted based on N2000 and other MPA related legislation.

There is also a need to integrate and mainstream protection of marine biodiversity in other sectors and in financing. To align and integrate European research and innovation efforts in developing and upscaling solutions to protect marine biodiversity and to promote sustainable use of marine resources an Advisory group should be established. This board would consist national stakeholders representing different funding sources such as LIFE, Horizon Europe, Interreg and EMFF.

Communication with stakeholders and development of digital information services

Almost all administrative work is based on well operating information systems. Also, communication with stakeholders and the wider public is much depended on web-based tools and services. These systems need to be continuously maintained, developed, and technically updated.

At present, the Natura 2000 site specific GIS-based data is available only to the authorities responsible for management of the network, with only few exceptions. Standard Data Forms are made available to the public by the Ministry of the Environment and Finnish Environment Institute, but development of interfaces to the GIS-based protected area information management systems (ULJAS) is needed to open up data for public use. The ULJAS systems also need a technical upgrading during the MFF.

Visitor infrastructure, including routes and service points are found in a web-based service (Excursionmap.fi). There is growing need and demand for opening more site-specific data on e.g. restrictions to other stakeholders and the public at large. > see also E.1.5.

Lessons learned from the data gathering work for Finnish PAF 2021-2027 are that there is a need for more communication with stakeholders of the PAF-process and work in the future. The PAF process integrates information from several stakeholders and policy sectors. To ensure this in the future, strong and consistent coordination as well as persistent dialogue with stakeholders are needed.

Prioritization of measures to be implemented during the next MFF period

All measures above are considered as prioritised measures.

[17] https://www.merialuesuunnittelu.fi/en/
https://meriskenaariot.info/merialuesuunnitelma/en/merialuesuunnitelma-english/

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Estimated cost in Euros (annualised)	Possible EU co-funding source
Administration and communication with stakeholders			
- Ministry of the Environment (incl. Finnish Environment Institute)	recurring	70 100 000	
- Regional ELY Centres	recurring	5 700 000	
- Metsähallitus, Parks and Wildlife Finland (P&WF)	recurring	40 000 000	
- Åland landskapsregering	recurring	200 000	
Covering • Staff, facilities, overheads • Stakeholder consultation and cooperation with national and regional authorities, NGOs • Public consultation and participation • Stakeholder communication on N2000 network • Issue of land use permits, advocation of protected areas etc. **Administration and communication with stakeholders total**	recurring	**sum of the above figures 116 000 000**	
Administration: Maintenance of GIS-based protected area information management systems (ULJAS)	recurring	1 215 000	
Communication w/stakeholders: technical maintenance of web-based services	recurring	345 000	
Development of marine administration and stakeholder communication - Establishing an advisory group/symposium to mainstream marine protection - Analyse responsibilities of marine environmental actors - Analysis of relevant marine biodiversity related legislation and other forms of governance Analyse marine N2000 site designations and recommend new conservation measures	one-off	200 000	
Administration: - Development of GIS-based protected area information management systems (ULJAS), - incl. investment in technical upgrading of system	one-off	770 000	
Communication with stakeholders: investment costs, - Development of web-based interfaces to Natura 2000 site information, - incl. habitat and species/visitor services data, site condition assessments, NATA, management plans, restriction areas	one-off	545 000	
- Development of national PAF-work coordination and communication	one-off	200 000	
TOTAL		**119 275 000**	

* indicate whether the measure is recurring or one-off

Expected results

ADMINISTRATION AND COMMUNICATION:

The site administration organisation enables good management and maintenance of Natura 2000 network, securing the coherence and the conservation status of the nature values in the network and providing increased visitor services to the sites.

Roles and responsibilities of marine environmental actors clarified, including recommendations for improving the national legislation and methods.

Improvement suggestions to enhance the efficiency of the current marine conservation process tools for management, guidelines for activities and recommendations for improving the marine related legislation to support achieving the environmental and biodiversity goals.

Assessment of the effectiveness of current conservation measures, incl. recommendations for OECM, suggestions of new restrictions under different kind of MPAs and proposals for new measures and/or the effectivization of the existing ones.
The status and effectiveness of different MPAs in protecting the marine biodiversity is clear and improved.
The data systems are continuously maintained, developed and updated, and enable that Natura 2000 site specific GIS-based data is reliable and available for the public.
Communication with stakeholders is fluent.
Prioritised action framework for Natura 2000 post 2027 is well planned and drafted in time.

E.1.3. Monitoring and reporting

Current status and progress made so far in terms of monitoring and reporting

Monitoring of Natura 2000 areas has been mainly based on field inventories. Reporting (e.g. for Habitat Directive and Bird Directive) has mostly been based on the evaluation work of expert panels using a set of different data.

Changes in the ecosystem condition are based both in qualitative and quantitative parameters. So far, the use of Earth observations (EO), such as remotely sensed parameters and changes in ecosystem extent and condition is rare. However, there is increasing amount of high-resolution data available from drones, airborne campaigns, and especially satellites, such as Sentinels supported by the EU. Systematic species surveys are done for birds and butterflies. Novel monitoring techniques such as eDNA or molecular biological methods hasn't been used at all so far despite of their increasing potential in species monitoring. Finland has launched in 2020 a new Finnish Ecosystem Observatory initiative which aims at improving these elements of ecosystem monitoring.

An extensive network of forest monitoring sites has been set up throughout Finland covering protected areas as well as areas outside protected areas.

In Åland there are annual monitoring programs run for several species and habitats. As well, there is a program for annual monitoring of Natura 2000-areas and nature conservation areas. This monitoring work includes both a first monitoring when new areas are stablished and monitoring for follow-up of management measures and the status of habitats and species within these areas. Areas in need of more management measures and sites with restauration measures are planned to be monitored every 5-6 years.

<u>National networks for monitoring of the impacts of ecological restoration and management in Natura 2000 areas Finland</u>

The impacts of ecological management and restoration measures in Natura 2000 sites are monitored to assess how well the management and restoration objectives have been realized. The guidelines for restoration and monitoring have been written in co-operation with scientist, experts and practical workers of Metsähallitus Parks & Wildlife Finland. An initial inventory is made before restoration to assess the status of the habitat. The general monitoring after restoration and management of all managed sites determine whether the measures have been technically successful and examine whether the ecological succession to a more natural state of the habitat has been triggered as intended. Furthermore, permanent plot monitoring generates more detailed data about the impact of restoration measures by.

By restoration of forests the area and representativeness of habitat type 9010 Western taiga has increased / will increase. The network of 30 monitoring sites includes restored sites in heathland forests together with a parallel set of control sites set up either in an unmanaged part of the same stand or in a similar stand nearby. Monitored variables include living and dead trees, beetles and polypores at sites were deadwood has been created during 2002 - 2007. In sites where measures have been taken to create more deadwood trees are monitored to examine how the formation of decaying wood is progressing. Measurements are repeated in both the managed sites and the control sites at five-year interval. The impacts of restoration on beetles and polypore assemblages are monitored in sites where the amounts of deadwood have been increased. Polypore monitoring is a long-term project - it may take decades for trees to decay to the extent that they provide suitable substrate for polypores, enable the polypores' mycelia to develop into spore-producing fruit bodies and facilitate a succession of polypore species.

The national monitoring network of herb rich forests (habitat type 9050 Fennoscandian herb-rich forests with Picea abies) was establish during 2012-2015 and it has 7 monitoring sites. In Southern Finland the management measures include removal of spruce trees to favor broadleaved trees and to improve the light conditions for shrubs, herbs and ferns. The development of vegetation (trees, vascular plants, mosses) and mushrooms is monitored 2, 5, 10, 15 and 20 years after management. In Norther Finland most of the herb rich forests do not need any management measures.

The national monitoring network of sun lit habitats was established during 2010-2015 and it has 3 monitoring sites of habitat type 9060 (Coniferous forests on, or connected to, glaciofluvial eskers). The management measures include reducing shade by removing trees, clearing undergrowth and exposing mineral soils and controlled burning. The development of vegetation (trees and vascular plants), ants and some insect taxa (Coleoptera, Heteroptera) are monitored after management measures.

Finland has set up a national network of 145 sites for the monitoring of the impacts of peatland restoration on hydrology and biodiversity. Both natural and restored peatlands of nature protection areas are included in the network. In general monitoring observations of the reversion of the peatland to a more natural state is collected as well as data about effectiveness of ditch infilling and dams and recovering or declining trends in the occurrence of peatland vegetation and other species. Restoration primarily aims to re-establish peatlands' natural hydrology and hydrological monitoring involves direct observations of such trends. The chemical properties of water samples collected three times during the snow-free season are also analyzed. Biodiversity monitoring aims to identify any changes occurring in peatland species and their relative abundance after restoration. Vegetation, especially the mosses of the ground layer play a vital role in the functioning of peatland ecosystems. Permanent vegetation monitoring plots have been designated in peatland to be restored in protected areas and in comparable natural peatlands. The monitoring results indicate whether the desired changes in vegetation have been successfully triggered by the restoration measures. By monitoring we get data of the representativeness and status of several habitat types: 7110 Active raised bogs, 7140 Transition mires and quaking bogs, 7160 Fennoscandian mineral-rich springs and springfens, 7230 Alkaline fens, 7310 Aapa mires and 91D0 Bog woodlands.

The national monitoring network of semi-natural grasslands was established during 2009-2020 on protected areas. The impact of grazing and mowing on vegetation (vascular plants) is monitored in new management areas, old management areas and unmanaged areas of several habitat types: mesic meadows (HT 6270), coastal meadows (HT 1630), wooded pastures (HT 9070) and dry heaths (HT 4030). Monitoring is repeated at five-year interval.

<u>Case studies of monitoring the impacts of ecological restoration and management in Natura 2000 areas</u>

There is also monitoring data that has been collected outside the national monitoring networks and / or before the networks have been established. The method of the monitoring is different, usually the control plots are missing from these. Monitoring has been included in many projects and the data has been collected for the purposes of the project. Usually monitoring of these plots have ended together with the project. For example, the impacts of restoration of peatlands on some animal species has been monitored in several LIFE-projects (butterflies, dragonflies, birds). There are also some regional monitoring sets of semi-natural grasslands, oldest of them dating back to 1970's. The data has been collected for a long time and it is very valuable.

<u>Monitoring the impacts of ecological restoration and management outside Natura 2000 sites in Finland</u>

Forests and peatlands have been restored and valuable habitats managed also outside Natura 2000 areas but there are almost no monitoring measures so far. The only exception is the monitoring sets of mesic and dry grasslands (started in early 2000's by the Finnish Environmental Institute) that is situated mainly outside Natura 2000 sites.

<u>Monitoring of marine environment</u>

The Baltic Sea monitoring programme is a part of the implementation of the EU's Marine Strategy Framework Directive (MSFD) in Finland. The updated Monitoring Programme for 2020–2026 consists of 44 sub-programmes under which information is collected on species, biotopes, the quality of marine water, and pressures on the marine environment. A responsible authority was appointed for each sub-programme. The national monitoring network within MSFD and WFD is constantly evolving, but more effort is needed into developing the network for HD and BD needs as well.

Finland's marine areas have been surveyed in the Finnish Inventory Program for the Underwater Marine Environment (VELMU). The nationwide mapping efforts have resulted in achieving good insight into the spatial distribution and abundance of habitats, biotopes and species in the Finnish marine environment. Based on the already amassed knowledge and existing datasets, it should be possible to build up a cohesive well-functioning monitoring network to assess changes in marine environment.

Monitoring of the marine areas around Åland have been partly surveyed with the same methods than the whole Finnish sea area. There also is an ongoing project working on surveying further areas. Still, there is a need of more monitoring within the off-shore area as well in Åland.

Monitoring of directive species

Only for 24 out of all reported species the population trend is based on complete survey. Number of Saimaa ringed seal pups born annually is monitored, resulting also in the population size estimation and information on the range of the seal. The Artic Fox population are monitored annually in whole their range in Finland, in close cooperation With Sweden and Norway. Monitoring of several birds of prey, such as Golden Eagle, Gyrfalcon and Peregrine Falcon is conducted annually in northern part of Finland.

Monitoring of seals and wintering birds and fish species such as Whiting and Sea trout are part of MSDF monitoring programme. Several Game species (mammals and birds) are regularly monitored.

Monitoring of the white-tailed sea eagle is done every year in Åland since decades ago. As well, the osprey is monitored every year. Several areas for annual monitoring of the ejder duck and some other sea bird species are established in Åland, some of them have also been monitored for decades.

Monitoring of other species

Bird monitoring is conducted in co-operation with many organisations and voluntary ornithologists. The value of voluntary work is estimated around at least 30 M€. The participating organisations are Finnish Natural History Museum, Parks and Wildlife Finland, Finnish Environment Institute, Regional Centres for Economic Development, Transport and the Environment and the Forest and Agriculture administration.

The different bird monitoring include winter bird count, Bird Atlas, Water Bird count, Point count, Line transect censuses, Nest record scheme, Raptor grid scheme and Bird feeder count.

Pollinators

There is not enough information about changes in the abundance of common pollinator species or general trends in Finland. According to the latest Red List assessment, about 20% of Finnish bee species and 17% of butterfly species have been assessed as threatened. Endangered species are typically quite rare and their share of pollination services is thus not large as a whole. However, there are yield statistics on animal-pollinated crops where it has been found that there is also a regional pollination deficit in Finland.

Finland is currently establishing a national pollinator strategy. The goal is to prevent and stop the loss of diversity and quantity of pollinating insects, reverse the trend and thus secure the continuation of ecosystem services provided by pollinators in Finland. At the same time, we are responding to halt the depletion of Finland's biodiversity.

The strategy's approach will be holistic and it should cover all wild pollinating insects and their habitats. The strategy will take into account the key role of pollinators in agriculture and agricultural areas and the importance and effects of honeybees and other farmed bee beetles and related industries. Both international and EU-level initiatives and objectives will be taken into account.

When drawing up the strategy, special attention will be paid to the means by which the causes of pollinator loss are reduced, raise awareness of pollinators and encourage various sections of society and operators to take responsibility for the survival of pollinators and the services they provide.

In addition, a proposal for the organization of national pollinator monitoring, taking into account the EU level ongoing work to improve monitoring, will be created. Also an assessment of the resources required for increasing the knowledge on pollinator population and trends will be done.

Further measures needed

Terrestrial and fresh water environment

Monitoring terrestial Natura 2000 sites has mainly been conducted by Metsähallitus Parks & Wildlife Finland. In 2014 the personnel of Metsähallitus spent 4,5 person-years in monitoring but in 2018 only 2 person-years. The basic funding is not enough for the work and some monitoring data could not be collected in recent years. Furthermore, the monitoring data should be recorded to the databases of Metsähallitus and all the relevant analyses should be done. Some of the guidelines for monitoring need also updating. The valuable data of the case studies described above should also be analysed. The method of monitoring the national networks of terrestrial Natura 2000 sites is fixed and the data qualifies also scientifically, so it is very important to continue the monitoring according to the monitoring schedules. The changes in the status of habitats or in species assemblages after restoration and management can be very slow.

Monitoring of Marine environment

The Finnish Baltic Sea monitoring programme does not serve the HB and BD reporting needs sufficiently for the evaluation of the status of marine habitats and species and assessing the effectiveness of management and restoration actions. Therefore, an extensive monitoring programme should be set up for the marine N2000-areas and marine habitats and species protected by HD. This should be built on the already existing monitoring within MSFD and WFD. The monitoring network and guidelines for suitable methods should be developed in collaboration between scientist, experts and field workers and include all variables needed to fulfil the requirements obligated trough concerned EU directives. The present knowledge should be used to identify geographic areas that are representative for both species, and species groups. The areas should be chosen to encompass both key habitats within and outside the N2000 network, including continuously submerged Sandbanks (1110), Reefs (1170), Estuaries (1130), Coastal lagoons (1150), Large shallow inlets and bays (1160) and Boreal Baltic narrow inlets (1650).

Suitable methods, study areas and time intervals of the observations should be assessed, developed and tested to create an efficient network that will allow for temporal monitoring of strategic areas and provide the information needed for indicator-based assessments. To maximize the benefit, the methods should, as far as possible, be planned to also cover broad habitats and therefore also the monitoring objectives connected to the MSFD. In addition, restored marine areas should be monitored to assess the effects of management actions. Development of a full-scale monitoring programme requires a broad participation from organisations responsible for marine mapping and administration of marine protected areas.

Creating a nationwide monitoring program for marine Natura 2000 network, that fills the needs of different conventions, agreements and directives, requires:

- Establishment of a collaboration network authorities, experts and stakeholders
- Establishment of the monitoring network and selection of habitats e.g. by using waterbodies according to Water Framework Directive and/or Marine Strategy Framework Directive
- Assessing parameters and indicators to include in the monitoring programme and using existing extensive knowledge of mapping methods and spatial inventory data to generate a cost-effective spatial monitoring network and to assess the time-interval most suitable for monitoring actions. Assessment on the efficiency of the current marine conservation process to achieve the goals set in different legislations, with possible improvement suggestions.

- Considering and developing new methods as needed.
- Testing of the monitoring programme to assure seamless deployment, to assess the state and development of habitats and species in the Natura 2000 network and to assess the effectiveness of the marine Natura 2000 network.

Monitoring of species

Monitoring of birds and other species of community importance should be strengthened. This should be done together with strengthening monitoring of all species in order to ensure cost-effectiveness of monitoring. A monitoring scheme for pollinators will be drawn up with regard to the suggested common monitoring scheme for the whole EU.Planning and developing a national network for extensive bird monitoring programme in archipelago

Bird populations are in fast change in the Finnish archipelago. Larger bird species like ducks, geese and gulls are encountering high pressure due to increasing number of white-tailed eagles in outer archipelago. Many species like greylag goose (*Anser anser*), barnacle goose (*Branta leucopsis*), common eider (*Somateria mollissima*) and herring gull have (*Larus argentatus*) decreased in numbers rapidly in the outer archipelago. Populations are partly moving towards inner archipelago for breeding. The Finnish bird monitoring in the archipelago areas is one of the oldest bird monitoring programs of marine birds in the world, but it is focused mostly to outer archipelago. Currently, the method is overlooking the marine bird populations in inner archipelago and giving false information of development of overall bird populations. Due to different environment with more forested and larger islands and increasing human impact, it awakens a need for a new kind of inventory method to fulfill the gap in the monitoring of marine birds.

Application of remote sensing and Earth Observation methods

The use of remote sensing (UAV, airborne, satellites) has been very limited despite of great improvements in spatial, temporal, and spectral accuracy of current techniques and data sets, data availability, and data feasibility. There is also a need for capacity building to fully harness the potential of Earth observations (EO) in monitoring the state of biodiversity. Data bases to store and analyse EO data and ecosystem condition data are no optimal or they do not exist, in particularly this is the situation covering the whole country (i.e., outside of the Natura 2000 areas). However, also ecosystem parameters and ecosystem condition data is needed outside the current protection areas to improve nature's adaptation capacity towards climate change, and connectivity of the protected areas (cf. green infrastructure thinking). Ecosystem extent and condition information are crucial for tailoring management activities, but also for ecosystem accounting, and ecological compensations. Investments in applying EO for biodiversity monitoring would upgrade monitoring schemes. One particular way of developing monitoring is to harmonize indicators used in measuring biodiversity, and to cover all the relevant aspects of the biodiversity, such as those of the Essential Biodiversity Variables developed by GEO BON. Especially, structural and functional diversity could be improved with such approach.

Prioritization of measures to be implemented during the next MFF period

During the next MFF period 2021-2027 **all monitoring measures of the national monitoring network in Natura 2000 sites** are prioritized. Furthermore, data recording and reporting and updating of guidelines should be prepared and new targets under the EU biodiversity strategy must be considered while monitoring is developed.

During the next MFF period 2021-2027 a **national monitoring network for Finnish marine Natura 2000 sites** is planned and tested. For creating a monitoring programme, cooperation between different organisations, experts and researchers is of utmost importance, which urges for a yearly sum for cooperation. Furthermore, the gathered data should be analysed and used for reporting and updating of guidelines and indicators.

New **monitoring method suitable for birds in the archipelago areas** needs to be created and tested. Analysis method must be created to give reliable estimates of bird populations in the inner archipelago areas. The monitoring network should be established both within and outside of the current Natura 2000 sites.

Improved **monitoring of the effects of agri-environmental scheme and grassland management** for semi-natural grasslands in mainland Finland including EU pollinator monitoring scheme.

Improvement of the **monitoring scheme for Species of Community interest** to ensure rapid reaction to changes in trends and status of species. Improvement includes combining species occurences with their habitat and habitat condition.

Development of improved and new monitoring and reporting methods. Those can be divided, for instance, in four categories:

1) Methodological development and testing: use of EO to monitor biodiversity, especially ecosystem extent, condition, structure and functioning, and the changes in those;

2) Data fusion: Integrating, for instance, various sources and types of data (LiDAR/ALS, hyperspectral, optical, Sentinel products (multispectral, radar) from various platforms etc.) to improve understanding and the reasons behind the ecosystem change – this includes also evaluation of the uncertainties related to novel monitoring techniques, this could include e.g. operationalization of the EBV approach at local/ national scale;

3) Modernised data bases and data pools with algorithm development, i.e. building up the data infrastructure systems where changes can be analysed, and from where the data can be used for reporting and decision-making efficiently;

4) Capacity building: Institutional changes to capture new monitoring techniques are slow, and joint cooperation with traditional field biologists, conservationists, GIS and information technology experts, and remote sensing specialists are needed. Also decision-making systems might need tailoring to interpret new information.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Estimated cost in Euros (annualised)	Possible EU co-funding source
Annual monitoring measures of the networks in Natura 2000 sites according to their schedules: forest and peatland restoration and management of herb rich forests, sun lit habitats and semi natural grasslands. Estimated costs 2,5 person-years / year (50 000 € / year + travel costs + costs for the water quality analyses); costs of semi-natural biotope monitoring are excluded (chapter E.2.4.: 20 000 €) + Åland 30 000 €.	recurring	150 000	
Developing monitoring of other Habitats of Community Interest. Estimated costs (3 year project) 4 person-years / year; 75 000 € / person year + travel and other costs	one-off	150 000	
Monitoring on the effects of agri-environmental scheme and grassland management for semi-natural grasslands in mainland Finland (2 person-years/year; 50 000 € / person year + travel/other costs), including EU pollinator monitoring scheme 1 000 000 € (estimated by the EU expert group) (+Åland 40 000 €)	recurring	1 160 000	
Recording of collected data of terrestrial monitoring network to the databases of Metsähallitus, reporting the data and updating the guidelines 2 person-years (70 000 € / year)	one-off	140 000	
Planning and testing a national monitoring network for marine Natura 2000 network	recurring	400 000	
Developing bird monitoring method in archipelago	one-off	10 000	
Development of Bird monitoring in Åland	one-off	10 000	
Bird monitoring (realised/budgeted costs incl. travel costs) + Golden Eagle 70 000 €/year + Perecrine falcon 20 000 €/year + Gyrfalcon 7 000 €/year	recurring	736 286	
Improvement of monitoring scheme of Species of HD	one-off	1 000 000	
Monitoring Species of HD and Red listed species (+ Åland 20 000 €)	recurring	20 000	
Monitoring of marine Natura 2000 network in Åland	recurring	100 000	EHFF
Methodological development and testing of EO methods	one-off	1 000 000	Horizon Europe (FP9), LIFE, Copernicus
Developing and testing eDNA and other molecular biological methods in monitoring and assessing the state of species communities across various habitats, and implementation of such monitoring methods in assessing the status and occurrence of species listed in the Habitats Directive.	one-off	600 000	Horizon Europe (FP9)
Data fusion (e.g. towards EBV development)	one-off	600 000	Horizon Europe (FP9), Copernicus
Modernised data bases, data pools, algorithms - infrastructure	one-off for launching, recurring for running	200 000	Funding for research infrastructures from various sources
Capacity building	recurring	500 000	Interreg, EAKR or similar, LIFE?
TOTAL		**6 776 286**	

* indicate whether the measure is recurring or one-off

Expected results

Ecosystem condition is monitored over all ecosystems and over the whole area of Finland. Impacts of different policy choices are monitored and up-to-date results are available to decision makers.

The impacts of ecological management and restoration measures in Natura 2000 sites are monitored to assess how well the management and restoration objectives have been realized. By monitoring we can update the status and representativeness of habitats and get data about the species assemblages. The results can be utilized and to some extent generalized in reporting of Habitats and Birds Directives.

We can develop the restoration and management methods in all ecosystems with the help of monitoring data so that the measures will be more efficient in the future. Long-term data is important also for evaluating and mitigating the effects of climate change.

Improvement of the monitoring schemes for species (incl. Species of Community interest) to ensure rapid reaction to changes in trends and status of species. Improvement includes combining species occurences with their habitat and habitat condition.

Finland will have a tested and well-functioning, cost-effective marine monitoring program for Natura 2000 network that also supports the monitoring connected to the MSFD and WFD.

An active network of authorities and stakeholders of marine areas has been created.

More reliable data on the marine bird species distribution and population sizes can be used to identify the most important breeding and moulting areas and possible hotspots. This information is crucial for implementing (cost) effective conservation measures and management actions.

In the autonomic Åland province waters, the results of the bird inventories are directly used to identify potential areas for new Natura 2000 sites. This is expected to lead to improved conservation status of the marine bird populations, improved implementation of the Birds Directive and better coherence and connectivity of the Natura 2000 network, also between mainland Finland and Sweden.

Upgrading monitoring schemes with EO data and techniques provides several results:

1) baseline measure for extent and condition of Natura 2000 areas,

2) spatially and temporally improved data access,

3) quantified, transparent measures,

4) option to allocate field resources in priority areas where changes have been observed,

5) harmonized analysis over the whole EU,

6) advanced expertise, outcomes of the capacity building can be expanded to other countries and regions,

7) improved knowledge of e.g. green infrastructure also outside the protected areas. Along with the improvements, the national reporting on the implementation of EU nature conservation directives and international biodiversity agreements could be developed and streamlined more cost-effective compared to the present state.

E.1.4. Remaining knowledge gaps and research needs

E.1.4.1. Biotope inventories, terrestrial habitats

Current status

Good quality of basic information of the habitats is prerequisite for planning the restoration and management measures. Biotope data is collected in field surveys and/or via interpretations of aerial photos or satellite images. Biotope data consists of vegetation types, tree stands and dead wood, Natura 2000 habitat types, needs for habitat restoration and management measures and so on. Field computers are used for data collection and the data is transferred to the SAKTI database (System for management of protected area biotope information) administered by Metsähallitus PWF. Implementation of measures and monitoring of impacts are also documented in the SAKTI system.

At the moment, biotope data of protected areas covers approx. 4 M hectares of which 3,75 M ha are situated in Natura 2000 sites. Almost half of the data was collected in 1996-2000 so it has expired and needs updating.

Further measures needed

There is still lack of biotope data in Natura 2000 sites for about 530 000 hectares (470 000 hectares privately owned areas, mostly freshwater and 40 000 hectares of terrestrial biotopes and 20 000 hectares of freshwater biotopes in protected areas). Lack of biotope data in protected areas outside Natura 2000 network is 80 000 hectares (72 000 ha terrestrial, 8 000 ha freshwater biotopes). Inventory of most of the biotopes means field work but other methods will be implemented as well. The focus of the inventories by field work is in southern Finland. The needs for freshwater inventories and prioritization of them and estimated costs for the measures are described in more details in chapter E.2.8.

In Lapland the biotope data of 2,8 M hectares was inventoried during 1996 - 2000. There is urgent need for updating the data, because climate change already affects alpine habitats. The updating will be done mainly based remote sensing data (laser scanning data, satellite data), so the amount of field work should be minimized.

Prioritization of measures to be implemented during the next MFF period

The measures mentioned above are prerequisite for detailed data and proper management planning for the habitats of the habitat Directive in Natura 2000 sites.

The priorities for inventories outside the Natura 200 network are set to habitat types that are species rich, in unfavourable conservation status, poorly known and under serious threats.

7230 Alkaline fens are rare and threatened in Finland, and they still hold about half of all the threatened mire species. Many of the alkaline fens are threatened by mining. The Alkaline fen inventories are based on wide background GIS and other information collected by the Finnish Environment Institute and planned to cover the whole country between 2021-2025.

8210 Calcareous rocky slopes are also rare, endangered, poorly known and very species rich habitats (308 nationally threatened species and over 500 species known to live in calcareous rocky slopes) facing many threats. The nationwide inventories have started and will cover the whole area in the next few years based on the plan by Finnish Environment Institute and the data partly by the Finnish Geological Survey.

The coastal habitats are the most poorly known habitat group in Finland, and threatened by overgrowth, alien species and other threats. In Helmi Habitats Programme one of the targets is the management of the degraded coastal (and freshwater) habitats like sandy beaches, dunes etc. But first we need to start systematic inventories of the coastal habitats.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Estimated cost in Euros (annualised)	Possible EU co-funding source
Inventory of terrestrial biotope data of protected areas: Natura 2000 sites 60 000 ha, protected areas outside Natura 2000 sites 80 000 ha; total 140 000 ha; costs: 500 hectares / month -> 280 months (costs 5000 € / month) -> 23 person years -> total costs 1 400 000 € (salary and travel costs)	One-off	200 000	
Commissioning of remote sensing methods in updating of the biotope data of Lapland; costs for Finnish Environment Institute 116 000 €/year and Metsähallitus PWF 174 000 / year, total costs 88 000 / year	Recurring	290 000	
Inventories of insufficiently known habitat type 7230 Alkaline fens	One-off	500 000	
Inventories of insufficiently known habitat type 8210 Calcareous rocky slopes with chasmophytic vegetation	One-off	300 000	
Inventories of insufficiently known Coastal habitats	One-off	400 000	
TOTAL		**1 690 000**	

* indicate whether the measure is recurring or one-off

Expected results

As a result, there will be up-to-date and high-quality data to be in use in restoration, management and monitoring of habitats as well as in assessing the conservation status and threat categories of the habitat types. Management of habitats will be targeted effectively, and monitoring will be improved by using remote sensing methods.

E.1.4.2. Biotope inventories, marine habitats

Current status

The level of knowledge on the underwater environment has increased significantly in Finland during the recent years due to VELMU inventories. Spatial modelling and remote sensing techniques have also advanced, with extensive species distribution modelling, spatial prioritization analyses and other data synthesising work being done across several organisations.

Aside from increased understanding on the underwater environment, our understanding on the impacts humans have on the sea has also increased. Anthropogenic pressures originating from e.g. construction activities, ship traffic and fisheries, may also threaten the ecological integrity of marine protected areas (MPAs), including the N2000 network.

<u>Mapping of species and habitats</u>

Mapping of marine habitats and species has increased significantly during the recent decade. Hence, we now have basic knowledge on the geographical distribution of habitats and species. The mapping has mostly been conducted within the VELMU-program and associated projects. In addition to the mapping of species distributions, also more specific mappings have been conducted, with aims to accurately delineate individual habitat patches and to get more detailed information on ecosystem condition and species communities, as well as on their structure and function. For example, concerning HD habitats, underwater inventories of two HD habitat types have been piloted between years 2016 and 2018: sandbanks which are slightly covered by seawater all the time (1110) and coastal lagoons (1150). Mapping sandbanks has included the verification of a habitat's geological features using side scan sonar, and biological inventories carried out by SCUBA-diving and drop-videos. Mapping coastal lagoons has included a verification of the physical borders of the habitats with the help of orthomosaics produced of aerial photographs acquired with small remotely piloted aircraft systems (RPAS). Scuba-diving, snorkelling and other field sampling methods have also been used to map the biological features of coastal lagoons.

Mapping of offshore shallow areas of significant importance to birds during breeding and moulting

Current status of common eider (*Somateria mollissima*), velvet scoter (*Melanitta fusca*), black guillemot (*Cepphus grylle*) and common guillemot (*Uria aalge*) is alarming in Finland. Each species has been determined as threatened due to small population size or recent decrease of population size. There is an increasing pressure to shallow offshore areas from utilizing off-shore wind energy and mining sand and gravel from the sea bottom. Bird monitoring in Finland has been concentrated near the shorelines and less information exists from the outer sea areas. Many diving ducks and auks use areas of sea depth of 20 meters. Along the Finnish outer sea areas, there are many large sea areas which are of depth 10-20 meters. Currently, no information of bird is gathered from these shallow areas. Diving ducks can use these areas during migration or for moulting and auks can use these marine areas for feeding during breeding period.

Modelling & remote sensing

The use of modelling and remote sensing techniques have become everyday tools in nature conservation and management in Finland. By combining mapping with modelling and remote sensing, data layers on all the six marine HD-habitats occurring in Finland have been produced. Species distribution models for over one hundred taxa have been produced, including HD species, such as *Alisma wahlenbergii*, *Hippuris tetraphylla* and *Macroplea pubipennis*. A more recent development has been to combine these layers with information on human activities in a computational spatial prioritization framework in order to, e.g., estimate the sufficiency of the current network and to aid the establishment of future MPAs.

Further measures needed

Even though data and knowledge have been increasing, significant knowledge gaps remain. An example of these knowledge gaps may be seen in, e.g. the latest national Red List assessments on species and habitats, where several species and habitats were assessed Data Deficient. There is also a strong need for improving the indicators in the marine environment, especially concerning benthic habitats, so that they would better reflect the conditions of the habitats and preferably serve multiple purposes covering HD and MSFD. A thorough analysis of potential knowledge gaps concerning marine habitats and species, determining the level of knowledge needed for meeting the requirements set by, e.g. different EU directives, and a plan of how to reach this level are needed.

Mapping of species and habitats

The existing knowledge on the occurrence of HD habitats is based to a large degree on modelling, mapping of geological features and from delineations derived from aerial photographs. Further mapping efforts are needed to verify these occurrences in the field. More information on the biological features and ecosystem functions of HD habitats is needed in order to assess the representativeness, current status and changes in status of habitats in marine N2000 –areas. In order to bridge the remaining knowledge gaps, further inventories of all marine N2000 habitat types are required. Verification of occurrences of HD species is also needed, in order to secure these occurrences in e.g. land use planning. Spatial models of species will be used in order to focus the mapping efforts.

An analysis of the underwater nature values that fall outside of the HD habitats, such as hard bottoms that are not reefs (1170) or underwater parts Baltic islands and skerries (1620) are needed to evaluate what could be done to strengthen their protection. As we already know that the HD does not cover well marine species and habitats, mapping efforts should also be allocated e.g. for species and habitats red listed nationally or within HELCOM, as well as mapping of key habitats and areas important for providing ecosystem services.

Map offshore shallow areas of significant importance to birds during breeding and moulting

Bird inventory programme for shallow offshore areas along the Finnish coast needs to be established. Target species are common eider, long-tailed duck, velvet scoter and auks. Auks are monitored during their breeding season by vessel surveys and other species are monitored during the main migration periods by aerial surveys, common eider also during the moulting period in the southwestern sea area.

Modelling & remote sensing

Even though modelling and remote sensing have advanced in the recent years, they remain underused in the marine environment. Below are listed some identified future research and development needs within this field:

1. Operationalize data flows for efficient updating and developing of species distribution models (SDMs), accounting for environmental changes
2. Quantifying, modelling and projecting future changes in human pressures that affect N2000 areas and HD/BD species and habitats, and to develop methods for human pressure mitigation
3. Study the effectiveness and spatial and temporal changes of different conservation measures
4. Investigate the potential of remote sensing approaches in, e.g., quantifying and mapping species distributions and human activities in marine regions and operationalize the data flows and the usage of remote sensing approaches in marine regions.

The ability to project changes in human pressures depends on the availability of (i) reliable climatic and environmental projections; (ii) scenarios of maritime sectors and associated activities; (iii) relevant biological and environmental data, and suitable models describing their development under changed conditions.

Other future research needs

Analysis of ecosystem functions and mapping of ecosystem services within marine N2000 areas would provide advantages when assessing and communicating the benefits of N2000-areas. Assessment of ecosystem services is embodied by MSPD aiming simultaneously to support Blue Growth and to achieve the good status of marine environment. To balance these aims there is a need to further identify, map and assess ecosystem services and possible conflicts related increasing utilization of marine sources in the sea areas. It would be important to recognize sea areas and species´ traits providing important ecosystem functions maintaining ecosystem service supply, and to assess how the current network of protected areas supports the persistence of these ecosystem functions now and in the future of climate change.

There is a linkage between green and blue infrastructure and maritime cultural heritage, which provide important socio-economic and ecosystem service benefits to the society. The Baltic Sea has an unique and well preserved maritime cultural heritage, but there is a huge lack of information on the distribution, character, age and state of the sites, as well as an urgent need for surveying, modelling and identifying jointly especially underwater and shoreline maritime cultural heritage hot spots. Also, management plans etc. require knowledge of cultural heritage sites and their consideration. The structure and character of e.g. a medieval harbour can only be understood if marine archaeological investigations are combined with archaeological surveys on land. This would also allow achieving a synergy of joint mapping of ecological and cultural values under and over the sea surface.

Prioritization of measures to be implemented during the next MFF period

Even though we have gained plenty of new information during the past ten years, during the next period we need to make a thorough analysis of our existing knowledge gaps. Based on this analysis can future mapping efforts be focused to fill the gaps. From the gaps we already know, for the next MFF period the mapping efforts should be focused on habitats within the existing N2000-network, in order to a) more accurately determine the location and area of habitat patches and b) more solidly be able to determine the condition of these. Some effort should also be allocated to mapping outside the network, but these are not included in the calculations below. Even though the focus is on HD habitats, habitats falling outside of these should not be overlooked. We also need to map shallow offshore areas important for birds, to be able to take these better into account e.g. in future N2000 network development, but also for the needs of MSP etc.

Research and modelling development concerning the N2000-network should be implemented by covering at least the issues addressed above, such as improving species and habitat distribution modelling as well as quantifying and assessing human pressures affecting these. Of these pressures, particular emphasis will be put on the impacts of climate change. To support assessments and monitoring within HD and BD, while supporting MSFD and WFD, we to continue the development of sufficient indicators for marine biodiversity, especially concerning benthic biodiversity in shallow areas.

In order to better understand the value of our MPA networks, we need to work on assessing the ecosystem services they provide, and the different ecosystem functions the harbour. As part of this we need to put some effort on further mapping of the maritime cultural heritage in these sites.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Estimated cost in Euros (annualised)	Possible EU co-funding source
Identifying existing data gaps and determine level of knowledge	one off	60 000	
Inventories of HD habitats & species	recurring	500 000	
Shallow offshore marine area bird inventories	one-off	50 000	
Modelling and remote sensing of marine areas	one-off	115 000	
Assessing climate change and other pressures affecting marine species and habitats	one-off	130 000	
Indicator development	one-off	100 000	
Analysing ecosystem functions and mapping ecosystem services	one-off	115 000	
Maritime cultural heritage inventories	one-off	45 000	
TOTAL		1 115 000	

* indicate whether the measure is recurring or one-off

Expected results

Gaining a good insight on the occurrence and condition of HD habitats, and species, within the marine N2000-network, as well as an improved picture on these outside the network as well. Improved knowledge of e.g. Red Listed non-directive habitats and species. Indicators reflecting the condition of these habitats would have been developed to aid monitoring and reporting. Modelling and remote sensing techniques supporting conservation and management efforts would be operational and based on up to date technology. MPA effectiveness and the impact of human pressures are known at a level that enables effective restoration, conservation and mitigation measures. The information gained benefits also to achieve the EU biodiversity strategy targets as well as of the goals of MSFD and updated HELCOM Baltic Sea Action Plan (BSAP).

E.1.5. Natura 2000-related communication and awareness raising measures, education and visitor access

Current status

Visitor access to and visitor management in Natura 2000 sites

Most of Finland's established protected areas, including all the 40 national parks, belong to Natura 2000 network. The national parks cover 20 % of the network area and represent all of the typical ecosystems and some of the most iconic natural landscapes and features in the country. Six of the national parks are coastal and marine: Bothnian Bay, Bothnian Sea, Archipelago Sea, Ekenäs Archipelago, Teijo and Gulf of Finland. All national parks are state owned. They are governed and managed by Metsähallitus. Some of the other protected areas that have recreational facilities are maintained by municipalities for example.

Especially national parks, but also many other Natura 2000 sites, such as national hiking areas, are increasingly significant visitor attractions. For example, visits to national parks have increased in ten years from 2 million visits (2010) to over 3,2 million (2019). This is not all due to increase in actual use, but also due to new areas being added to the national park network. Altogether during year 2019, there were 7 million visits to all of Finland's state-owned protected and hiking areas, most of which belong to the Natura 2000 network. Number of visits in coming years is estimated to grow significantly and calculations for year 2020 support this scenario: there were altogether over 8 million visits to protected and hiking areas and a 23% increase in visitation to national park alone. This is partially due to corona pandemic related boom of domestic recreation and nature-based tourism.

The traditional right of open access to nature enables common recreational use of lands and waters to everyone in Finland, also in protected areas. In some of the most fragile areas (e.g. strict nature reserves, restriction zones of national parks), access is limited permanently or for certain seasons.

The sustainability of the recreational use of the areas is ensured with protected area management plans, where e.g. the amount and spatial distribution of recreational services are defined based on zoning of use. Management plans and protected area regulations are public and available in the internet. Across the entire Natura 2000 -area network, uniform principles of protected area management as well as principles of sustainable tourism are applied, including the limits of acceptable change (LAC) -monitoring system. Sustainable tourism development strategies are drafted for hot spot touristic locations, when ever needed.

Visitor monitoring, including continuous visitor counting and visitor surveys repeated at a few year's interval, is implemented in all the national parks and 20 other most popular areas. Visitor information is essential in ensuring the protection of nature and cultural heritage, quality recreation experiences, sustainable tourism development, and showcasing the benefits of protected areas.

Recreational infrastructure in Natura 2000 -sites

Recreational infrastructure is provided where there is clear need for active visitor management, most importantly in national parks. On the other hand, there are plenty of Natura 2000 sites without recreational infrastructure.
Infrastructure both ensures the accessibility of the Natura 2000 sites as well as channels the recreational and tourism use, thereby safeguarding the natural and cultural values of the sites. Finland's protected areas provide for example more than 5,000 km of trails, 1,000 km of skiing routes, 1,000 rest sites, and 400 wilderness huts. These services are free-of-charge for visitors visiting the area on their own. For commercial use, a permit is required and there is a charge per person for the use of recreational infrastructure.

Cooperation with nature tourism enterprises

Commercial use of the recreational infrastructure in Natura 2000 areas that are managed by the state always requires a permit or an agreement. The goal of the cooperation agreements is to ensure sustainability of the tourism use of the areas by e.g. increasing the entrepreneurs' awareness and know-how on nature, and by encouraging development of products that support and enhance protection goals. By the end of year 2019, there were more than 650 nature tourism entrepreneurs who had cooperation contracts with Metsähallitus related to operations at Natura 2000 sites.

As a manager of state-owned protected areas, Metsähallitus Parks & Wildlife Finland also has cooperation in tourism destination management together with enterprises, as well as in national level together with Visit Finland and other national tourism institutions. Cooperation with tourism industry is based on the Principles of Sustainable Tourism, developed for protected areas and UNESCO World Heritage Sites. Similarly, Landskapets Fastighetsverk in Åland has cooperation with VisitÅland.

Communication, awareness raising and education

Visitor centres provide information and education on both natural and cultural values of Natura 2000 sites as well as on recreational opportunities that the sites provide. The centres offer diverse permanent and changing exhibitions on nature and culture, spectacular nature films, events, services for different types of visitors, including school and pre-school children. For the most part, the access to the nature centres is free, while exhibitions may have an entrance fee.

There is currently a network of 23 visitor centres across the country, receiving 1.2 million visits year 2019. While the number of visitor centres has been decreasing, visitation numbers per centre show an increasing trend. Some of the older exhibitions are in need of updating, fully using new digital possibilities.

Web services are increasingly essential in communicating about Natura 2000 network and its values. Rising trend in communications is from traditional visitor centres towards digital customer service, which is seen more and more as additional information channel for customers. New investments are needed to improve the quality of digital customer service and experience connected with Natura 2000 site management. This investment need includes development of databases and related information systems.

Luontoon.fi (Nationalparks.fi in English) -web service provides a wide range of information on natural and cultural values, history, current issues, services and activities available, and rules and regulations of all the Natura 2000 sites that provide significant amount of services to the visitors. The web service is designed for current and potential visitors of the sites, as well as for the tourism sector. It aims at attracting also new visitors to the sites, hoping that more and more people get out to the nature, adopting recreation in nature as part of their lifestyle.

In many Finnish travel destination national parks are key attractions, and marketing messages are often connected with protected areas. Also, in national level, Natura 2000 sites form an essential part of the tourism image of Finland.

Luontoon.fi (including all the language versions) had over 12 million page views, and more than 2 million unique visitors year 2018. The estimated use for year 2020 is over 18 million page views, and number of unique visitors is close to 3 million.

Retkikartta.fi (Excursionmap.fi in English) -online map service allows users to view all the Natura 2000 -sites and their recreational services on a map. It is an independent service, but it is also embedded in other popular web pages such as Nationalparks.fi and Eräluvat.fi. There is also a mobile version of Excursionmap.fi, which can be used on-site. Year 2017, Excursionmap.fi was visited more than 4 million times, with 1.7 million unique visitors. The new map service was opened at the end of June 2020. The estimated use for year 2020 3,8 million visits and number of unique visitors is app. 1,3 million.

Marinefinland.fi is Finnish marine data and information portal, providing information about the Baltic Sea and bringing together the maritime materials and services of the key institutions of administrative branches producing marine data in Finland. The service's development has relied on data and materials concerning the Baltic Sea gathered over decades. These have then been made freely available to the public. Marinefinland.fi ensures the findability and availability of Finnish marine data and maritime materials.

Environmental education is provided by Parks and Wildlife Finland and other units of Metsähallitus. A large number of staff members interact with children, adolescents and educators while working on environmental education and communication addressed to young people. Every year, some 37,000 children and adolescents are encountered at Metsähallitus' service points around Finland. In particular, these encounters take the form of guided activities, including tours of exhibitions and guided walks on nature trails at visitor centres and in Haltia Nature School as well as in Wildlife Tutor and Junior Ranger activities. Additionally, Metsähallitus organises events, offers support and training for teachers and educators, produces digital teaching materials, carries out projects and supervises on-the-job learners. PWF also interacts with organisations working with children and adolescents and other stakeholders.

Further measures needed

Visitor access and management

To accommodate growing visitor numbers, maintenance of current recreational infrastructure and building of new services for visitors require significant investments during the MFF.

Ensuring visitor safety is necessary, if Natura 2000 sites are to provide increasing benefits to the public and to allow for tourism product development. Actions include risk analyses and documentation of safety issues, and their utilization in infrastructure development and communications.

To secure cultural values and customer safety in the most visited sites, repair investments of existing infrastructure is needed. A 12- year targeted program is required to meet the investment needs.

Need to monitor sustainability in most visited sites is increasing. Development of methodology is needed in marine sites.

Strengthening climate responsibility in visitor management of Natura 2000 network sites.

Communication, awareness rising and education

Designing and producing communication materials to web sites and visitor centres, e.g. video material, exhibitions

Closer cooperation with tourism industry to support climate responsibility
Anticipative actions for guiding recreation and tourism to reduce carbon emissions
Prioritization of measures to be implemented during the next MFF period

Maintenance of current recreational infrastructure and building new services for visitors
The infrastructure in Natura 2000 sites is in a need of renovation, which will be implemented by targeted program for next six years in Natura 2000 sites and in visitor centres. Safety and quality of appropriate infrastructure is essential to ensure sustainable recreational use of Natura 2000 sites.

Innovative new investments are needed e.g. to improve accessibility and service design as whole, to better guide and accommodate increasing visitor pressures in some sites, and to maintain the service level. Anticipation of new activities and products is essential to be ready to allow or reject them, depending on their suitability to the Natura 2000 sites (taking into account conservation and other objectives).

Monitoring of visitors and sustainability for visitor management

Visitor counting is a continuously on-going activity in all national parks and most other popular destinations. Visitor surveys are recurring at several years' intervals. This data is essential for sustainable visitor management.

Metsähallitus is monitoring the sustainability of recreation and tourism in key touristic locations. In 2020 fifteen protected (Natura 2000) sites are implementing annual monitoring of sustainability and by 2021 the number of sites is estimated to grow to 25. Monitoring is connected with principles of sustainable tourism and the method is Limits of Acceptable Change (LAC). Evaluation of monitoring data is part of the Natura 2000 site condition assessment (NATA).

National report 2019 indicates that sustainability is at a good level. Improvement needs are mostly connected with the state of recreational infrastructure and the level of resources channelled to tourism cooperation in some specific locations.

Development of sustainable tourism in marine national parks

The marine national parks are presently facing sudden and rapidly increasing number of visitors (20 % increase in 2020 compared to parallel period in 2019). At the same time there is a need to develop nature tourism through variety of services and infrastructure, but simultaneously the national parks experience the detrimental effects of the increasing usage. Objectives for the protection and use of marine national parks are complex and the effects from increasing tourism are not fully covered or considered. Therefore, there is a need to develop sustainable nature tourism in marine national parks preferably by using Limits of Acceptable Change (LAC) method and through adaptive management, guidelines, awareness, channelling, etc.

Development of web services and visitor centres

Increasing international tourism and new visitor segments require new communication and marketing channels and material, including making better use of geographic information and open data.

Cooperation of Natura 2000 site managers, tourism industry and other key stakeholders to safeguard the common messages and the quality of communications and marketing.

Renewing main exhibitions to encourage visitor use and appreciation of Natura 2000 sites and network and producing new exhibitions supporting communications on Natura 2000 sites and values.

List of prioritized measures to be carried out, and estimated cost for these measures

Name and short description of the measures	Type of measure	Estimated cost in Euros (annualised)	Possible EU co-funding source
VISITOR FACILITIES and MANAGEMENT			
Recreational infrastructure	one-off	2 500 000	
A: investment in maintenance, repairs and security of existing facilities			
B: investment in new facilities			
Cultural heritage features: investments in maintenance, repairs and visitor security	one-off	1 400 000	
GIS-based information collection and management (incl. field computer equipment, maintenance and development of databases)	recurring	50 000	
Interactive visitor feedback system development	one-off	20 000	
Visitor management information: counters, surveys, development, cooperation	recurring	100 000	
Sustainable tourism: infrastructure, development, cooperation	recurring	300 000	
COMMUNICATION, AWARENESS RAISING and EDUCATION			
Communication venues and materials: production and development of digital services, cooperation with tourism entrepreneurs and stakeholders	recurring	1 000 000	
Visitor centre investments: energy efficiency repairs, exhibitions etc.	one-off	150 000	
TOTAL		5 520 000	

Expected results

VISITOR ACCESS and MANAGEMENT

The condition of Natura 2000 sites is improved through effective visitor management. Natural and cultural heritage values are secured.

Accessibility of the sites is improved. Services are maintained and safe for the visitors.
Service design is based on customer feedback and customer satisfaction is high.
International cooperation in visitor management of Natura 2000 network is enhanced.

Visitor monitoring and sustainability

The monitoring system for the sustainability of recreation and tourism is in full use.
The sustainable use of Natura 2000 sites for recreation and tourism is improved.
Sustainable nature tourism is enhanced especially in marine national parks.

COMMUNICATION, AWARENESS RAISING and EDUCATION

The nature tourism products support nature protection values and other goals of the sites.
The benefits of the recreational use of Natura 2000 sites are well known and appreciated.

Natura 2000 network and its sites are well known, appreciated and influential in the society by large, thanks to effective communication and marketing measures.
The social capital in the surroundings of Natura 2000 sites is improved.

CLIMATE CHANGE MITIGATION

The recreational infrastructure, communications and interpretation of Natura 2000 network promote energy efficient actions and low-carbon solutions.

E.1.6. References (for horizontal measures and administrative costs related to Natura 2000)

Hyvärinen E. & Aapala, K. (toim.) 2009: Metsien ja soiden ennallistamisen sekä harjumetsien paahdeympäristöjen hoidon seurantaohje. Metsähallituksen luonnonsuojelujulkaisuja Sarja B 118. https://julkaisut.metsa.fi/julkaisut/show/437

Metsähallitus 2016: Principles of Protected Area Management in Finland. Nature Protection Publications of Metsähallitus. Series B 217. 143 pp. https://julkaisut.metsa.fi/julkaisut/show/2005

Raatikainen, K. (toim.) 2009: Perinnebiotooppien seurantaohje. Metsähallituksen luonnonsuojelujulkaisuja Sarja B 118. https://julkaisut.metsa.fi/julkaisut/show/687

E.2 Site-related maintenance and restoration measures, within and beyond Natura 2000

E.2.1. Marine and coastal waters

Current status of habitats and species, conservation measures taken until now and their impact so far, remaining pressures and threats

There are 6 marine habitat types listed in Annex 1 of the Habitat Directive occurring in Finland. The habitats are:

- Sandbanks which are slightly covered by sea water all the time (1110)
- Estuaries (1130)
- Coastal lagoons (1150)
- Large shallow inlets and bays (1160)
- Reefs (1170)
- Boreal Baltic narrow inlets (1650)

Also, the habitats Boreal Baltic islets and small islands (1620) and Baltic esker islands (1610) can be considered marine habitats concerning their underwater parts (described also in chapter E.2.7).

In the latest reporting under article 17 of the Habitats Directive the conservation status of 1110 and 1170 were assessed as Unfavourable-inadequate, whereas the status for 1130, 1150, 1160 and 1650 were assessed as Unfavourable-bad (https://www.eea.europa.eu/themes/biodiversity/state-of-nature-in-the-eu/article-17-national-summary-dashboards/conservation-status-and-trends). In addition, for different assessments and evaluations there are other habitat type classifications commonly used, such as HELCOM Underwater biotope and habitat classification system (HELCOM HUB) and LuTU habitat type classification, which was developed for an assessment for endangered habitats in Finland. The HELCOM HUB and LuTU classifications consist of species communities in different environments, e.g. benthic habitats characterized by *Fucus spp.*, and enable to understand the presence of the wide-ranging bottom biotopes. Many valuable HELCOM HUB and LuTU habitats commonly occur outside of the Natura 2000 network, and therefore it is reasonable to target some of the restoration actions outside of the Natura 2000 areas and thereby maintain coherence of green infrastructure.

Eutrophication and climate change

The main problem causing deterioration of marine habitats is eutrophication caused by intensive land use, such as agriculture and forestry activities. Eutrophication affects all listed marine habitats and leads to a change in species composition and functions of habitats. As an example, can be mentioned the decrease of two important habitat building species; eelgrass (*Zostera marina*) from the habitat sandbanks which are slightly covered by sea water all the time (1110) as well as bladder wrack (*Fucus spp*), often found on reefs (1170). To combat eutrophication, measures are primarily needed outside the Natura 2000-area by implementing requirements from EU BD 2030, WFD, MSFD and HELCOM BSAP. Within Natura 2000 areas, minor effects can be accomplished by restoring wetlands and their water filtering function. By reintroducing key species to areas where they are lost, or the population is severely damaged, important habitats could be recovered.

Because of changes in temperature and precipitation patterns, climate change is expected to further enhance the runoff of nutrient rich waters, but also to lead to more frequent acidification events in areas with acid Sulphur soils. The effect will be prominent in estuaries (1130) and water bodies with limited water exchange, like coastal lagoons (1150), having a major negative effect on their function. Measures within the Natura 2000 sites cannot prevent these future changes, but objects and structures that will maintain or could replace these important functions in the future should be identified and managed to ensure to keep the function within the area also in the future.

Successful, cost-effective mitigation of the impacts of human pressures necessitates, besides identification of sources of human pressures, quantification of their spatio-temporal extent and overlap with MPAs, and their impacts on marine species and habitats.

Environmental conditions and human pressures may change with time, due to climate change and development of the society. Changes in maritime traffic, coastal construction, usage and translocation of seabed materials, wind power, aquaculture, as well as changes in agricultural practises on land, will affect the sea in the future. Successful conservation needs to take such future changes into account and allocate sufficient measures to mitigate the pressures that threaten the integrity of species and habitats intended to be protected by the Natura 2000 network.

Marine litter and underwater noise

The most common type of litter at marine sites origins from land-based sources. Especially in conservation areas in the outer archipelago of the Gulf of Bothnia and the Archipelago, there are vast amount of sea-driven anthropogenic litter on the shores of small islets. The litter mainly consists of different plastics and metal particles, which decompose extremely slowly. Especially the plastic litter is hazardous since under the UV-radiation and wave action it breaks down into small micro plastic particles that can eventually end up to food chain. The ongoing internal sea-driven loading of plastic litter is an acute problem and especially manifested in conservation areas in outer archipelago habitats Boreal Baltic islets and small islands (1620) and Baltic esker islands (1610). Underwater species are also put under pressure because of noise pollution originating, e.g., from shipping and leisure boats. Ship traffic can also damage the seafloor, and the impact can be considerable especially in shallow areas and around navigational lines. Overall, commercial shipping is considered as the largest contributor to anthropogenic underwater noise in the Baltic Sea. Underwater noise levels have been measured since 2013 from several open sea and coastal monitoring sites in the Finnish waters, but the ecological impacts of underwater noise remain largely unknown in the Finnish marine environment. As threshold values for the good ecological status (GES) regarding underwater noise have not been determined thus far, the present target has been to limit the introduction of energy, including underwater noise, to levels that do not adversely affect the marine environment.

Invasive non-indigenous species

The spread of non-indigenous species (NIS) is a global problem that affects most ecosystems and is among the greatest threats to biodiversity. The damage to aquatic biodiversity is often irreversible as NIS are often impossible to eradicate after they have established themselves in the aquatic ecosystem. The shallow and enclosed nature of the Baltic Sea, low species diversity due to low salinity and the intense marine traffic makes the Baltic Sea prone to the introduction and establishment of NIS. There are ca 30 NIS in the Finnish territorial waters but only a few invasive species. These include e.g. a coastal fish the round goby (*Neogobius melanostomus*) and the crabs: Harris Mud crab (*Rhithropanopeus harrisii*) and Chinese mitten crab (*Eriocheir sinensis*). Only the last one is on the list of European Union concern and should be eradicated. Management of all of these would be beneficial for the conservation of the Baltic Sea.

Recreational use

Recreational use of the archipelago has negatively affected the habitats and species listed in the HD and BD. This is certainly true for flads and glolakes, a sub type of the habitat Coastal lagoons (1150), for which dredging, boat traffic and construction inside these sensitive habitats has had a major impact. Restoration actions should here be taken, to preserve their function, such as recreating the water regulating structures of the inlet of the lagoon, restoring areas damaged by buildings and reintroducing naturally appearing species important for the water quality. Human pressures have also deteriorated the quality and quantity of fish reproduction in these habitats. The problems and actions also apply for large shallow inlets and bays (1160), estuaries (1130) and boreal Baltic narrow islets (1650).

Restoration of habitats and species

Due to the scarcity of information of underwater nature, restoration actions have mostly been lacking in Finland. During the last decade, this information gap has slowly been filled up and nationwide mapping efforts have resulting in good insight into the distribution and abundance of habitats and species in the Finnish marine environment. With gained knowledge, it is now possible to take another step towards restoration actions, and today, the first trials are being made to restore marine areas. The current restoration actions have been carried out e.g. within the projects CoastNetLIFE and Kvarken flada (Interreg VA Botnia-Atlantica) and Environmental Program for Fisheries (EMFF-funding) all aiming to restore the functions and fish habitat provided by coastal lagoons. Flads and other small bays are important reproduction habitat of e.g. pearch (*Perca fluviatilis*), pike (*Esox lucius*), and pikeperch (*Sander lucioperca*).

There are several sea-spawning white fish (e.g. *Coregonus lavaretus*, Annex V, vulnerable) stocks in the northern Baltic Sea. Status of the stocks are not well known. In the southern Finnish coast sea-spawning white fish stocks have declined due to several reasons, including changes in the environment.

The conservation status of Baltic ringed seal (*Pusa hispida botnica*) varies between different references. According the EU Habitats Directive assessment (2013-18) the status of Baltic ringed seal was unfavourable (U1+) and in the Finnish Red list assessment (2019), the status is considered to be near threatened (NT) in Finland. Thus, according to global IUCN assessment (2015), the population of Baltic ringed seal is categorized as a least concern (LC) due to increasing population trend of the north part of Baltic Sea (the Bothnian Bay). Whereas, in HELCOM Red List Category this subspecies is categorized as Vulnerable (VU) based on climate change and poor/unknown status of the southern breeding areas (the Archipelago Sea, the Gulf of Finland and the Gulf of Riga). These ringed seal of southern waters are suffered by negative effects of mild winters.**Measures needed to maintain or restore favourable conservation status**

Restoration of habitats and species

Finland's marine environment needs a national restoration plan as well as measures, with feasible, cost-effective restoration acts that are planned and targeted in detail. The importance of restoration has also been raised in the MSFD programmes of measures and the current draft versions of HELCOM BSAP and the EU Biodiversity Strategy. All potential sites of marine habitats and species where restoration and management actions are needed should be assessed, categorized and visualized on a map. After the analysis, restoration and management plans and actions can be targeted cost-effectively in sites where models predict the highest improvement in biodiversity. Spatial information is needed, not only to direct efforts towards achieving optimal benefits in terms of conserving biodiversity and functioning of healthy ecosystems, but also to ensure important ecosystem functions maintaining ecosystem services, such as carbon sequestration.

For cost-effective targeting of restoration actions, it is necessary to (i) identify species communities and habitats, as well as geographic areas, that have been severely degraded, and (ii) identify those that benefit most from restoration actions. For sustained remediation of the habitats, it is also important to identify the pressures that most severely threaten the habitats and areas intended to be restored. These may include, e.g., marine traffic, fisheries, aquaculture, wind power, point sources of treated wastewater, dredging, dumping, construction of harbours, piers and other structures, as well as leisure activities, and the pollution these create.

During this restoration plan process we also need to analyse and test the best management practices for certain habitats and species. For example, habitat forming species like bladderwrack (*Fucus vesiculosus*), eelgrass (*Zostera marina*) and stoneworts (*Charales*) are potential targets for transplantations. However, only little is known and more on-site experience in Finnish coastal waters are needed.

Correctly targeted habitat restoration measures (e.g. in small sheltered flad bays) could provide effective tools for maintaining and protecting coastal fish stocks. At the moment, the knowledge level is low on suitable restoration methods. To enhance the status of whitefish-stocks there is at least a need to map the potential reproduction habitats, evaluate need and possibility for restoring the habitats and guide local fisheries management.

For Baltic ringed seal HELCOM highlights the acute need of developing long-term monitoring and research programmes for estimating current status and conservation needs of these potentially isolated breeding areas. Therefore on-going Life project (Our Saimaa Seal LIFE - LIFE19NAT/FI/000832) focuses on development of novel monitoring methods, identifying and establishing new Natura 2000 -sites for ringed seals in Åland waters and piloting climate change mitigation methods (developed in Lake Saimaa) for improving pup survival on the Archipelago Sea.

Measures beyond N2000

New measures proposed in the programme of measures of the MSFD will contribute to achieve the good environmental status in the Finnish marine areas. The proposal of programme of measures includes a total of 65 new measures for the period of 2022-2027. The measures include for example:

Actions to reduce nutrient loads and eutrophication, reduce underwater noise, restoration and MPA-related actions.

Marine litter and underwater noise

In addition, the new marine policies pay attention to the threats emerging from marine littering, especially in the form of plastics, and anthropogenic underwater noise. Plastic litter has been shown to cause damage to various marine animals, by trapping animals and through them ingesting large quantities of plastic. While the phenomenon is well known and recognized globally, the magnitude and localization of the problem is not well known in the Finnish sea area. For cost-effective collecting of plastic, and other mitigation and restoration actions, it is necessary to make a nation-wide survey of the occurrence of plastic litter and other types of thrash in the seascape.

Until the status of the outer archipelago of Gulf of Bothnia and Archipelago Natura 2000 habitats (1620 and 1610) can be considered good, there is a need to remove the sea-driven macro litter being a major supply of micro plastic particles re-entering the sea. Also, as tourism and recreational uses of coastal areas are major land-based sources of marine litter, there is need to raise public awareness of the detrimental effects of litter to habitats and species.

As for the underwater noise, some studies have been made concerning noise created by open sea ship traffic, but virtually nothing is known on the occurrence and spread – or the ecological effects - of the noise created by thousands of smaller vessels (mainly motorized leisure boats) criss-crossing the Finnish archipelagos especially during summer. To focus mitigation action (e.g. speed limits) it is necessary to (1) conduct field measurements of the spreading of noise from boats (in practise, fairways) to adjacent areas, including N2000 areas, and (2) assess and test experimentally the effects of noise on various marine organisms, including fish and invertebrates. In addition, underwater noise emissions from marine construction must be examined in order to mitigate noise pollution from individual marine construction projects.

Invasive non-indigenous species

Although eradication of aquatic invasive non-indigenous species is often impossible, management actions in geographically restricted areas might be possible and would be beneficial to test in areas where removal of the species would save vulnerable keystone habitats or prevent further spread. Finnish coastal area lack of native crab species and predatory behaviour of Harris mud crab has the potential to impact the native macroinvertebrate littoral community associated with *F. vesiculosus* habitats. All management actions will be monitored to study the effectiveness and spatial and temporal differences to ensure cost-effective actions to be prioritized. With well-planned and targeted restoration and management actions we can improve the deterioration of the marine environment, ameliorate the natural buffering capacity of the environment, and mitigate and adapt marine environment to climate change.

Prioritization of measures to be implemented during the next MFF period

To be able to restore the conservation status and manage marine habitats and species, functioning and cost-effective measures should be identified and tested.

First, species and habitats that could benefit from restoration actions should be identified. Second, cost-effective methods available to improve the situation should be recognized. Based on the results, restoration action should be piloted, and the result monitored to ensure high quality actions and identify spatial and temporal changes in different conservation measures.

Following, a coast-wide holistic restoration plan should be developed, securing that the most important objects will be focal points and effective measures will be used, to ensure the cost-effective results of available funding. This requires use of tools, such as Zonation, for identifying prioritized sites. To ensure the effectiveness of the protection and management actions as well as the N2000 network, all management actions should be monitored.

List of prioritized measures to be carried out, and estimated costs for these measures

- within Natura 2000 sites designated for the targeted habitats and species

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Development of restoration plan and prioritization of actions in Finnish marine Natura 2000-areas.	one-off	Marine habitats and species in need of restoration	85 000	
Developing and piloting restoration actions.	one-off	restoration of species habitats (e.g. Zostera, coastal lagoons)	400 000	
Restoration, management and protection of essential fish habitats	one-off	Essential fish habitats e.g. spawning areas	250 000	
Develop and promote measures to address the threats that non-indigenous species cause to underwater habitats and species	one-off	removing for e.g. Harris mud crab, Chinese mitten crab, Neogobius melanostomus	50 000	
Locating marine litter hot spots, removing marine litter from N2000 sites, analysing the content and communication actions	one-off	Marine and coastal habitats e.g. 1620, 1610	100 000	
TOTAL			**885 000**	

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
New tools to mitigate pressures, taking account the river basin management plans of the WFD and programmes of measures of the MSFD Annual costs include pubic and private investments (78 %) and direct costs (30 %), personnel costs of civil servants (3%),	recurring		69 000 000	
Underwater noise, open sea and coastal monitoring	recurring		60 000	

* indicate whether the measure is recurring or one-off

Expected results for targeted species and habitat types

After next MFF period suitable sites of marine habitats and species in Finnish coastline and best practices are known for cost-effective restoration and management actions.

The underwater noise map and its spreading within a selected Archipelago Sea area. This output will be combined with knowledge of the effects of noise on marine organisms, enables designating targeted measures for reducing the harmful effects of anthropogenic underwater noise in the Finnish sea area. A report on the noise levels and frequencies that are likely to induce adverse impacts particularly to local (fish/invertebrate) keystone taxa, endangered species or health of the marine habitats.

Regarding the Our Saimaa Seal LIFE – project expected results for Baltic ringed seal are increased knowledge on the Archipelago Sea sub-population size, distribution and most important areas for effective conservation and management measures, new Natura 2000 areas for Baltic ringed seal are established in Åland, based on the project results and based on Lake Saimaa experiences, the photoID method is developed and artificial nest pilot is conducted in Archipelago Sea conditions.

Expected results: other benefits

After next MFF period necessary knowledge and experience are gained for marine habitats and species and based on gained praxis we can fulfil the national restoration plan and widen management plans and actions for other marine habitats and species too.

E.2.2. Heathlands and shrubs

Current status of habitats and species, conservation measures taken until now and their impact so far, remaining pressures and threats

Alpine and boreal heaths (4060) Climate change and reindeer grazing, as well as their combined effects, are the most significant factors affecting the state of fell habitats. Reindeer grazing is part of the nature of the fell area. However, strong year-round grazing pressure degrades the condition of mountain heaths. Intensive grazing shapes and alters the composition, structure and abundance of vegetation. On more oligotrophic sites, intensive grazing reduces the growth of lichens in particular but also that of slow-growing woody plants. Changes in vegetation as well as in chemical processes and microbial activity in the soil may in turn affect the abundance and species composition of invertebrates living in the soil and on the ground.

A majority of the area of Alpine and boreal heaths are already protected in Finland and they don´t need active management measures. Nowadays the impacts of climate change and reindeer herding together form a threat to this habitat, so new measures are needed concerning the reindeer herding in particular.

Measures needed to maintain or restore favourable conservation status

There are 57 reindeer herding cooperatives in Northern Finland. Herding cooperatives are required to have a management plan to ensure the sustainability of reindeer pastures. The management plans must specify two measures and regionally limited objectives and implementation methods. Alternative measures include voluntary reduction of reindeer numbers, improvement of reindeer lichen pastures, development of summer grazing rotation, or merging of reindeer herding cooperatives to organize more efficient grazing rotation.

Prioritization of measures to be implemented during the next MFF period

The management plans of all 57 herding cooperatives with appropriate measures to improve the status of the heaths. The plans cover several habitats and partly Natura 2000 sites, partly beyond. Here we have estimated the coverage and costs for the planning and implementation of the plans concerning habitat 4060 both within Natura sites and outside.

List of prioritized measures to be carried out, and estimated costs for these measures

- within Natura 2000 sites designated for the targeted habitats and species

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Compiling the management plans and the implementation of the plans within the Natura sites to ensure the sustainability of reindeer pastures.				
- Reindeer numbers, grazing rotation etc.	Recurring		200 000	
TOTAL			200 000	

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Compiling the management plans and the implementation of the plans outside the Natura sites to ensure the sustainability of reindeer pastures. - Reindeer numbers, grazing rotation etc.	Recurring		100 000	
TOTAL			100 000	

* indicate whether the measure is recurring or one-off

Expected results for targeted species and habitat types

These measures implemented according to the management plans will improve the state of mountain heaths, especially lichen-rich dry and dryish types and their typical species.

Expected results: other benefits

The management planning and implementing the planned measures will also improve the resilience of other alpine habitats and species in the changing climate.

E.2.3. Bogs, mires, fens and other wetlands

Current status of habitats and species, conservation measures taken until now and their impact so far, remaining pressures and threats

Originally Finland had natural peatlands a total area of 10.4 million hectares. Today we have about 8.7 million ha of which some 4.7 million ha have been drained and 4 million ha remained undrained. In protected areas there are some 1.2 million ha of peatland (13,8 %) though more than 50 000 ha of this area had been drained before they were protected. During the years 1989 - 2019 a total area of approx. 27 500 ha of peatland have been restored in protected areas, mainly in Natura 2000 sites. Meaning on the average, less than 900 ha of peatland restored yearly with current mainly EU –funded project resources and meaning roughly 25 000 ha of peatland still to be restored within protected areas.

Most of the peatland area in Finland is outside the Natura 2000 areas (86,2 %). The proportion of drained peatlands in GI varies locally from over 80 % in parts of Central-Finland to less than 10 % in Lapland.

We have 10 habitat types of bogs, mires and fens listed in Annex 1 of the Habitats Directive. In this PAF assessment Fennoscandian mineral-rich springs and springfens (HT 7160) and Petrifying springs with tufa formation (Cratoneuron) (HT 7220) are included in chapter E.2.8 Freshwater habitats. All the bird wetlands that are designated as Special Protection Areas (SPAs) are described in chapter E.3.1 Species-specific measures.

In this chapter we concentrate on boreal bio-region and on the following habitats that need restoration measures:

- *Active raised bogs (HT 7110)*
- *Transition mires and quaking bogs (HT 7140)*
- *Calcareous fens with Cladium mariscus and species of the Caricion avallianae (HT 7210)*
- *Alkaline fens (HT 7230)*
- *Aapa mires (HT 7310)*
- *Palsa mires (HT 7320)*
- *Bog woodlands (HT 91D0)*
- *Fennoscandian deciduous swamp woods (HT 9080)*

All these habitats are reported as being currently (2019) in an unfavorable conservation status in boreal bio-region https://nature-art17.eionet.europa.eu/article17/ .

In the most recent available report on the conservation of habitats and species under Habitats Directive ("Article 17 report"), the "Structures and functions" criterion for 3 habitat types has been assessed as being Unfavourable-Inadequate (U1) and for 2 habitat types Unfavourable-Bad (U2) indicating that additional efforts will be required to improve the conservation status of these habitats. Furthermore, for 5 of the 8 bogs, mires and fens habitat types, the total area coverage is currently deemed insufficient, and for palsa mires unfavourable, bad (based on the "area" criterion in the Article 17 report), meaning that additional measures will be required to restore these habitats. Only for calcareous fens with Cladium mariscus the area criterion was assessed as favourable.

The statistics for bogs, mires and fens of Natura 2000 -sites in Finland (boreal and alpine bio-region) are described in the following table (data of the SDF-database). All sites have been legally adopted as Special areas of conservation (SACs) and/or Special Protection Areas (SPAs). They have specific conservation objectives for one or several of these habitats especially in those Natura 2000 sites that have been designated for conservation of a certain habitat type. Site-specific conservation and restoration are described and quantified in the site's management plans and Natura 2000 Site Condition Assessments (NATA). There is still lack of habitat data in many Natura sites so the need for measures is not complete yet.

Habitat type	The number of Natura 2000 sites with the habitat type	The number of Natura 2000 sites designated for conservation of the habitat type	Total area of the habitat type in Natura 2000 sites ha	Total area of the designated conservation of the habitat type in Natura 2000 sites ha
7110	364	248	113 284	103 937
7140	696	155	141 572	66 309
7210	1	1	0,2	0,2
7230	396	209	50 370	45 936
7310	466	331	730 906	700 219
7320	13	7	37 311	35 681
9080	276	72	1 280	645
91D0	1 230	477	225 890	165 059

Ecological restoration measures for peatlands usually involve blocking and damming drainage ditches with excavators. It is also necessary to fell and remove trees in naturally open or sparsely wooded peatlands and along the banks of the ditches to be blocked. Restoration must involve raising water levels in the peatland, slowing water flows, and diverting water to make it flow in more natural direction.

The large peatland areas are mire complexes that consist of several peatland habitat types. The ideal objective of ecological restoration is to restore the whole complex and all habitat types. In aapa mire complex there can be bog woodlands (91D0), transition mires and quaking bogs (7140) and alkaline fens (7230) in addition to aapa mire habitat type (7310). Small peatland areas very often consist of only one habitat type - for example, spruce mires are wooded peatlands where the dominant tree species is Norway spruce, and they are classified as bog woodlands habitat type 91D0.

The development towards natural stage is very slow after restoration and it takes time for the hydrological conditions to be near natural. Ecological restoration has had positive impact on the representativeness of these peatland habitats so far, but additional measures will be needed to meet the sites' conservation objectives.

Many of the restoration and management activities have been carried out in several LIFE-Nature -projects since year 1995. At the moment there are two LIFE-projects going on in Finland targeting the restoration of peatlands in several SAC- / SPA-sites. Freshabit-LIFE -project will end in year 2022 and Hydrology-LIFE -project in 2023. In Hydrology-LIFE project about 5 000 hectares will be restored, most of them before the PAF period of 2021-2027.

In private owned land approximately 50 – 150 ha of peatlands is currently restored annually. Target habitats include bog woodlands (especially spruce mires) and alkaline fens. The work is done mostly as part of the Forest Biodiversity Programme for Southern Finland, METSO, which is a voluntary-based conservation programme for private forest owners. METSO programme is funding permanent and temporary protection of privately owned forests as well as management and restoration of habitats (privately owned) important for biodiversity. During 2008-2017 the total area of restoration and management measures was 4 711 ha, of which the restoration area of peatlands was 1 273 ha and management of other important habitats 3 438 ha.

Metsähallitus Forestry Ltd is responsible for the management of state-owned multiple-use commercial forests. Most of the restoration measures in state owned commercial forests so far have been executed in peatlands, with a total of 6 000 hectares. Target habitats include active raised bogs, transition mires and aapa mires with an emphasis on peatland areas with high restoration cost-efficiency.

Threats

Main threats for all peatland habitat types are hydrological changes caused by ***drainage for forestry*** including the effects of old ditches and clearing of old ditches in the surroundings of the site and in the catchment area. Hydrological regime is also deteriorated because of ditching and other land use in the surroundings of the site and in the catchment area. Structure and function of Fennoscandian deciduous swamp woods *(*9080) has deteriorated also because of ***water construction and water level regulation***. Forest management measurements have had an impact on the structure of the tree layer and on the amount of deadwood. ***Peat extraction and conversion for agriculture*** are also a threat to most peatland habitat types.

Boreal palsa mires (HT 7320) are located on the southern edge of the whole range of palsa mires, which make them especially sensitive to rise of temperature, because of ***climate change***. By comparing old and new aerial photographs, it has been observed that palsa mounds are degrading and thermokarst ponds (remains of melted palsa mounds) are common. Increasing temperature and possible increase in snow depth are likely to affect formation of new palsas in the future, however the quantitative effects are still unknown.

Climate change is the major threat for palsa mires (HT 7320) and the status of palsa mires cannot be improved by any ecological restoration, but they status need to be monitored. In Continental Finland we have only one site of Calcareous fens with Cladium mariscus and species of the Caricion avallianae (HT 7210). It is very difficult to increase the area of this rare habitat and the main objective is to maintain the status of the site as it is at the moment.

Measures needed to maintain or restore favourable conservation status

It has been estimated that approximately 10 000 hectares of peatland could still be restored in Natura 2000 areas in Finland. To achieve the favourable conservation status of peatland habitats, large-scale restoration supporting the Natura 2000 network is needed in the areas outside the Natura 2000 network (Green Infrastructure). However, cost-effective approaches (maximizing biodiversity responses, also tackling water and climate benefits) and socially sustainable operative models need to be identified before significantly larger scale annual restoration efforts can be launched.

Ditching and other land use in the surroundings of Natura sites deteriorate the hydrology of protected peatlands, so it is vital to restore ditched peatlands also outside Natura sites. Co-operation with the neighbouring landowners is very important. Returning waters of the surrounding commercial forest areas and ditched peatlands to unditched protected bogs and mires is becoming more common as a restoration measure. This is a very cost-efficient restoration measure as directed waters spread out on large areas that have dried because of the ditched surroundings.

For the following habitat types active ecological restoration and management measures are required to increase their area coverage and representativeness of the habitats thereby contributing to restoring their favourable conservation status.

- *Active raised bogs (7110)*
- *Transition mires and quaking bogs (7140)*
- *Alkaline fens (7230)*
- *Aapa mires (7310)*
- *Bog woodlands (91D0)*
- *Fennoscandian deciduous swamp woods (9080)*

Prioritization of measures to be implemented during the next MFF period

The habitat types mentioned above were chosen to be emphasized according to spatial prioritization using Zonation approach (see also chapter A.3.), maximizing cost-effectiveness of the improvement (restoration and management) effort over all habitats in Natura 2000 sites. The spatial prioritization process emphasized conservation status and rarity of each habitat, average habitat specific costs for actions, site level information of current state of the habitats, landscape level connectivity and occurrences of threatened species (national red listed species data).

There is not enough spatial data available outside the N2000 network to use Zonation approach in prioritizing restoration measures in GI, but on general level all the above mentioned habitat types have potential for restoration also in GI. Combining the habitat level restoration cost-efficiency estimates from the national scale restoration prioritization project and the habitat restoration cost-effectiveness approaches from the Zonation analysis provide a good knowledge base for building up a large scale restoration plan for the GI. When restoring in the GI, a great emphasis should be on peatland areas, where the restoration also positively effect nearby N2000 areas (structural connectivity through hydrology of the connected watersheds). Identification of these kind of integrated situation has been started and systematic methods to recognize ***landscape level peatland restoration opportunities*** is under development.

Average cost of the restoration action (800€/ha) and its effect to the hydrology of the sites were acquired from the Finnish Restoration Prioritization project (http://www.ym.fi/download/noname/%7BB9F54F49-11D7-4955-98E6-E36B9FC3956D%7D/109588). The cost of 800 €/ha is valid for large peatland areas where part of the costs of restoration measures can be covered with income of tree removal. The restoration has so far been carried out in large, easily feasible Natura 2000 -areas. The remaining peatlands in need for restoration in Natura 2000 -areas are small and detached and the estimated costs of restoration/ha are higher than earlier, about 1 000 €/ha. Blocking of the ditches is the most cost-efficient method that restores on average 95% of the hydrology-based ecosystem structure and function. Returning the waters to unditched protected peatlands from the surrounding areas is becoming more common as a restoration measure especially in aapa mires.

Helmi Habitats Programme aims to restore 12 000 hectares of ditched peatlands in protected areas by the end of 2023. The objectives of Helmi habitats programme for peatland restoration until 2030 are under preparation. Only part of the protected areas belong to Natura 2000 -network and it is estimated, that altogether approximately 10 000 ha in Natura 2000 areas could be carried out in the MFF 2021-2027 period. Furthermore 250 mires could be restored by returning waters of the surrounding commercial forest areas and ditched peatlands to unditched protected bogs and mires. Total restoration costs of peatlands restoration in the MFF 2021-2027 period are approximately 11,9 M€.

Additional measures beyond Natura 2000 (wider green infrastructure measures)

Drained low-timber production peatlands have degraded biodiversity and flood retention capacity and they are source of carbon emissions and nutrient runoff. Restoration of hydrology of degraded peatlands in wider countryside provides carbon storage services on long-term basis while providing fast evolving and long-lasting benefits for biodiversity, flood retention and other ecosystem services such as nutrient binding from drainage waters.

Restoration includes damming of existing ditches, redirecting drainage waters of agriculture and forestry to restored peatlands and where necessary removal of established trees to prevent unnecessary evaporation. Estimated cost/hectare is on average 500-800 euros. To provide tangible biodiversity and other benefit the restored area needs to be of sufficient scale.

Outside Natura 2000 areas there is a need to restore about 20 000-50 000 hectares of private areas near protected mire areas and detached to private areas, another 20 000 ha of protected mire areas not in Natura network and around 10 000 hectares of peatlands on Metsähallitus Forestry Ltd lands.

List of prioritized measures to be carried out, and estimated costs for these measures

- within Natura 2000 sites designated for the targeted habitats and species

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Active raised bogs (HT 7110): Restoration of the hydrology of drained raised bogs / complexes of raised bogs by blocking the ditches (average annual cost per hectare1 000 €)	One-off	5 500 ha	785 000	
Transition mires and quaking bogs (HT 7140): Restoration of the hydrology of drained bogs by blocking the ditches (average annual cost per hectare: 1 000 €)	One-off	80 ha	12 000	
Alkaline fens (HT 7230): Restoration of the hydrology of drained fens by blocking the ditches (average annual cost per hectare: 800€)	One-off	25 ha	3 600	
Aapa mires (HT 7310): Restoration of the hydrology of drained mires / complexes of aapa mires by blocking the ditches (average annual cost per hectare: 800€)	One-off	4 200 ha	480 000	
Fennoscandian deciduous swamp woods (HT 9080): Restoration of the tree structure for deciduous or herb rich forests (average annual cost per hectare: 800€)	One-off	30 ha	3 500	
Bog woodland (HT 91D0): Restoration of the hydrology of drained bogs, mires and fens by blocking the ditches. (average annual cost per hectare: 1 000 €)	One-off	165 ha	24 000	
Restoration by returning the waters to unditched bogs and mires of several peatland habitat types, mainly aapa mires. *(average cost per restoration area is 7 000 €)*	One-off	250 mires	250 000	
Planning of the restoration measures in Natura 2000 sites; 2 person-year/year during the PAF period 2021-2027 (average annual salary and travel costs 2 x 70 000 € -> 140 000 €/year)	Recurring	14 person years	140 000	
TOTAL		**10 000 ha**	**1 700 000 €**	

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Restoration of hydrology of drained peatlands by blocking the ditches	One-off	52 000 ha	5 840 000	
Consulting and planning of the restoration measures in both site and landscape levels	Recurring		200 000	
Monitoring of restored peatlands	Recurring		80 000	
National level Invasive Alien Predator Management framework in the wider countryside. Please refer to E.3.1.2. on this cross-cutting measure covering variety of habitats				
TOTAL		**52 000 ha**	**6 120 000 €**	

* indicate whether the measure is recurring or one-off

Expected results for targeted species and habitat types

The presented measures and specifically their extent do not yet guarantee favourable conservation status for the impacted habitats. However, the used methods and affected areas and habitats offer a cost-effective combination of habitats (areas), i.e. their improvement heuristically maximizes the improvement effect to U2 and U1 status habitats for the 2021-2027 period.

For bogs, mires, and fens the proposed actions and quantities will continue the long term work for the restoration of the large areas that have been drained, mainly for forestry purposes. As most of the drained areas are outside the N2000 network, it is clear that the proposed actions for the N2000 network will have only small effect to the more common habitat types like active raised bogs (HT 7110) and aapa mires (HT 7310). Thus, active restoration work and identification of the most cost-effective approaches in GI are also needed. However, for smaller scale targets like the very important alkaline fens (HT 7230) in southern Finland, the proposed restoration actions and quantities for the N2000 network have a significant effect in Natura 2000 sites. The prioritized total amount is also subject to administrative and operational restrictions. The work to make a significant difference to the vast number of drained peatlands will continue, and since the restoration actions are one-off by nature the effect will accumulate over time.

The mire restoration improves the critical habitats for several species with declining populations listed in Annex II and IV of the Habitats Directive like *Pytho kolwensis* (U1x), *Lopinga achine* (U1-), *Cypripedium calceolus* (U1=), *Saxifraga hirculus* (U1-), *Hamatocaulis vernicosus* (U1=), Hamatocaulis lapponicus (U1), *Herzogiella turfacea* (U1=) and *Meesia longiseta* (U1=) and several bird species listed in Annex I of the Birds Directive like: *Calidris pugnax*, *Lagopus* , *Motacilla flava* and *Tringa glareola*. Poorly known terrestrial molluscs *Vertigo genesii* and *Vertigo geyeri* (unknown conservation status XX) may also benefit the restoration measures.

Expected results: other benefits

Restoration and management of mire and wetland habitats and construction of wetlands to suitable sites contribute to variety of other EU objectives, such as flood mitigation, surface water protection, biodiversity, carbon sequestration and other ecosystem services.

Restoration activities are prioritized firstly to Natura 2000 sites and their surroundings and secondly to degraded peatlands where overall benefits for biodiversity, flood retention and surface water quality override the short-term methane emissions and provide cumulative long-term benefits as stored carbon in the peat overweighting the climate effect of methane emissions.

Restoration of peatlands can improve the recreational possibilities of the mires by better hiking, berry picking and game hunting possibilities together with improved landscapes and biodiversity.

Restoration of peatlands also support local economies and employment, when loggers and local entrepreneurs execute restoration measures.

E.2.4. Grasslands

Current status of habitats and species, conservation measures taken until now and their impact so far, remaining pressures and threats

Grasslands in Finland contain totally 13 habitat types listed in Annex 1 of the Habitats Directive. Three habitat types, *Boreal Baltic coastal meadows* 1630*, *European dry heaths* 4030 and *Fennoscandian wooded pastures* 9070 are included in the Grassland-group as these are considered as management dependent semi-natural grasslands in Finland. One habitat type, *Siliceous alpine and boreal grasslands* (6150) exists naturally on fells and is not dependent on management actions. This type is the only one of grassland habitat types assessed as favorable in both regions.

Amongst the grassland habitats, 12 are depending on an active management through agricultural management practices (grazing or mowing). These are:

- *Boreal Baltic coastal meadows* (1630*)
- *European dry heaths* (4030)
- *Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)* (6210) *and important orchid* sites (6210*)
- *Species-rich Nardus grasslands, on siliceous substrates in mountain areas* (6230*)
- *Fennoscandian lowland species-rich dry to mesic grasslands* (6270*)
- *Nordic alvar and Precambrian calcareous flatrocks* (6280*)

- *Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinia caeruleae)* (6410)
- *Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels* (6430)
- *Northern boreal alluvial meadows* (6450)
- *Lowland hay meadows* (6510)
- *Fennoscandian wooded meadows* (6530)
- *Fennoscandian wooded pastures* (9070)

Semi-natural grasslands are nationally assessed as the most threatened habitat group in Finland, where nearly all habitat types belong to critically endangered habitat types (Kontula & Raunio 2018). In the most recent available report on the conservation of habitats and species under Habitats Directive (Article 17 report 2018) totally 10 of semi-natural grasslands are reported as being currently in an unfavourable - bad (U2) conservation status in the boreal region and 2 as unfavourable – indadequate (U1) . "Structure" criterion for 9 habitat types and “Future” criterion for 10 habitat types has been assessed as being unfavourable - bad (U2), indicating that additional efforts are quickly needed to stop the loss of the species and deterioration of the area. Additional measures are required to restore these habitats and re-instate a continuous management compatible with their ecological requirements on areas that are currently subject to abandonment or other land uses (e.g. tree plantations, improved grasslands, constructions). Only one habitat type 6430, which is not as dependent on the management practices as the other above-mentioned habitat types, is currently being assessed as unfavourable - inadequate in boreal region and favourable in alpine region. Type 6430 exists naturally on open lands on wet soils, but also on pastures and overgrowing meadows.

Altogether, the above 12 Annex I grassland habitat types dependent on management actions are found in 307 Natura 2000 sites of mainland Finland. The number of Natura 2000 sites of this kind in Åland is 8. Altogether, over 300 Natura 2000 sites in mainland Finland and all 8 sites in Åland have specific conservation objectives for one or several of these habitats in Finland. Site-specific conservation and restoration are described and quantified in the site's management plans.

Finland lacks accurate inventory data on directive habitat types for grasslands. The estimated current management dependent Annex 1 grassland habitat area in Finland is circa 19,900 ha (2018) based on limited information. Currently, the inventoried area with detailed data for Annex 1 habitat types is circa 9,310 ha (2018). Inventory data is mainly available from the protected areas in mainland Finland. Most of the grassland area in Finland is located outside Natura 2000 network and not inventoried. Also, the inventories of Åland are in progress and data is incomplete.

Non-Annex I grasslands

In addition to the Annex I habitat types under Habitats Directive, there are other grassland habitat types that are an essential part of the network of the semi-natural grasslands in Finland. These are national grassland habitat types: freshwater meadows, moist and mesic hay meadows, fen meadows and grazed woodlands, partly also rocky meadows. Usually these non -Annex habitats are found as a part of larger entireties of different semi-natural habitats. They play a big role in supporting the habitat networks for many grassland species. Due to that these national semi-natural habitat types are considered as part of the Finnish grassland habitat group and its targets in this PAF. In addition, there are lot of areas that are not yet inventoried as Annex 1 habitat types due to inadequate inventories. There is also number of areas where habitats are not considered yet as Annex 1 habitat types due to their bad condition, i.e. overgrowing. These abandoned, or just newly restored areas have a high potential as being included into Annex 1 habitat types in the long run after proper actions of restoration and some years of high-quality maintenance.

Previous measures

Previous measures taken for grassland habitats include agri-environment measures and non-productive investments under the national Rural Development Programme. 130 of the Natura 2000 sites that have specific conservation objectives for one or several of these habitats are at least partly under agri-environmental

measures in mainland Finland. This is less than half of the Natura 2000 sites considered having specific conservation objectives for these habitats. In Åland all 8 Natura 2000 sites having specific conservation objectives for grasslands are at least partly under agri-environmental measures.

Also, LIFE-Nature projects have had measures for grassland habitats. Semi-natural grasslands have been included in several LIFE-projects (18) as a small part. But there have been only four LIFE Nature projects targeting especially restoration and management of Annex I grassland habitats. None of LIFE projects are targeted in increasing communication and general knowledge sharing for grasslands, which are important tools for encouraging people to conservation and management of semi-natural grasslands. Also, none of the LIFE projects have included other than Natura 2000 sites, although "green infra" is vital to the grassland network in Finland.

Under Rural Development Programme there have been conducted regional projects enhancing the management of grasslands among farmers. Also, volunteer work has been an important part of the restoration measures. Several volunteer camps are arranged per year by NGOs and Metsähallitus Parks & Wildlife Finland, for example to help to collect the clearing waste from the tree and shrub clearings. Volunteers, for example via local village or conservation associations, take care of some maintenance management as well, mainly mowing. A small proportion of the measures are taken by Metsähallitus Parks & Wildlife Finland and regional ELY-centres with national funding for nature conservation.

These above-mentioned measures have already stopped the decline of grassland habitats within many sites of the Natura 2000 network, and also partly outside Natura 2000 network. But additional measures are needed to start restoration and annual management on the unmanaged sites, as well as, to achieve good quality management and meet the sites' conservation objectives on the managed sites. This need is urgent both within and outside Natura 2000 network.

Bird species breeding in semi-natural grasslands

In Finland, 4 bird species (listed in Annex I of the Birds Directive or considered as trigger species for SPA designation) have regular breeding populations in coastal meadows (Annex 1 habitat 1630*). These are:

- Baltic Dunlin *Calidris alpina schinzii* (55-60 breeding pairs)
- Black-tailed Godwit *Limosa limosa* (110-130 breeding pairs)
- Redshank *Tringa totanus* (4,500-6,000 breeding pairs)
- Ruff *Philomachus pugnax* (10,000-15,000 breeding pairs)

Three species (Baltic Dunlin, Redshank and Ruff) have undergone substantial population declines and a reduction of their breeding range over the last decades, mainly as a result of loss and fragmentation of suitable breeding habitats (both as a result of land abandonment and unfavourable habitat changes). Black-tailed Godwit population is small but slightly increasing. All 4 target species are considered as threatened in Finland.

Altogether 20 core sites, covering a total suitable coastal meadow area of 3,600 hectares, have been designated as Special protection areas (SPA) for breeding populations of these 4 species. Previous measures undertaken for these species include two LIFE projects (covering land purchase, restoration planning and habitat restoration actions on a total area of 1,000 hectares) and agri-environment measures under the national Rural Development Program, supporting a targeted annual grazing management in 90% of the core areas currently used by the species.

These above-mentioned measures have already led to a positive population trends within these 20 Natura 2000 sites, but additional measures will be needed in line with site's conservation objectives.

Open semi-natural grasslands have a high importance for 4 other bird species listed in Annex I of the Birds Directive. Trend of these species has been declining due to overgrowing of grasslands. Protection of open habitats and more effective management actions would help these species to nest and feed, and so increase the number of breeding pairs. These species are:

- Eurasian skylark *Alauda arvensis*
- Corn creke *Crex crex*

- Red-backed shrike *Lanius collurio*
- Barred warbler *Sylvia nisoria*

Other species depending on semi-natural grasslands

In Finland, 9 other species (listed in Annex IV) are living primarily on semi-natural grasslands. These are:

- Clouded Apollo *Parnassius mnemosyne*
- Large Copper *Lycaena dispar*
- Violet Copper *Lycaena helle*
- Marsh Fritillary *Euphydryas aurinia*
- Scarce fritillary *Euphydryas maturna*
- Siberian Winter Damsel *Sympecma paedisca*
- Hairy Agrimony *Agrimonia pilosa*
- Little Grapefern *Botrychium simplex*
- Siberian Primrose *Primula nutans*

Little Grapefern (unfavourable - inadequate U1), and Siberian Primrose (unfavourable - inadequate U1) have undergone substantial declines in their populations due to overgrowing of coastal meadows. Hairy Agrimony as well as Clouded Apollo assessed as unfavourable - inadequate (U1), and Violet Copper assessed as unfavourable - bad (U2), have been declining due to the general abandonment and overgrowing of different kinds of meadow habitats.

There are 7 Natura 2000 sites especially targeted to protection of the Marsh Fritillary. This species is dependent on meadows and forest edges were the plant *Succisa pratensis* is growing. Status of the species is inadequate bad (U2). Due to overgrowing, the habitats of this species have declined. One of the targeting Natura 2000 sites has already lost its population.

Restoration and maintenance of semi-natural grasslands have already had some positive effects on these species on many Natura 2000 sites, but effective additional measures are needed to enhance the recovery of the habitats and populations of these species.

Measures needed to maintain or restore favourable conservation status

Active annual management measures are required to ensure maintenance, avoid deterioration and/or progressively lead to an improvement of ecological condition of the 12 Annex 1 grassland habitat types. Measures are also required to ensure maintenance of other semi-natural grassland habitats important to grassland network. Management actions include annual grazing or mowing, and maintenance clearance of trees and shrubs if necessary. In wooded meadows maintenance also includes pollarding of trees and spring clearance of dead litter.

Urgent active habitat restoration measures are also required to increase the habitat area coverage and strengthen the habitat networks, thereby contributing to the restoration of favourable conservation status of grassland habitat types and species. Restoration actions in all grassland habitat types suffering from overgrowing include tree and shrub clearings before annual management starts, making fences and other relevant infrastructure for the grazing animals, mowing or rotovating reed from and in the front of the coastal meadows and/or burning the old litter from the meadows or junipers from the heaths. Inventories of habitats and species, as well as restoration and management plans are needed before the actions.

As the meadows are efficiently restored and yearly maintained, it will have a big effect not only on the conservation status of the habitats, but also on the conservation status of many Annex IV species and Annex I birds, as well as many other nationally threatened species.

The following estimates can be given for the Boreal region in Finland for each habitat dealt with in this section, based on background data collected for the previous reporting and the assessment of threatened habitats in Finland (Kontula & Raunio 2018), accompanied by current incomplete GIS-data and estimates made by grassland experts.

Habitat	Habitat area, ha	Current management area ,ha	Need for restoration longterm, ha	Restoration target 2021-2027, ha	Maintenance target 2021-2027, ha***	Priority 2021-2027
1630*	6200	3100	3100	2100	5200	Medium
4030	2000	240	1060	490	730	Medium
6210	140	28	112	100	128	High
6210*	10	5	5	5	10	High
6230*	50	10	40	32	42	High
6270*	1500	970	530	420	1390	High
6280*	50	5	45	35	40	High
6410	30	9	21	21	30	High
6430	4000	400	600	30	430	Low
6450	3200	730	270	270	1000	Medium
6510	50	20	80	60	80	High
6530	230	100	130	100	200	High
9070	3400	1700	1700	1300	3000	Medium
Non-Annex grassland habitats**	45000	22980	22100	9940	32930	Medium
Total	**65860**	**30300**	**29790**	**14900**	**45210**	

*priority Natura 2000 habitat type, **include those areas detected with a high potential of becoming for Annex 1 habitats, but not yet fulfilling the Annex 1 strict requirements due to abandonment or newly started management. Include also estimate of non-inventoried habitats and national grassland habitat types important for the grassland network,***include currently managed area and new area from restoration during 2021-2027

Maintenance needs

Active annual management measures are required to ensure maintenance, avoid deterioration and/or progressively lead to an improvement of ecological condition of Annex I habitat types. This includes the areas that already are inventoried as Annex I habitat types (mainly on protected areas) and those that do not have detailed inventory data yet but are estimated as being Annex I grassland habitats (mainly on private lands outside Natura 2000 areas). Maintenance need includes also the national grassland habitats, as well as those not yet considered as Annex 1 habitats due to their condition and strict requirements of Annex 1 habitat typing.

Totally, the annual maintenance need for the semi-natural grassland habitats **currently under management in mainland Finland is circa 30,000 hectares**. Of the currently managed area only circa 70 hectares are under mowing. Others are managed by grazing. 12,000 hectares (40%) of the annually managed area are inside Natura 2000 sites and circa 18,000 hectares outside Natura 2000 sites. This is a rough estimate, as there are no data available in Finland for detailed habitat types of semi-natural grasslands outside the protected areas and the inventories of Natura 2000 sites are still in progress. **In Åland, the annual maintenance need for currently managed grasslands is circa 2,200 hectares.**

Restoration needs:

One main reason for the current bad state of semi-natural grasslands in Finland is the low amount under management, because semi-natural grasslands no longer play a natural part of common farming practice in modern animal husbandry. It is estimated that **60,000 hectares would be the minimum amount of managed grassland area** that can maintain the semi-natural grassland habitats and their species in mainland Finland. This goal was set already for the year 2010. However, as the **current area under management is only half of this, declining of habitats and species has continued**. Urgent restoration actions are needed to stop the decline and improve the situation. Active restoration measures are required to increase the coverage of semi-natural grasslands in general and specially Annex I habitat types. Restoration will have a decisive effect on achieving the conservation objectives of Annex I habitat types and grasslands in general, and on maintaining the grassland dependent species in Finland.

Thus, **circa 30,000 hectares of semi-natural grasslands in mainland Finland are in need for restoration** as soon as possible. This new restoration should be first targeted to the most valuable and species-rich sites to maximize the ecological benefits, e.g. sites inventoried as nationally and regionally valuable, as well as to those sites that have the best possibilities to improve the habitat networks.

Network can be supplemented with sites of lower values. As the data of Finnish semi-natural grasslands and their values is still very incomplete, the national inventory of semi-natural habitats should be completed during the first years of the next MFF period and the spatial data of the habitats should be saved in a national database to help targeting the restoration and management to the most urgent areas.

Of the restoration area in mainland Finland circa 10,000 ha is estimated to be in the Natura 2000 sites and circa 20,000 ha outside the Natura 2000 areas. This is a rough estimate, as the national data of grasslands is incomplete. Majority of this restoration area does not currently belong to any Annex 1 habitat type due to overgrowing and abandonment, but with a proper restoration actions and annual management they can move to Annex 1 habitat types or into national grasslands types in a long-term.

In Åland all grasslands in Natura 2000 sites are already maintained. **In Åland circa 50 hectares of Annex 1 habitat types outside Natura 2000 sites are in need for restoration**. In addition to Annex 1 habitat types, **it is known that there are Non-Annex habitat types in need restoration in Åland,** but the exact data is lacking.

Inventory and monitoring needs:

As data of the semi-natural grasslands in Finland is very incomplete and no spatial data is available for large number of sites, carrying out the inventories of semi-natural grasslands in the whole country, including Åland, is essential as soon as possible. To be able to plan and target the actions, the inventory of the sites and habitats is crucial. Ministry of Environment in Finland started updating the grassland data by field work in some counties, but as the available national financing has been low, updating is progressing slowly. For effective targeting and prioritizing of restoration and management, the updated spatial data of the grassland sites and habitats should be available at the latest in the first years of the next MFF period. The updated data is essential also for the equal consideration of the agri-environmental payment applicants.

There has been national database for semi-natural grasslands in Finland technically available since 2016. It should be verified that there are enough resources to put data in the database after the inventories and other field visits. Also, ensuring the smooth operation of the new GIS system is important. Today, the input of the data is in its beginning, following the slow process of field inventories. As well as completing the field inventories, inputting the data should be speeded up to help the evaluations of the eligible sites for agri-environmental payment, assessments for the Article 17 reporting, threatened habitat types and species, as well as several other purposes. In the future, database of the grassland sites should be kept as updated as possible after the detailed firsts inventories. This needs monitoring visits and keeping contacts with the site managers. Updating should be coordinated nationally and regionally by the environmental authorities.

Long-term detailed monitoring sets are also important when following the state and changes in semi-natural grasslands and their species. As a part of detailed monitoring of the structure and function of grassland habitats, as well as the effectiveness of the agri-environmental payments in Finland, the Finnish Environment Institute's monitoring sets of mesic and dry grasslands, started in early 2000's, should be continued. Also, the long-term monitoring sets by Metsähallitus Parks & Wildlife Finland in the protected areas should be continued, some of these dating back even to 1970s. For birds, data collected by volunteer bird watchers is in a major role in monitoring the long-term effects on species in coastal meadows.

As the previous monitoring sets are concentrated very much on monitoring vascular plants, more attention should be put into inventory and monitoring of other species groups, e.g. insects, mosses, lichens and fungi. There are many species groups that still are poorly known in grassland habitats, not to mention monitoring the effects of management or abandonment for species. Long-term data sets will be even more important in the future to evaluate and mitigate the effects of climate change.

Cultural heritage plays an important role in semi-natural grasslands. Former land-use has modified the grassland sites in many ways. Documentation of the ancient structures and history and evaluating the right restoration and management actions hand in hand with the biodiversity targets, gives a holistic picture of the site's development into current state. This helps to choose the right steps for the future. First, the inventories of cultural heritage are targeted into nationally and regionally valuable sites.

Advisory activities:

As maintaining and restoring semi-natural grasslands is highly dependent on the local farmers and other entrepreneurs, it is essential to increase the easily available advisory services for both the current and the potential new managers. Agricultural advisory organizations in Finland should put more focus on biodiversity issues. More freely available advisory services should be available for biodiversity and grassland issues.

Also, public awareness should be raised in issues related to importance of grassland habitats for biodiversity, and socio-economic benefits, including pollination services.

Regional coordination and advising given by environmental authorities should be strengthened to increase the knowledge sharing of semi-natural grasslands and their management. Coordination helps to find the right managers to those sites in need for the most urgent restoration. In Finland, municipalities are responsible for land use planning. Therefore, the valuable sites which are owned by the municipalities should be taken into agenda in planning in every level from general land-use planning to more accurate plans. Specially, small but usually very species-rich dry grasslands owned by municipalities suffer from the pressures created by construction and growing conurbation. More information of the valuable grassland sites and ecological habitat networks should be available for different scales of community planning, including provincial and municipality master plans for land-use. By sharing the information and knowledge, the pressures can often be mitigated.

As management and conservation of semi-natural grasslands is tightly linked to the animal husbandry, increasing the public awareness of environmentally and biodiversity friendly local meat production in semi-natural grasslands is needed. Combined with increasing awareness of biodiversity and climate change related issues, a substantial improvement in knowledge could be achieved among citizens and their consumption behaviour.

Prioritization of measures to be implemented during the next MFF period

Prioritized maintenance needs for grasslands 2021-2027

The area of semi-natural grassland in mainland Finland to be maintained during the MFF period 2021-2027 through annual agri-environmental management measures encompass total area of circa 30,000 hectares currently under management (Mavi 2016). Of this, 12,000 hectares inside Natura 2000 sites and 18,000 hectares outside Natura 2000 (i.e. wider "green infrastructure") (Kontula & Raunio 2018, Sakti 2018, Article 17 report 2018, Mavi 2016, expert estimate). In SPA sites agri-environmental scheme cover circa 8,400 hectares and in SAC 9,470 ha (Mavi 2016, Sakti 2018). Of these 6,836 ha is both SAC and SPA sites.

Maintenance area in mainland Finland includes also the new area, circa 15,000 ha, from the restorations 2021-2027. This area moves into annual management gradually after the restoration actions are completed.

In this PAF both, the current yearly management area, and the new area restored during the next MFF period are dealt as the total maintenance target, meaning total 45,000 ha of maintenance need 2021-2027 in mainland Finland. This total management area includes Annex 1 habitat types and those non-Annex I grassland habitats which are part of the grassland network in Finland. This total area is corresponding to the ecological requirements of grassland habitats, 4 Annex I migratory bird species breeding on coastal meadows or other grassland dependent Annex IV species.

In Åland, the semi-natural grassland area to be maintained during the MFF period 2021-2027 though annual agri-environmental measures includes 2,200 hectares of currently managed areas and new area from restoration 2021-2021 The amount of new area from restoration is unknown. Maintained total area includes both, the Annex 1 and non-Annex I grassland habitats.

The active maintenance measures are essential to avoid further deterioration of the conservation status of 12 grassland Annex I habitat types, national grassland habitat types, 4 coastal meadow bird species and several other Annex 1 species as well as several nationally threatened grassland species. Any reduction in the extent of the area actively managed for these habitat types or species would lead to a further deterioration of their conservation status. For that reason, **all maintenance measures for grasslands are to be considered as priority measures**. Amongst these measures, attention must be paid to those measures implementing the necessary conservation measures for Natura 2000 sites and those sites outside Natura 2000 which have the highest conservation value for grassland habitats and species. These include sites of nationally and regionally valuable semi-natural grasslands, and those sites supporting most effectively the grassland network in Finland. Also, special attention should be paid to maintain the currently very rare mowing measure at those sites with long tradition of mowing and sites were mowing is the best or only measure to maintain the sites ecological values.

On maintenance, more interest should be paid on the proper **management quality**. It is evident that many sites, inside and outside Natura 2000, are suffering from too low grazing and mowing pressure or inadequate tree clearings. Additional management actions should specially be targeted to the most valuable and species-rich sites to get the best ecological results.

Also, the ecological requirements of different species groups need more attention when targeting to the optimum stage of habitats and species. For example, in coastal meadows, strong reed bed is a common problem and often grazing is not enough to dispose the reed in the early stage of the management. As a supporting measure for annual grazing, reed cutting in the coastal meadows and in the water areas in the front of the coastal meadows should be increased to speed up the recovery, particularly the return of waders and other coastal meadow bird species. In addition, for example many insect species benefit of different management pressure than plants.

Prioritized restoration needs for grasslands 2021-2027

As the state of the semi-natural grasslands in Finland is so poor and the amount of the habitats in general is so low, all the actions increasing the grassland habitat coverage are important. The **whole grassland network needs supportive and high-quality actions** to be able to maintain habitat values and the species, and to help to maintain species also in the changing climate. However, **special attention must be paid on restoration of the most species rich grassland habitats and sites, such as dry and mesic meadows and wooded meadows, particularly on calcareous soils,** i.e. Annex 1 habitat types 6210, 6210*, 6270*, 6280* and 6530. Åland has a major role in restoring and maintaining all the above-mentioned high priority habitat types.

Generally, the prioritized restoration measures should be **targeted based on site's real ecological values, habitat resilience and habitat connectivity**. As the amount of open grassland habitats in Finland is low, but the amount of threatened species living in these habitats so high, the amount of open grasslands should be increased by picking up the most potential sites for restoration actions also from the severely overgrown areas. From the overgrown wooded habitat types, those that have the highest potential for Annex 1 habitat type wooded pastures (9070) should be prioritized. Large, heterogeneous entities, as well as local and regional connectivity are important points to be considered when choosing the priority sites for restoration in general, but in land-use planning of municipalities, also the small but species-rich sites should also be respected.

Altogether, the area of grasslands to be restored to achieve minimum conservation objectives of the grassland habitats in mainland Finland and to receive better conservation status of the species through various types of restoration measures covers totally circa 30,000 hectares. Circa 8 000 - 12,000 hectares of this total area to be restored is estimated as locating inside Natura 2000 sites, and 18,000 - 22 000 hectares outside Natura 2000 (i.e. wider "green infrastructure"). Due to data deficiencies, this is a rough estimate. When the habitat area under management will be increased by 30,000 hectares, the minimum target for managed semi-natural grasslands in in mainland Finland, 60,000 ha, can be achieved.

For various reasons (lack of access to the most suitable lands for targeted restoration measures, insufficient participation of private landowners and managers into restoration measures on their land, competition with other land uses, incomplete data of semi-natural grassland sites, etc.), only part of the area required to improve the conservation status will already be available for the implementation of measures during the MFF 2021-2027. Based on a rough estimate, it is assumed that on average only circa **50 % of the needed grassland restoration measures will be achieved during the next MFF period 2021-2027.** Any remaining measures will therefore be implemented at a later stage, but as soon as possible. Target for MFF period 2021-2027 is most dependent on the financing of the restoration action via Non-productive investment measure and restoration projects.

Receiving the target requires also proper coordination, counseling and guidance of managers. On that 50 %-basis, one can assume that the prioritized measures for the restoration of grasslands during the MFF period 2021-27 will cover an area of approximately **15,000 hectares in mainland Finland**.

These measures will contribute the conservation objectives for the above 12 grassland Annex I habitat types as well as other grassland habitat types, 4 coastal meadow birds and 9 other Annex IV species, and in addition, numerous other grassland species. The measures will have a major effect on improving the habitat networks of semi-natural grasslands. Circa **5,000 ha** of the restoration area during the MFF period 2021-27 is estimated to locate inside Natura 2000 sites, and 1**0,000 ha** outside Natura 2000 (i.e. wider "green infrastructure").

Due to lack of data the prioritized restoration actions for Åland are not estimated for this PAF.

In future updated versions of the current PAF, the restoration measures inside and outside Natura 2000 may be complemented to achieve the goals for the ecologically minimum area under proper management and slowly by slowly come closer to the favourable conservation status of grassland habitat types.

List of prioritized measures to be carried out, and estimated costs for these measures

- within Natura 2000 sites designated for the targeted habitats and species

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)**	Possible EU co-funding source
Yearly maintenance (agri-environmental scheme) for **coastal and freshwater meadows in mainland Finland**: grazing, including maintenance removal of shrubs (average annual cost per hectare: 875 €) agri-environmental scheme	recurring	6 967 ha	6 096 180	CAP
Investment measure for the restoration of **coastal and freshwater meadows in mainland Finland**: removal of shrubs and trees, 30 % of the restorable target area is estimated as in need of tree and shrub removal (total cost per hectare: 2,240 €)	One-off	585 ha	187 151	CAP, LIFE and other restoration projects
Investment measure for the restoration **of coastal and freshwater meadows in mainland Finland**: re-instatement of grazing infrastructure and initial grazing management, e.g. fencing (total cost per hectare 2,760 €)	One-off	1 949 ha	768 655	CAP, LIFE and other restoration projects
Investment measure for the restoration of **coastal and freshwater meadows in mainland Finland**, including currently grazed and new restorable areas: removing reed from the coastal meadows and from the water areas in the front of coastal meadows creating open fairways for nesting and migrating birds from the sea to the meadow (total cost per hectare: 700 €, done twice)	One-off	1 800 ha	360 000	CAP, LIFE and other restoration projects
Yearly maintenance (agri-environmental scheme) for **open semi-natural grasslands in mainland Finland**: grazing, including maintenance removal of shrubs (average annual cost per hectare: 875 €)	Recurring	4 948 ha	4 329 867	CAP
Yearly maintenance (agri-environmental scheme) for **open semi-natural grasslands in mainland Finland**: mowing, including maintenance removal of shrubs (average annual cost per hectare: 2,121 €)	Recurring	150 ha	318 150	CAP
Yearly maintenance for **open semi-natural grasslands in mainland Finland**: spring clearings, mowing, only for wooded meadows (average annual cost per hectare: 2,350€)	Recurring	276 ha	648 718	CAP, MoE
Investment measure for the restoration of **open semi-natural grasslands in mainland Finland**: removal of shrubs and trees, 30 % of the restorable target area needs tree and shrub removal (total cost per hectare: 2,240 €)	One-off	460 ha	147 339	CAP, LIFE and other restoration projects
Investment measure for the restoration of **open semi-natural grasslands in mainland Finland**: re-instatement of grazing infrastructure and initial grazing management, e.g. fencing (total cost per hectare 2,760 €)	One-off	1 385 ha	546 001	CAP, LIFE and other restoration projects
Investment measure for the restoration of **open semi-natural grasslands in mainland Finland**: burning (total cost per hectare: 3 700 €)	One-off	480 ha	253 714	CAP, LIFE and other restoration projects

Investment measure for the restoration of **open semi-natural grasslands in mainland Finland**: pollarding recurring every fifth year only for wooded meadows (average annual cost per hectare 700 €)	One-off	276 ha	27 605	CAP, MoE, LIFE and other restoration projects
Yearly maintenance (agri-environmental scheme) for **wooded semi-natural grasslands** in **mainland Finland**: grazing, including maintenance removal of shrubs (average annual cost per hectare: 875 €)	Recurring	5 066 ha	4 4332 969	CAP,
Investment measure for the restoration of **wooded semi-natural grasslands in mainland Finland**: removal of shrubs and trees, 50 % of the restorable target area needs tree and shrub removal (total cost per hectare: 2,240 €)	One-off	756 ha	241 800	CAP, LIFE and other restoration projects
Investment measure for the restoration of **wooded semi-natural grasslands in mainland Finland**: re-instatement of grazing infrastructure and initial grazing management (total cost per hectare: 2,760 €)	One-off	1 511 ha	595 864	CAP, LIFE and other restoration projects
General measures**: inventory of semi-natural grasslands** in mainland Finland (average cost per hectare 30 €/ha)	One-off	20 000 ha	85 714	MoE
General measures: regional **coordination**, keeping site and habitat databases updated after the inventory, helping to organize management in mainland Finland (total average cost 200 000 €/year)	Recurring	20 000 ha	200 000	MoE, Metsähallitus, ELY-centres
General measures: making **detailed management action plans** for semi-natural grasslands restoration and maintenance in mainland Finland (total cost per hectare 375 €)	One-off	5 000 ha	267 857	MoE, LIFE and other restoration projects
General measures: making **regional plans** for semi-natural grassland networks in mainland Finland, prioritization in relation to other habitat networks, e.g. deciduous forests (circa 100,000 €/year)	One-off		100 000	MoE, RDP & LIFE projects,
General measures: **advising services** for managers for semi-natural grasslands in mainland Finland (average annual cost 50 €/ha)	Recurring	15 000 ha	750 000	CAP, MoAF, ProAgria
General measures: **awareness raising** campaign, information sharing and portal for semi-natural grasslands in mainland Finland (total cost 1,000,000 €)	One-off		142 857	LIFE and other communication projects
General measures: **cultural heritage inventories** of semi-natural grasslands in Natura 2000 sites in mainland Finland, prioritizing in the next MFF period the nationally valuable grassland sites (circa 200 sites, 'a 1,000 €/site)	One-off	200 sites	28 571	MoEC, cultural heritage projects
TOTAL RESTORATION	One-off		3 128 129 €	
TOTAL MAINTENANCE	Recurring	17 408 ha	15 725 884 €	
TOTAL GENERAL MEASURES	One-off		624 729 €	
TOTAL GENERAL MEASURES	Recurring		950 000 €	
TOTAL			**20 428 742 €**	

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)**	Possible EU co-funding source
Yearly maintenance (agri-environmental scheme) for **coastal and freshwater meadows in mainland Finland**: grazing, including maintenance removal of shrubs (average annual cost per hectare: 875 €)	Recurring	7 975 ha	6 978 038	CAP
Investment measure for the restoration of **coastal and freshwater meadows in mainland Finland**: removal of shrubs and trees, 30 % of the restorable target area is estimated as in need of tree and shrub removal (total cost per hectare: 2,240 €)	One-off	657 ha	210 142	CAP, Restoration projects
Investment measure for the restoration of **coastal and freshwater meadows in mainland Finland**: re-instatement of grazing infrastructure and initial grazing management, e.g. fencing (total cost per hectare 2,760 €)	One-off	2 189 ha	863 082	CAP, Restoration projects
Investment measure for the restoration of **coastal and freshwater meadows in mainland Finland**, including currently grazed and new restorable areas: removing reed from the coastal meadows and from the water areas in the front of coastal meadows creating open fairways for nesting and migrating birds from the sea to the meadow (total cost per hectare: 700 €, done twice)	One-off	1 500 ha	300 000	CAP, Restoration projects
Yearly maintenance (agri-environmental scheme) for **open semi-natural grasslands in mainland Finland**: grazing, including maintenance removal of shrubs (average annual cost per hectare: 875 €)	Recurring	5 839 ha	5 109 291	CAP
Yearly maintenance (agri-environmental scheme) for **open semi-natural grasslands in mainland Finland**: mowing, including maintenance removal of shrubs (average annual cost per hectare: 2,121 €)	Recurring	100 ha	212 100	CAP
Yearly maintenance for **open semi-natural grasslands in mainland Finland**: spring clearings, mowing, only for wooded meadows (average annual cost per hectare: 2,350 €)	Recurring	24 ha	56 400	CAP, MoE
Investment measure for the restoration of **open semi-natural grasslands in mainland Finland**: removal of shrubs and trees, 30 % of the restorable target area is in need of tree and shrub removal (total cost per hectare: 2,240 €)	One-off	510 ha	163 218	CAP, Restoration projects
Investment measure for the restoration of **open semi-natural grasslands in mainland Finland**: re-instatement of grazing infrastructure and initial grazing management, e.g. fencing (total cost per hectare 2,760 €)	One-off	1 668 ha	657 743	CAP, Restoration projects
Investment measure for the restoration of **open semi-natural grasslands in mainland Finland**: burning (total cost per hectare: 3 700 €)	One-off	15 ha	7 929	CAP, Restoration projects
Investment measure for the restoration of **open semi-natural grasslands in mainland Finland**: pollarding recurring every fifth year only for wooded meadows (average annual cost per hectare 700 €)	One-off	24 ha	2 400	CAP, MoE, Restoration projects
Yearly maintenance (agri-environmental scheme) for **wooded semi-natural grasslands in mainland Finland**: grazing, including maintenance removal of shrubs (average annual cost per hectare: 875 €)	Recurring	14 262 ha	12 479 259	CAP
Investment measure for the restoration of **wooded semi-natural grasslands in mainland Finland**: removal of shrubs and trees, 50 % of the restorable target area needs tree and shrub removal (total cost per hectare: 2,240 €)	One-off	3 359 ha	978 720	CAP, Restoration projects
Investment measure for the restoration of **wooded semi-natural grasslands**: re-instatement of grazing infrastructure and initial grazing management, e.g. fencing (total cost per hectare 2,760 €)	One-off	6 117 ha	2 411 846	CAP, Restoration projects
General measures**: inventory of semi-natural grasslands** in mainland Finland (average cost per hectare 30 €/ha)	One-off	30 000 ha	128 571	MoE
General measures: regional **coordination**, keeping site and habitat databases updated after the inventory, helping to organize management in mainland Finland (total average cost 200 000 €/year)	Recurring	40 000 ha	300 000	MoE, Metsähallitus, ELY-centres
General measures: making **detailed management action plans** for semi-natural grasslands restoration and maintenance in mainland Finland (total cost per hectare 375 €)	One-off	10 000 ha	535 714	MoE, LIFE and other restoration projects
General measures: making **regional plans** for semi-natural grassland networks in mainland Finland, prioritization in relation to other habitat networks, e.g. deciduous forests (circa 100,000 €/year)	One-off		100 000	MoE, RDP & LIFE projects,
General measures: **advising services** for managers for semi-natural grasslands in mainland Finland (average annual cost 50 €/ha)	Recurring	30 000 ha	1 500 000	CAP, MoAF, ProAgria
General measures: **awareness raising** campaign, information sharing and portal for semi-natural grasslands in mainland Finland (total cost 2,000,000 €)	One-off		285 714	LIFE and other communication projects
General measures: **cultural heritage inventories** of semi-natural grasslands in Natura 2000 sites in mainland Finland, prioritizing in the next MFF period the nationally valuable grassland sites (circa 200 sites, 'a 1,000 €/site)	One-off	400 sites	57 143	MoEC, cultural heritage projects
TOTAL RESTORATION	One-off		5 595 980 €	
TOTAL MAINTENANCE	Recurring	28 200 ha	24 835 088 €	
TOTAL GENERAL MEASURES	One-off		1 107 142 €	
TOTAL GENERAL MEASURES	Recurring		1 800 000 €	
TOTAL			**33 338 210 €**	

* indicate whether the measure is recurring or one-off

** Due to lack of data costs from Åland is not included

Expected results for targeted species and habitat types

The full implementation of the above annual (agri-environmental) maintenance measures targeting grassland habitat types, 4 coastal meadow bird species and 9 other Annex species will help to ensure that none of these features will suffer from any further deterioration or population decline during the next MFF period. The habitat quality and representativeness will improve.

In addition, a full implementation of the prioritized restoration measures ("non–productive investments" ort other similar kind of financing mechanism) targeted in increasing the total coverage of grassland habitat types and in improving the management quality are expected to lead to a measurable positive trend in the conservation status of these habitats by 2028. As restoration measures during the next MFF period are targeted to the most valuable and species rich sites, there will be a strong effect on the conservation status of many grassland species as well.

For the 4 coastal meadow bird species, the full implementation of the prioritized restoration measures for coastal meadows ("non–productive investments" or other similar kind of financing mechanism for important bird areas) targeting the restoration of their habitat is expected to contribute to an average increase per species of about 10-20% of the size of their breeding populations (i.e. a positive population trend), to be achieved by 2028.

Expected results: other benefits

The above measures for grassland maintenance and restoration are expected to contribute to the following ecosystem services and socio-economic benefits:

- The management of semi-natural grasslands support the local economies. This includes farmers, local entrepreneurs and professions of rural tourism. As animals are grazing on the natural pastures, the fields can be used for crops. The farming industry benefits from additional grazing areas and funding received through agri-environment contracts. Local small enterprises receive job opportunities, such as removing of trees or making fences. For agritourism, semi-natural grasslands and natural pastures and their management offer many types of potential (including attractive landscapes, grazing livestock, heritage farms).

- Products based on grazing animals of semi-natural grasslands, including skins and wool, are an ecologically sustainable choice for consumers. Meat production from animals grazing in natural pastures benefits the environment and promotes biodiversity, and traditional rural biotopes are also perfect for grazing organic livestock.

- Semi-natural grasslands are very important for pollinators and predator insects as they offer good feeding and nesting possibilities. From the meadows they move to nearby fields and pollinate crops and work as natural pest controllers. Grasslands can be used for honey production.

- Grasslands are important for the carbon sequestration. With their year-round plant cover and thick root layer, semi-natural grassland are efficient carbon storages. Properly done grazing and using natural pastures can help to reverse climate change.

- For the climate change mitigation, the meat production in semi-natural grasslands is an environmentally friendly choice, compared to imported meat from e.g. Brazil, where forest cuttings are accelerated to produce more meat to be shipped to European consumers.

- With their year-round plant cover, semi-natural grasslands influence ground water accretion by binding moisture and filtering it into the ground. The meadow’s ability to absorb runoff water prevents soil washout and nutrient leaching into water bodies.

- As unfertilized areas, semi-natural grasslands have a negative nutrient flow. More nutrients are taking away from the grasslands by grazing animals or mowing biomass than is the nutrient income. Grazing and mowing effectively remove nutrients from shore meadows, reducing further nutrient leaching and eutrophication of water bodies.

- Traditional agricultural landscapes are an important part of cultural landscape and history. Cultural heritage benefits from management of semi-natural grasslands, for instance when shrubs and dead grass covering ancient monuments are removed.

- Semi-natural grasslands offer good possibilities for recreation. In protected areas, there are many nature trails going nearby managed areas. Along these nature trails visitors can observe grazing animals or get information of the habitats and species, and to get to also know how food is produced.

- Coastal meadows offer attractive sites for bird observation. For example, Laajalahti Natura 2000 site (FI0100028) in southern Finland located in the metropolitan area of Helsinki receive over 100 000 visitors per year.

- Participating in traditional rural biotope management, for example by volunteering, is an experiential way of strengthening your personal relationship with nature. Volunteer camps are already a well-established concept. Camps are arranged by associations, such as WWF and Finnish Association for Nature Conservation, together with Metsähallitus Parks & Wildlife Finland. Year after year most of the camps are fully booked immediately after the registration is opened. New concepts, such as 'Shephard weeks' in the protected areas, offer attractive and easy chance for citizens to familiarize themselves with the nature conservation, semi-natural grasslands and the grazing animals, and meanwhile help farmers with sheep control in distant places. Simultaneously with the great experiences and possibilities to be a part of the conservation and management, semi-natural grasslands offer many possibilities to be in straight contact with the numerous good microbes in nature. These microbes have been proven to strengthen our resistance to diseases and reduce allergies.

- Semi-natural grasslands and natural pastures are significant genetic resources. Animals of indigenous livestock breeds are excellent ecological and landscape managers. Grasslands provide habitats for many wild relatives of our cultivated plants. These wild plants might be needed in plant breeding in the future to improve cultivated plants genetics in a changing climate.

- Biomass and clearing material can be utilized in many ways. Reed biomass removed from shore meadows can be spread on fields to increase organic matter, improve the soil structure and reduce the need for artificial fertilizers. It can also be utilized as biogas or can be further processed for example into substrates of planter soils. Felled trees and clearing waste can be made into chips or firewood or used for building or the manufacture of different wood products.

E.2.5. Other agroecosystems (incl. croplands)

Current status of habitats and species, conservation measures taken until now and their impact so far, remaining pressures and threats

Current status

Agriculture in Finland consists largely of conventional cereal production, combined with hay fields and field pastures used for cattle grazing. The proportion and area of other agricultural land uses, e.g. different kinds of orchards is low. The average size of both farms and field parcels is smaller (average size under 2,5 ha) than in most Central or Western European countries, leading to highly fragmented agricultural landscapes with forests often as the dominant land use type.

For this reason, majority of Finland was relieved from the demand of Ecological Focus Areas (EFAs) during the programme period 2014-2019. In addition to this, only a very small proportion of ca. 1 % of Finnish UAA is located within N2000-areas. In contrast to this, around 1/3 of species-rich semi-natural grasslands are located within N2000-areas (see section E.2.4.Grasslands). Due to the small proportion of agricultural land in Finland (about 7 %), it is important to maintain agricultural production throughout the country in order avoid the reduction of open agricultural area suitable for the species of agricultural nature.

Many of the EU's optional EFA land use categories either do not occur in Finland at all, or only in very small quantities. These include terraces, agro-forestry, short term coppice, hedges, tree lines and stone walls. Nationally the most relevant EFA landscape feature is fallow land (i.e., long-term set-asides).

Measures within N2000-areas

As a general rule, the CAP measures enhancing and maintaining biodiversity on UAA are applicable both within and beyond N2000-areas and there are no specific measures or requirements targeted to UAA in N2000-areas. This is due to the very small share of UAA within the N2000 network, and therefore specific requirements or targeted measures would create considerable administrative burden. However, there are two exceptions. Buffer strips are targeted to N2000-areas, as well as groundwater areas and parcels along water bodies, which encourages establishing buffer strips and thereby sustaining and improving biodiversity as well as reducing nutrient runoff in these areas. Also permanent grasslands have stricter requirements in N2000-areas in greening, namely the prohibition to converting the grassland into any other land use.

Measures within and beyond N2000-areas

The following description and measures apply to areas both within and beyond N2000 in Mainland Finland.

The most important sub-measures of the Rural Development Programme (RDP) with large-scale effects on farmland biodiversity have been the different kinds of environmental grasslands in M10 Agri-Environment Climate measure, and M11 Organic Farming. RDP measures targeted outside of arable area have significance for a considerably larger number of animal and plant species. Most important of these are the Environment Contracts for management of both Biodiversity, and Wetlands in M10. Uptake for both of these measures has increased during the programme period 2014-2019. The target area for Management of Wetlands is likely to be achieved by the end of the period, but that of Management of Biodiversity will not(see section E.2.4.Grasslands). The positive development in both these measures has been a result of the increased uptake in M04.4 Non-productive Investments.

M10 Agri-Environment Climate measure (AECM) is by far the most effective part of the RDP for biodiversity. In 2017 approximately 86 % of active farms and 90 % of agricultural land receiving direct payments were within the AECM. AECM contains a large variety of operations or measures, which are aimed to produce different kinds of environmental benefits. Majority of these operations are targeted towards water protection, but many of them produce also biodiversity benefits. Some of the operations have been targeted specifically for enhancing farmland biodiversity.

AECM includes several operations supporting the maintenance of different kinds of non-productive environmental grasslands on arable fields. The combined area of these has been annually around one fifth of the total area of all arable grasslands. Most essential for biodiversity are the Environment Contracts for Managing Biodiversity, which maintain a clear majority of all the semi-natural grasslands in Mainland Finland. In addition to this, these Contracts are used for managing around 60 % of the area of the endangered traditional rural biotopes included in the Natura 2000 network.

In 2020, around 13 % of all arable land in Mainland Finland received support for M11 Organic Farming. Due to its large total area, this RDP measure has significance especially for farmland birds. However, in Finland the average usage of pesticides is far lower than in more southern countries, which decreases the relative benefits of organic farming in comparison to conventional farming.

Several sub-measures of the RDP, such as M07, M16 and M19 are implemented as projects. These have generally had little significance for farmland biodiversity. One major exception is M04.4 Non-productive Investments, which are entirely targeted for the restoration and establishing of valuable habitats (semi-natural grasslands and wetlands). Despite its relatively modest funding, M04.4 has been one of the most effective biodiversity measures in the RDP.

Impacts so far

Table 1 provides an overview on the assessed direct and indirect biodiversity benefits for each sub-measure of the RDP, including a qualitative estimate on the extent of these benefits. Further on, Figure 1 illustrates the amount of public funding used for actions enhancing biodiversity for each sub-measure. Together, Table 1 and Figure 1 provide a holistic view on the estimated significance of individual sub-measures for biodiversity.

Table 1. Expert estimates on the different kinds of direct or indirect biodiversity benefits of the individual RDP sub-measures. The extent of benefits has been estimated either as marginal (X) or considerable (XX).

Biodiversity benefits (direct or indirect)	Sub-measures targeted on focus area 4A													
	M01	M02	M04.4	M07.1	M07.6	M10	M11	M13	M14	M16.1	M16.2	M16.5	M16.9	M19
Direct benefits														
Maintaining habitats														
Perennial grasslands						XX								
Established biodiversity fields						XX								
Buffer strips						X								
Traditional rural habitats					X	XX								
Management of wetlands						X								
Permanent pastures								X						
Plant cover on arable land in winter						X								
Restoration or establishing of habitats														
Restoration of traditional rural habitats			X		X	X								X
Establishing wetlands			X		X	X								X
Reduced use of pesticides						X	XX							
Removal of invasive species					X	X								X
Organising voluntary work for conservation measures					X									X
Indirect benefits														
Awareness raising	X	X		X	X	X	X				X	X		X
Environmental training of farmers		X		X	X	X	X				X	X		X
Continuance of agriculture						XX	XX	XX	X					
Landscape management				X	X	X		X						X
Lower fertilization levels						X								
Extensive grazing							X		X					
Management plans				X	X									X

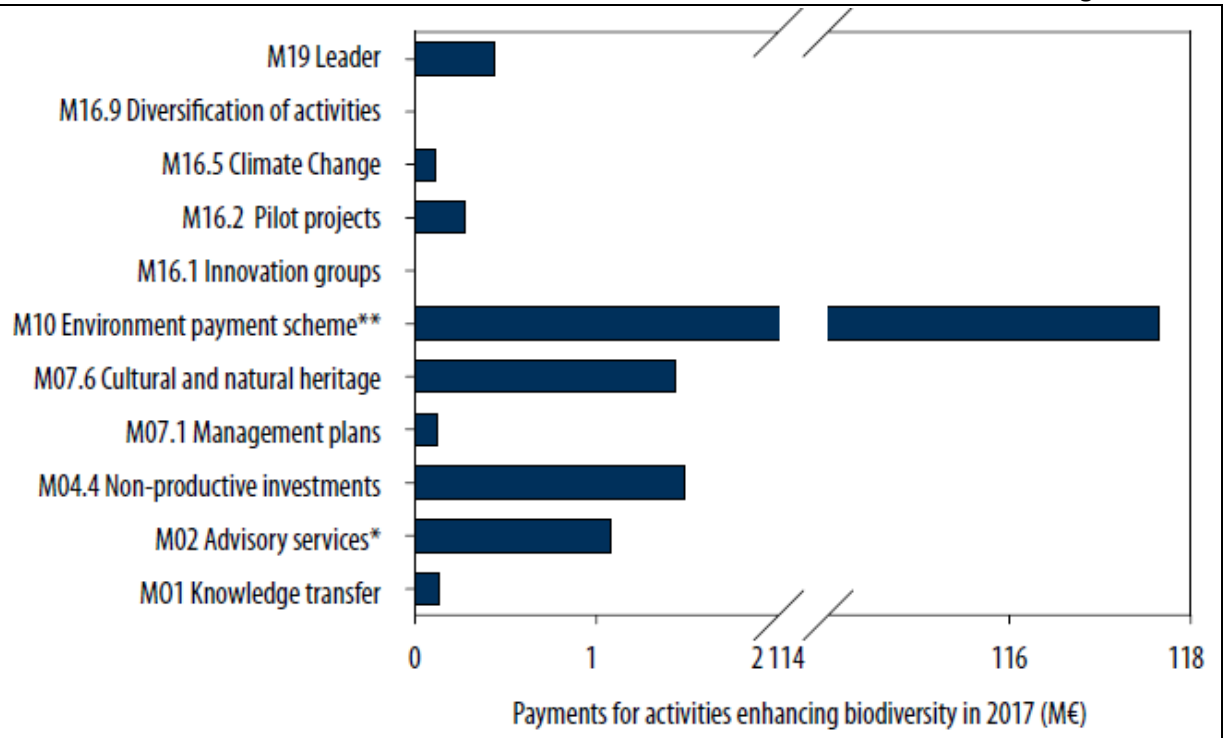


Figure 1. Total payments for activities enhancing biodiversity in various RDP sub-measures in 2017 (M€). *including all advisory events assigned for Focus Area 4A. ** including only the parcel-specific operations and environment contracts.

Remaining pressures

The main threats and pressures to farmland biodiversity in Finland are associated with the increasing land use efficiency on arable fields, and the decrease in the number of cattle and cattle farms in large parts of Finland. The latter is combined with the small and still decreasing use of semi-natural grasslands for grazing.

Measures needed to maintain or restore favourable conservation status

Measures targeted to N2000:

- Buffer strips: The aim of buffer strips is to reduce erosion and nutrient runoff and thereby protect groundwater and surface water bodies in agricultural areas. They can also have beneficial impacts on biodiversity, especially when maintained in the longer term. No specific species are targeted by this measure. In the current CAP, buffer strips are targeted to N2000-areas, groundwater areas and parcels along water bodies. In 2020, around 1 % of buffer strips (around 750 ha) were located in N2000-areas. In the upcoming CAP period (from 2023 onwards) the aim is to further enhance targeting of buffer strips and thereby increase the ambition of the measure.

- Permanent grasslands: Maintaining permanent grasslands is considered especially important within N2000 network and therefore permanent grasslands located in N2000-areas (2 061 ha in 2020) cannot be converted to other land use. Maintaining permanent grasslands is currently part of the requirements of greening support of the CAP. From 2023 onwards, this will be done through GAEC 10 of the conditionality system of the CAP. No specific species are targeted by this measure.

Measures applicable within and beyond N2000:

- Support for areas of natural constraints (ANC): ANC is key to sustain the continuation of agricultural production in Finland, thereby maintaining biodiversity in open landscapes and habitats. ANC support covers nearly 95 % of UAA in Finland, and is thereby likely to affect also N2000 areas.

- Nature management field grasslands: These grasslands on UAA are evaluated as one of the most beneficial measure for biodiversity, e.g. for farmland birds.

- Biodiversity on cropland: This measure enables establishing meadows, landscape fields and wildlife fields on cropland. The measure, especially meadows, is evaluated as one of the most beneficial measure for biodiversity and provides benefits e.g. for pollinators.

- Support for organic farming

- Support for alternative plant protection in horticulture: This measure is beneficial e.g. for pollinators

- Support for winter soil cover: This measure is beneficial e.g. for farmland birds.

- Animal welfare support: Favourable conservation status of farmland birds is influenced by the prevalence of pastures for livestock, which is supported by the animal welfare measure of the CAP.

- Support for apiculture: The measure compensates producers for natural constraints in Finland for apiculture and thereby supports pollination services. In 2019, support for apiculture covered 31 000 bee colonies.

- Support for bird fields: The measure enables establishing bird fields for e.g. cranes and geese (also influencing protected Branta leucopsis).

- Measures related to wildlife fields in croplands beyond N2000:

Favourable conservation status of many farmland and wetland birds depend on quality habitat patches within agriculture areas. Sufficient network of wildlife fields (unharvested crops, fallows, planted wildlife fields for food and cover) provide necessary habitat patches at farm and landscape level, which is the pre-requirement for achieving favourable conservation status.

Network of wildlife field averaging 1 % of the area covered by CAP provides significant level of habitat and allows farm/local landscape level concentrations in high-biodiversity value sites.

Prioritization of measures to be implemented during the next MFF period

All measures mentioned above are prioritised.

List of prioritized measures to be carried out, and estimated costs for these measures

- within Natura 2000 sites designated for the targeted habitats and species

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Buffer strips in N2000-areas Buffer strips aim to reduce erosion and nutrient runoff and thereby protect groundwater and surface water bodies in agricultural areas. They can also have beneficial impacts on biodiversity, especially in the longer term. In the current CAP, buffer strips are targeted to N2000-areas, groundwater areas and parcels along water bodies. In 2020, around 1 % of buffer strips (around 750 ha) were located in N2000-areas.	Recurring	>750 ha in N2000	>262 500 EUR	CAP Strategic Plan EAFRD
Permanent grassland in N2000-areas Prohibition to convert permanent grasslands in N2000-areas is part of the requirements for greening support of the CAP in 2021 and 2022. Greening support includes three requirements, of which maintaining permanent grasslands is only one. The estimated cost covers all three requirements. From 2023 onwards, maintaining permanent grasslands will be part of the enhanced conditionality (GAEC 10) and no support/compensation for farmers will be provided for maintaining these grasslands. Estimated costs for years 2021 and 2022 are 144 270 EUR per year, and 41 220 EUR when divided for the whole period 2021-2027.	Recurring in 2021-2022	>2 061 ha in N2000	>144 270 EUR in 2021 and 2021, >41 220 EUR for 2021-2027	CAP (2021-2022)
TOTAL	**Recurring**	**>2 811 ha in N2000**	**>303 720 EUR**	

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Wildlife fields in croplands Favourable conservation status of many farmland and wetland birds depend on quality habitat patches within agriculture areas. Sufficient network of wildlife fields (unharvested crops, fallows, planted wildlife fields for food and cover) provide necessary habitat patches at farm and landscape level, which is the pre-requirement for achieving favourable conservation status. Network of wildlife field averaging 1 % of the area covered by CAP provides significant level of habitat and allows farm/local landscape level concentrations in high-biodiversity value sites.	Recurring	1 % of 2,3 milj hectares = 23 000 hectares of Wildlife fields.	6,8 mi.	CAP Strategic Plan EAFRD, ERDF
National level Invasive Alien Predator Management framework in the wider countryside. Please refer to E.3.1.2. on this cross-cutting measure covering variety of habitats				
All measures mentioned above are prioritized (ANC, nature management field grasslands, alternative plant protection in horticulture, winter soil cover, organic farming, animal welfare, apiculture, bird fields). Needs and targets will be further defined when drawing up the CAP Strategic Plan.				
TOTAL	Recurring	23 000 ha	6,8 mil.	

* indicate whether the measure is recurring or one-off

Expected results for targeted species and habitat types

Finland has no specific targets for the conservation of species or habitats on arable land (excluding semi-natural grasslands; see section on grasslands). The overall goal is to halt the negative development in farmland biodiversity and e.g. abundance of farmland birds by the year 2030. If targets for specific habitats or species were set, it would also require targeted measures. The share of UAA in N2000 network is very small (only around 1 % of UAA) and therefore, most CAP measures enhancing and maintaining biodiversity are applicable both within and beyond N2000-areas. Specific requirements or targeted measures for such a small area would create considerable administrative burden. Also e.g. farmland bird populations are found widely around the country, which supports the approach of providing measures that are applicable more widely.

Two exceptions are buffer strips and permanent grasslands, which have specific requirements or focus for N2000-areas. Buffer strips in N2000-areas will help to reduce erosion and nutrient runoff and thereby protect groundwater and surface water bodies in agricultural areas. They can also have beneficial impacts on biodiversity, especially in the longer term. Prohibition to convert permanent grasslands in N2000-areas will contribute to preserving the area of valuable grasslands, which has biodiversity effects but also water protection and climate benefits.

Another exception is support for bird fields. The measure enables establishing bird fields for e.g. cranes and geese and influences also protected Branta leucopsis by providing feeding and landing zones during migration.

The measures of the upcoming CAP Strategic Plan (from 2023 onwards) must at least ensure no backsliding in environmental and climate objectives. More specific targets related to the above-mentioned measures will be defined when drawing up the CAP Strategic Plan of Finland.

Expected results: other benefits

CAP measures, which are not targeted to N2000-areas (ANC, nature management field grasslands, alternative plant protection in horticulture, winter soil cover, organic farming, animal welfare, apiculture, bird fields), will have direct or indirect benefits for biodiversity in agro-ecosystems, namely farmland birds and pollinators (see descriptions above).

The measures of the upcoming CAP Strategic Plan (from 2023 onwards) must at least ensure no backsliding in environmental and climate objectives. More specific targets related to the above-mentioned measures will be defined when drawing up the CAP Strategic Plan of Finland.

E.2.6. Woodlands and forests

Current status of habitats and species, conservation measures taken until now and their impact so far, remaining pressures and threats

In Finland we have 12 habitat types of woodlands and forests listed in Annex 1 of the Habitats Directive. In this PAF assessment *Fennoscandian wooded pastures (HT 9070) are included in chapter E.2.4., Bog woodlands (HT 91D0) and Fennoscandian deciduous swamp woods* (HT 9080) *are included in chapter E.2.3.* In this chapter we concentrate on boreal bio-region and on the following habitats that need restoration and management measures:

- *Western taiga* (HT 9010)
- *Fennoscandian hemiboreal natural old broad-leaved deciduous forests (Quercus, Tilia, Acer, Fraxinus or Ulmus) rich in epiphytes (HT 9020)*
- *Natural forests of primary succession stages of landupheaval coast (HT 9030)*
- *Nordic subalpine/subarctic forests with Betula pubescens ssp. Czerepanovii (HT 9040)*
- *Fennoscandian herb-rich forests with Picea abies (HT 9050)*
- *Coniferous forests on, or connected to, glaciofluvial eskers (HT 9060)*
- *Tilio-Acerion forests of slopes, screes and ravines (HT 9180)*
- *Old acidophilous oak woods with Quercus robur on sandy plains (HT 9190)*
- *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (HT 91E0)*

All these habitats are reported (period 2013-2018) as being currently in an unfavourable conservation status: six habitats are reported as unfavourable–inadequate U1 (HT 9010, 9020, 9040, 9050, 9180, 9190) and three habitats as unfavourable-bad U2 (HT 9030, 9060, 91E0) in boreal region.

https://nature-art17.eionet.europa.eu/article17/habitat/

In the report (period 2013-2018) on the conservation of habitats and species under Habitats Directive ("Article 17 report"), the "Structures and functions" criterion for 5 habitat types has been assessed as being Unfavourable-Inadequate U1 (HT 9010, 9020, 9050, 9180, 9190) and Unfavourable-Bad U2 for habitat types 9030 and 9060 indicating that additional efforts will be required to improve the conservation status of these habitats. Structure and functions could not be estimated for habitat types 9040 and 91E0. Furthermore, for 6 of the 9 woodlands and forest habitat types, the total area coverage is currently deemed insufficient (based on the "area" criterion in the Article 17 report), meaning that additional measures will be required to restore these habitats.

The statistics for woodlands and forests habitat types of Natura 2000 -sites in Finland, both boreal and alpine bio-region, are described in the following table (data of the SDF-database). All sites have been legally adopted as Special areas of conservation (SACs) and/or Special Protection Areas (SPAs). They have specific conservation objectives for one or several of these habitats especially in those Natura 2000 sites that have been designated for conservation of a certain habitat type. Site-specific conservation and restoration are described and quantified in the site's management plans and Natura 2000 Site Condition Assessments (NATA). There is still lack of habitat data in many Natura sites in Finland so the need for measures is not complete yet. The statistics for forest habitats of Åland is not included in following numbers and the data of forest habitats needs to be updated.

Habitat type	The number of Natura 2000 sites with the habitat type	The number of Natura 2000 sites designated for conservation of the habitat	Total area of the habitat in Natura 2000 sites ha	Total area of the designated conservation of the habitat in Natura 2000 sites ha
9010	1104	698	958 742	931 356
9020	48	41	337	330
9030	78	48	10 095	9 800
9040	32	16	401 218	397 054
9050	713	355	11 240	8 424
9060	187	115	44 220	41 128
9180	18	13	18	16
9190	10	10	22	22
91E0	91	27	1 435	259

Previous measures taken for these habitats include ecological restoration of boreal forests by controlled burning and improving the structural diversity of the forests. The objective is to increase quantity, quality and continuity of decaying wood and create canopy gaps to improve the conditions for the growth of deciduous trees and for the regeneration of the trees. So far forest habitats with a total area of about 17 000 hectares has been restored in Natura 2000 sites and other protected areas. As a result, the area of Western taiga (habitat type 9010) has increased.

Ecological management has been carried out in Finland also in valuable habitats e.g. herb rich forests and sun lit habitats totaling 5 300 ha so far (HT 9020, 9050, 9060). There has not been any need for ecological restoration of Nordic subalpine/subarctic forests (HT 9040) - the measures for improving the status of subarctic forests include other means than ecological restoration (reducing the impact of grazing reindeers). There have been some management measures of the two very rare habitat types of Tilio-Acerion forests of slopes, screes and ravines (HT 9180) and Old acidophilous oak woods with Quercus robur on sandy plains (HT 9190). It is very difficult to increase the area of these rare habitats in Natura 2000 sites and new measures need to be found to increase their conservation status.

The soil in Åland is calcareous and it makes the habitats very fertile and suitable for many demanding species, for example orchid plants. The relative area of deciduous forests (HT 9020, 9190) is higher than in mainland Finland and many of these valuable forests have been managed in Natura 2000 sites. The data of forest habitats outside Natura 2000 sites is missing and inventories are needed.

Many of the restoration and management activities have been carried out in several LIFE-Nature -projects since year 1995. At the moment there are 3 LIFE-projects going on (Coastnet LIFE, Flying Squirrel LIFE, Beetles LIFE) in Finland targeting the restoration and management of Annex I forest habitats in several SAC-sites. These measures have already had positive impact on the representativeness of the habitats within the Natura 2000 network, but additional measures will be needed to meet the sites' conservation objectives.

Restoration and management of habitats beyond the Natura 2000 network

Restoration and management of the habitats are everyday measures in Natura 2000 sites and other nature protection areas in Finland. The majority of most of the habitats however are situated outside protected areas so it is extremely important to manage the habitats also beyond Natura sites.

The Forest Biodiversity Programme for Southern Finland, METSO, is a voluntary-based conservation programme for private forest owners. In METSO programme you can protect your forest permanently or temporarily and you can manage your valuable habitats. During 2008-2017 the total area of 4711 hectares have been managed: herb rich forests 208 ha (HT 9050), sun lit habitats 45 ha (HT 9060), management of other valuable habitats 1841 ha, management of small freshwater habitats 1346 ha and restoration of peatlands 1273 ha.

Metsähallitus Forestry Ltd is responsible for the management of state-owned multiple-use commercial forests. Most of the restoration measures in state owned commercial forests have been executed in peatlands, totally 6000 hectares. Controlled burning of regeneration areas was earlier a normal procedure but nowadays burning of group of retention trees is the way of bringing dead and / or charred wood to the habitats.

Threats

There are several remaining threats for the forest habitats in Natura 2000 sites and beyond Natura 2000 sites. Because about 20% of the area of Western Taiga HT 9010 is situated outside protected areas, the most important pressure and threat for the area, structure and functioning of the habitat type come from forestry activities. These include clear-cutting and other types of logging, clearance of dead trees and deciduous trees, energy wood harvesting and construction of forestry roads, which cause paucity of old forests, dead wood and deciduous trees, fragmentation of forests, and decreased connectivity between patches of Western Taiga. Furthermore, within protected areas, continuity of aspens is hindered by moose browsing (and reindeer in the north) which prevents regeneration. Aspen is an important species for biodiversity in boreal forests.

The herb rich forests (HT 9050, 9180) suffer from factors such as forest management that alters species composition and age structure in tree layer and reduces the amount of deadwood. Increasing spruce and closing of the tree layer affects negatively typical species of herb rich forests. Moister types have also suffered from alteration of hydraulic conditions (i.e. ditching for forest management purposes. Invasive species negatively affect the structure and function of characteristic vegetation.

Lack of forest fires, thickening litter layer and gradual eutrophication are the most important negative factors affecting structure and function of the habitat type 9060 resulting in overgrowth of field layer. These factors have a negative impact on structure and function in protected areas as well.

Past or present forest management often causes break in dead wood continuum and natural structure of oaks, affecting species dependent on different stages of decaying oak and large hollow living oaks. In economically managed forests the renewal of oak is poor due to competition with spruce. Large proportion of the remaining occurences is protected and the structure and function of the habitat type 9190 can slowly improve there.

Water level regulation and forest management are the most important factors affecting the structure and function of the habitat type 91E0. Diminishing intensity of flooding increases the abundance of spruce and overgrowth of the field layer. Forest management measures have an impact on the composition and structure of the tree layer and on amount of deadwood.

<u>Species of woodlands and forests</u>

Several species listed in Annex II and IV of the Habitats Directive live in forest habitats in Finland. In the recent report (2013-2018) on the conservation of habitats and species under Habitats Directive the conservation status of many forest species is assessed as being poor (unfavourable-inadequate U1) or bad (unfavourable-bad U2) in

boreal region. There are several reasons for poor or bad conservation status: the main threats to natural heathland forests and their characteristic species are insufficient quantities of decaying wood, unfavourable changes in the age-structure and tree species assemblages of forests, the scarcity of natural forest fires, eutrophication and the fragmentation of forest habitats. Active restoration and management measures are needed to improve the state of forest habitats and conservation status of forest species.

- *Cucujus cinnaberinus,* punahärö U2-
- *Pytho kolwensis,* korpikolva U1x
- *Stephanopachys linearis,* havuhuppukuoriainen U1x
- *Stephanopachys substriatus,* mäntyhuppukuoriainen U1x
- *Aradus angularis*, palolatikka U1x
- *Boros schneideri*, lahokapo U1x
- *Xyletinus tremulicola,* haavansahajumi U1x
- *Phryganophilus ruficollis*, kaskikeiju U1x
- *Agathidium pulchellum*, korukeräpallokas U1x
- *Pteromys volans*, liito-orava U1-
- *Buxbaumia viridis* lahokaviosammal U1=
- *Dicranum viride* katkokynsisammal U1=
- *Plagiomnium drummondii* idänlehväsammal U1=
- *Cephalozia macounii* hitupihtisammal U2-
- *Calypso bulbosa*, neidonkenkä U1x
- *Cinna latifolia* hajuheinä U1=
- *Cypripedium calceolus* lehtotikankontti U1=
- *Diplazium sibiricum* myyränporras FV
- *Pulsatilla patens* hämeenkylmänkukka U2-
- *Pernis apivorus* mehiläishaukka ST decrease 10-39%, LT decrease -44-58%; EN
- *Buteo buteo* hiirihaukka ST -7-27%, LT -42-52%; VU
- *Buteo lagopus* piekana ST -16-96%, LT -45-80%; EN
- *Accipiter gentilis* kanahaukka ST -11-26%, LT -13-27%; NT
- *Bubo bubo* huuhkaja ST -29-48%, LT -61-70%; EN
- *Strix uralensis* viirupöllö ST -2-23%, LT +20-57%; NT
- *Denrocopos leucotos valkoselkätikka VU*
- *Poecile montanus* hömötiainen ST -36-50%, LT -43-62%; EN
- *Lophophanes cristatus* töyhtötiainen ST -37-53, LT -29-+10; VU

Several measures have already been implemented to strengthen the species populations. Beetles LIFE project is good example of the work that is going on with species protection. During 2018- 2023 Beetles-LIFE project concentrates on eight rare beetle-species of the Habitats Directive (*Cucujus cinnaberinus, Pytho kolwensis, Stephanopachys linearis, S. substriatus, Aradus angularis, Boros schneideri, Xyletinus tremulicola* and *Phryganophilus ruficollis*). Several restoration measures have been planned and already implemented such as restoration of forests by controlled burning, increasing the amount of dead wood and management of the forests in favor for aspen. Monitoring of ecological impact of the measures on these species takes place during the LIFE-project. Monitoring and active measures are needed to improve the conservation status of these rare beetles also after Beetles-LIFE project.

Management of herb rich forest habitats is essential for several vascular plant and moss species like *Cypripedium calceolus* and *Plagiomnium drummondii*. Removing of spruce trees gives space to light-demanding plants and mosses as well as favours broadleaved trees. Improvement of the quantity, quality and continuity of decaying wood are qualified measures for several moss species (*Buxbaumia viridis, Cephalozia macounii*). These measures have already led to positive population trends, but additional measures will be needed in line with site's conservation objectives.

Measures needed to maintain or restore favourable conservation status

For the following habitat types active ecological restoration and management measures are required to increase their area coverage and representativeness of the habitats thereby contributing to restoring their favourable conservation status.

- *Western taiga* (HT 9010)
- *Fennoscandian hemiboreal natural old broad-leaved deciduous forests (Quercus, Tilia, Acer, Fraxinus or Ulmus) rich in epiphytes (HT 9020)*
- *Nordic subalpine/subarctic forests with Betula pubescens ssp. Czerepanovii (HT 9040)*
- *Fennoscandian herb-rich forests with Picea abies (HT 9050)*
- *Coniferous forests on, or connected to, glaciofluvial eskers (HT 9060)*
- *Tilio-Acerion forests of slopes, screes and ravines (HT 9180)*
- *Old acidophilous oak woods with Quercus robur on sandy plains (HT 9190)*
- *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (HT 91E0)*

Forest fires are one of the most important factors that shape natural boreal forests. Due to modern fire prevention measures, very few extensive fires affect Finland´s forests nowadays. Controlled burning is clearly the most effective way to restore or increase the diversity of heathland forests. Controlled burnings aim to reintroduce fire and its ecological impacts to the dynamics of the forests in protected areas. Forest fires provide habitats for fire-dependent species, increase the amounts of charred and decaying wood, affect the quality of wood in living trees and diversify the tree structure of forests. Controlled burnings must be planned with care: the need for fire extinguishing equipment should be worked out well before burning is scheduled, water should be available, the area to be burnt should be lineated with the help of firebreaks and so on. The measure of prescribed burning is under control all the time.

Climate change and reindeer grazing, as well as their combined effects, are the most significant factors affecting the state of fell habitats. Reindeer grazing is part of the nature of the fell area. However, strong year-round grazing pressure degrades the condition of mountain birch forests (HT 9040). As global warming advances, damage by insects (in the fell area the outbreaks of the autumnal and the winter moth) are projected to become more common. The summer grazing of reindeer in turn has been observed to suppress regeneration of the mountain birch from both basal sprouts and seeds. Mountain birch forests has in many places descended or birch stands have been lost in areas where summer grazing has prevented the regeneration of trees and shrubs after damage caused by moth outbreaks. With moth outbreaks becoming more common due to the warming of autumns and winters, summer grazing may therefore also strengthen the negative impacts of climate change in fell habitats, especially in mountain birch forests.

There are 57 reindeer herding cooperatives in Northern Finland. Herding cooperatives are required to have a management plan to ensure the sustainability of reindeer pastures. The management plans must specify two measures and regionally limited objectives and implementation methods. Alternative measures include voluntary reduction of reindeer numbers, improvement of reindeer lichen pastures, development of summer grazing rotation, or merging of reindeer herding cooperatives to organize more efficient grazing rotation. All these measures will also improve the state of mountain birch forests (HT 9040).

Prioritization of measures to be implemented during the next MFF period

Forest habitats of Natura 2000 sites were spatially prioritized using Zonation approach (see also chapter A.3.), maximizing cost-effectiveness of the improvement (restoration and management) effort over all habitats. The spatial prioritization process emphasizes conservation status and rarity of each habitat, average habitat specific costs for actions, site level information of current state of the habitats, landscape level connectivity and occurrences of threatened species (national red listed species data). Cost-efficient methods and their costs and effects were acquired from the Finnish Restoration Prioritization project (http://www.ym.fi/download/noname/%7BB9F54F49-11D7-4955-98E6-E36B9FC3956D%7D/109588). The emphasis in the analysis results is on managing the tree structure on deciduous and herb rich forest habitats

(HT 91E0, HT 9020, HT 9050, HT 9180, HT 9190, approx. 3600 hectares in this PAF assessment), creating semi-open tree stand structure for sunlit esker forests (HT 9060, 3200 hectares) and restoration of western taiga (HT 9010) forest through controlled burning (700 hectares) and improving the structural diversity of the forests (2800 ha). *The total area for the prioritised measures for woodlands and forests for the PAF period 2021-2027 in Natura 2000 sites is about 10 300 hectares*.

For many of the habitat types listed above (e.g. HT 9020, HT 9180, HT 9190), the proposed actions cover most of the area needing action inside N2000 network in Finland, while others (e.g. HT 9010, HT 9050) need further actions over a significantly longer period of time than addressed here. It should be noted that these habitat types need repeated actions, however, the time interval for actions is varying and usually wider than the time period presented here. The actions, habitats and areas are prioritized and chosen so that the actions presented for all habitats in this PAF assessment will maximize the cost-effectiveness for the used resources.

Additional measures beyond Natura 2000 (wider green infrastructure measures)

In order to increase connectivity of Natura 2000 network and favourable conservation status of habitat types and species it is important to improve Finnish conservation area network and increase nature management in commercial forests e.g. by retention ecology and restoring valuable habitats whenever needed. Also controlled burnings are needed to increase conservation status of several forest species including fire-depending threatened species like *Aradus angularis* and fire as part of natural ecosystem regeneration.

Outside Natura 2000 areas there is a need to restore approximately 50 000 hectares of commercial forest areas with restoration of hydrology and preserving valuable forests habitats as well as nature-based management of these forests adjacent and between protected areas. Actions outside the protected areas are voluntary for forest owners and supported by national programmes. The measures for forest habitats beyond Natura 2000 sites include active management of the habitats as well as everyday forestry measures in commercial forests. In METSO Programme the objective is to continue the management of herb-rich forests and other valuable habitats in private forests approx. 200 hectares / year -> 1400 ha during PAF period 2021-2027.

In Metsähallitus Forestry Ltd multiple use forests there is need for management of valuable forest habitats for approximately 3 760 hectares during PAF period 2021-2027. The measures include management of herb-rich forests and sun-lit habitats as well as prescribed burning of heathland forests.

In EU's Biodiversity Strategy for 2030 there are several goals those will strongly support forest protection and restoration outside Natura 2000 network. According to the strategy it will be crucial to define, map, monitor and strictly protect all the EU's remaining primary and old-growth forests. This target will improve conservation status of HT 9010 at great extent in Finland. Significant areas of other carbon-rich ecosystems should also be strictly protected. This will set pressure and highlight restoration and protection of all peatland habitats including HT 9080 and HT 91D0. EU Forest Strategy in 2021 will include a roadmap for planting at least 3 billion additional trees in the EU by 2030, in full respect of ecological principles. This will improve forest conservation and management inside cities and towns. Implementation of EU's BD strategy will strongly support aims of forest protection and biodiversity management during PAF 2021 – 2027.

Forestry practices and education

Education and promotion of methods of Wildlife Friendly Forest Management to whole forestry sector should be applied in the common forestry practises and cross-cutting theme. The aim of the wildlife friendly forest management is to take into account grouses like Bonasa bonasia and Tetrao urogallus and other game species in forest management. There is need for designated project to educate and promote the methods for relevant stakeholders to deliver change in the existing forestry practises.

The main principles to be applied in forestry operations:

• Multidimensional structure of forests. At least 3 main tree species at a stand. Mixture of conifers and broadleafs natural to Finland. Compared to pure conifers there is more sunlight at forest floor providing better conditions for understory such as blueberry and for natural regeneration. The structure and species composition is largely determined in the establishment and early-stage management of the stand.
• In the thinnings, commonplace in forestry and important for the economic value of the stand, networks of shrubs, younger trees and wildlife thickets are left to provide shelter and habitat for birds.
• In the mature stands the extension of rotation instead of clear-cut is used, meaning that most valuable trees are harvested and viable medium-sized trees left to grow to be cut down later. This increases the general forest cover as clear-cuts becomes less frequent providing longer periods of habitat and berry crops to mention some of the benefits.
• Continuous cover forestry is preferred in peatland soils, transition zones between mineral soil and peatland as well as forest and open landscape habitats, along waterbodies and streams and other suitable sites. In many sites challenging for intensive forestry the extensive, continuous growth, forestry can be economically profitable while providing habitats for wildlife.

Key education approaches:

-campaign to forestry professional (planners, decision makers), educational events & materials
-campaign to landowners, educational events & materials
-Wildlife friendly forestry virtual training tool to be added into currently used machinery simulators in forestry education schools (machinery operators)
- two professional teachers (in northern and southern Finland) hired to educate the forestry-sector students on the approach of wildlife friendly forestry

List of prioritized measures to be carried out, and estimated costs for these measures

- within Natura 2000 sites designated for the targeted habitats and species

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) (HT 91E0): Management of the tree structure for deciduous or herb rich forests - method? (average annual cost per hectare: 500€)	One-off	150 ha	11 000	
Fennoscandian hemiboreal natural old broad-leaved deciduous forests (Quercus, Tilia, Acer, Fraxinus or Ulmus) rich in epiphytes (HT 9020): Management of the tree structure for deciduous or herb rich forests (average annual cost per hectare: 500€)	One-off	250 ha	18 000	
Fennoscandian herb-rich forests with Picea abies (HT 9050): Management of the tree structure for deciduous or herb rich forests: removal of spruce trees to favor broadleaved trees and to improve the light conditions for shrubs, herbs and ferns; Management of forest habitat to benefit the white-backed woodpecker (*Dendrocopos leucotos*) - removal of spruce and creating decaying birch wood (average annual cost per hectare: 500€)	One-off	3 200ha	230 000	
Coniferous forests on, or connected to, glaciofluvial eskers (HT 9060): Management of the tree structure for sun lit habitats: controlled burning, reducing shade by removing trees, clearing undergrowth and exposing mineral soils Restoration of the tree structure for sunlit esker forests (average annual cost per hectare: 500€)	One-off	3 200ha	230 000	
Tilio-Acerion forests of slopes, screes and ravines (HT 9180): Management of the tree structure for broadleaved or herb rich forests (average annual cost per hectare: 500€)	One-off	7 ha	500	
Old acidophilous oak woods with Quercus robur on sandy plains (HT 9190): Restoration of the tree structure for deciduous or herb rich forests (average annual cost per hectare: 500€)	One-off	7 ha	500	
Western Taiga (HT 9010): Controlled burning and management of structural diversity of boreal forests 500 ha / year (average annual cost per hectare: 700€)	One-off	3 500 ha	350 000	
Planning the management and restoration measures in Natura 2000 sites; 1 person-year/year during the PAF period 2021-2027 (average annual salary and travel costs 70 000 €/year)	Recurring	7 person years	70 000	
TOTAL		**10 300 ha**	**910 000 €**	

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Fennoscandian herb-rich forests with Picea abies (HT 9050): Management of the tree structure for deciduous or herb rich forests and management of other valuable habitats in private owned forests; (average annual cost per hectare: 500€)	One-off	1 400 ha	100 000	MoAF, Life
Management of valuable forest habitats in Metsähallitus Forestry Ltd multiple use forests (average costs per hectare: 500 - 1600 €)	One-off	3 760 ha	740 000	
Monitoring the area of primary and old growth forests for purposes of EU's Biodiversity Strategy	Recurring		60 000	MoE, MoAF
Specific project to educate and promote Wildlife Friendly Forest Management	Recurring		500 000	ERDF, LIFE strategic nature project
Nature management in commercial private forests including controlled burnings (e.g. HT 9060) and EU's biodiversity strategy goals	One-off		1 100 000	MoE, MoAF, Life strategic nature project
TOTAL			**2 500 000**	

Expected results for targeted species and habitat types

The presented measures and specifically their extent do not yet guarantee favourable conservation status for these forest habitats in Finland. However, the used methods and affected areas and habitats offer a cost-effective combination of habitats (areas), i.e. their improvement heuristically maximizes the improvement effect to status of the habitats for the 2021-2027 period. In Natura 2000 sites the representativeness of the habitats will be much better after these measures and for some habitats the favourable conservation status can be reached.

The restoration and management measures are expected to improve the structure and function of the target habitats e.g. the quantities of decaying wood, variability of the age-structure and tree species assemblages, the amount of forest fires etc. Thus active restoration and management measures will improve also the conservation status of many forest species, like white-backed woodpecker and many other forest birds, several beetle species, vascular plants, lichens and mosses listed above.

Expected results: other benefits

The above measures of restoration and habitat management of woodlands and forests are expected to contribute to the following ecosystem services and socio-economic benefits:

Restoration and habitat management of forests support the local economies when the workers are paid for their work. The restoration plans are implemented in several ways: the actual field work can be executed by local entrepreneurs, loggers or societies.

Woodlands and forests are important for pollinators as they offer good feeding and nesting possibilities. Open woodlands, like sun lit habitats can be used for honey production.

Woodlands and forests are important for the carbon sequestration. With their year-round plant cover and thick root layer, they are efficient carbon storages. Habitat management and conservation of forests can help to reverse climate change.

Woodlands and forests offer good possibilities for recreation. In protected areas, there are many nature trails in managed and natural state forests where visitors can observe the diversity of different kinds of forests. Berry and mushroom picking are allowed in almost all protected areas and in favourable autumns the berry and mushroom yields in managed sites can be enormous. Berry and mushroom picking can give nice income to visitors.

Participating in habitat management, for example by volunteering, is an experiential way of strengthening your personal relationship with nature. Volunteer camps are already a well-established concept. Camps are arranged by associations, such as WWF and Finnish Association for Nature Conservation, together with Metsähallitus Parks & Wildlife Finland. Year after year most of the camps are fully booked immediately after the registration is opened. During the volunteering week your work concretely for the biodiversity of herb rich forests, sun lit habitats and taiga forests.

The benefit of the Wildlife Friendly Forest Management methods is increased habitat value for variety of species with neutral or positive impact to economic benefits derived from forests. The other benefits of methods of Wildlife Friendly Forest Management are related to increased carbon sequestration and storage as well as enhanced water retention capacity and decreased nutrient leaching all provided by the increased average rotation time and decreased management of forest soils.

E.2.7. Rocky habitats, dunes & sparsely vegetated lands

Current status of habitats and species, conservation measures taken until now and their impact so far, remaining pressures and threats

This habitat group consist of very wide range of habitats and the grouping differs from the MAES -classification. In this chapter we concentrate on the coastal dunes and other terrestrial habitats that are influenced by the effects of the Baltic sea. *Calcareous rocky slopes with chasmophytic vegetation (HT 8210)* is the only habitat which occurs also in the mainland Finland. *Boreal Baltic coastal meadows* 1630 are mainly included in the Grassland-group (E.2.4.) as these are considered as management dependent semi-natural grasslands in Finland. The natural (= no management) parts of *Boreal Baltic coastal meadows* as well as terrestrial part of *Estuaries* (HT 1130) are also included in this chapter.

The following habitats of Boreal and Marine-Baltic bio-region need restoration and management measures:

- *Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation (HT 1610)*
- *Boreal Baltic islets and small islands (HT 1620)*
- *Boreal Baltic sandy beaches with perennial vegetation (HT 1640)*
- *Boreal Baltic narrow inlets (HT 1650)*
- *Embryonic shifting dunes (HT 2110)*
- *Shifting dunes along the shoreline with Ammophila arenaria ("white dunes") (HT 2120)*
- *Fixed coastal dunes with herbaceous vegetation ("grey dunes") (HT 2130)*
- *Decalcified fixed dunes with Empetrum nigrum (HT 2140)*
- *Wooded dunes of the Atlantic, Continental and Boreal region (HT 2180)*
- *Humid dune slacks (HT 2190)*
- *Dry sand heaths with Calluna and Empetrum nigrum (HT 2320)*
- *Calcareous rocky slopes with chasmophytic vegetation (HT 8210)*

All these habitats are reported (period 2013-2018) as being currently in an unfavourable conservation status in Boreal and Marine-Baltic bio-region: the status of seven habitats are reported as unfavourable–inadequate U1 (HT 2110, 2120, 2190, 2320, 1610, 1620, 8210) and the status of five habitats as unfavourable-bad U2 (HT 2130, 2140, 2180, 1640, 1650).

https://nature-art17.eionet.europa.eu/article17/habitat/report/?period=5&group=Dunes+habitats&country=FI&region=BORhttps://nature-art17.eionet.europa.eu/article17/habitat/report/?period=5&group=Coastal+habitats&country=FI&region=MBAL

In the report (period 2013-2018) on the conservation of habitats and species under Habitats Directive ("Article 17 report"), the "Structures and functions" criterion has been assessed as being Unfavourable-Inadequate U1 for five habitat types (HT 2110, 2120, 1610, 1620, 8210) and Unfavourable-Bad U2 for five habitat types (HT 2130, 2140, 2180, 1640, 1650) indicating that additional efforts will be required to improve the conservation status of these habitats. Furthermore, for 9 of the 12 Rocky habitats, dunes & sparsely vegetated lands types, the total area coverage is currently deemed insufficient (based on the "area" criterion in the Article 17 report), meaning that additional measures will be required to restore these habitats.

The statistics for habitat types of Rocky habitats, dunes & sparsely vegetated lands types of Natura 2000 -sites in Finland, both Boreal and Marine-Baltic bio-region, are described in the following table (data of the SDF-database). All sites have been legally adopted as Special areas of conservation (SACs) and/or Special Protection Areas (SPAs). They have specific conservation objectives for one or several of these habitats especially in those Natura 2000 sites that have been designated for conservation of a certain habitat type. Site-specific conservation and restoration are described and quantified in the site's management plans and Natura 2000 Site Condition Assessments (NATA). There is still lack of habitat data in many Natura sites so the need for measures is not

complete yet. The statistics for habitat types of Rocky habitats, dunes & sparsely vegetated lands types forest habitats of Åland are not included in following numbers and the data of these habitats needs to be updated.

Habitat	The number of Natura 2000 sites with the habitat type	The number of Natura 2000 sites designated for conservation of the habitat	Total area of the habitat in Natura 2000 sites ha	Total area of the designated conservation of the habitat in Natura 2000 sites ha
1610	20	16	5 746	5 452
1620	41	29	6 314	6 261
1640	44	18	183	167
1650	4	4	13 208	13 208
2110	17	13	34	33
2120	19	14	114	111
2130	19	14	168	167
2140	13	9	48	46
2180	20	15	797	789
2190	9	4	30	21
2320	3	3	419	419
8210	62	45	299	295

Habitats 1610 and 1620 of Baltic archipelago consist of terrestrial and underwater parts, which form a habitat mosaic important for several species. These species are dependent on the habitat combination of open and sparsely vegetated grounds and their surrounding underwater parts. Main group of threatened species are bird species of the Birds Directive. At terrestrial part small patches of different habitat types form special combination for insect species needing multiple habitats on their life cycle. Most important of them is the *Parnassius apollo* butterfly (listed in Annex IV) which has strongest population of Finland on HT 1620 islands. The status of these islands has weakened partly because of overgrowth, and climate change is a severe threat to these habitats.

In Finland the most representative patches of the habitat 8210 can be found at archipelago areas. These small open habitat patches host populations of Little Grapefern (*Botrychium simplex*) and other threatened botrychium species (*Botrychium lanceolatum*, *B. matricariifolium* and *B. boreale*). In addition to 1610 and 1620, occurrences of HT 8210 can be found on much larger open rocky islands.

Same habitat mosaic is abundant at inner archipelago where herb-rich forests (HT 9050), Calcareous rocky slopes with chasmophytic vegetation (8210), Nordic alvar and calcareous flatrocks (6280) and semi-natural grasslands and pastures can be found side by side in a patchy manner. Here Clouded Apollo (*Parnassius mnemosyne*) butterfly is still found as a large meta-population structure, but it is declining.
Terrestrial part of estuaries (HT 1130) form a habitat mosaic of sedge- and tallgrass meadows and alluvial forests along with deciduous herb-rich forests. Stochastic moving and flooding river on lowlands creates new grounds for meadow, herb rich and alluvial forest species preventing tree growth and favoring species tolerant for floods. Underwater parts are included in chapter E.2.1. Estuaries are usually strongly changed ecosystem, with its functions near collapsing. Nearly all of the southern estuaries are used as fields or towns. Water level regulation of the rivers by dam construction have also had severe impact on estuaries' structure and function. Sea side of quite many estuaries are designated as Natura sites.

Dunes and sandy beaches are restricted to sandy soils, which are rare in Finland. Thus being, open coastal sandy beaches (1640) and dune habitats (2110, 2120, 2130, 2140, 2190, 2320) are among the most threatened habitat types in Finland. A considerable number of declining and threatened species, especially invertebrates and birds, live in these habitats. The area of naturally open, treeless sandy beaches and dunes is approx. 1000 ha.

The tide is almost non-existent on shores of the northern Baltic Sea, which makes the formation of dune biotopes strongly dependent on the land uplifting (1,6 – 8,5 mm/year) caused by post-glacial rebound, the rise of land masses depressed by the weight of ice sheet during the last glacial period. In the northern coasts of the Baltic Sea, land uplift causes marine regression, which results in large areas of virgin land emerging from the sea. As a result, sandy beaches extending into dune zones are continuously shifting towards newly exposed land and former seashore

The habitat quality of all naturally open sandy beaches and dune biotopes is rapidly declining. Many coastal sandy areas have traditionally been grazed, sometimes with very high grazing pressure. Grazing has now mostly ended, and this, along with eutrophication, has caused the overgrowth of previously open coastal areas by shrubs and trees –mainly Scots pine *Pinus sylvestris.* The overgrowth by common reed *Phragmites australis* caused by eutrophication of the Baltic Sea also prevents the formation of new shifting dunes by binding sand and thus stabilizing the sandy beaches rising from the sea. Previously open dune areas (types 2130, 2320, 2140) have also been turned into commercial forests. Furthermore, recreational use causes disturbance and erosion, which can locally be very intense.

Although post-glacial rebound will continue for about 10,000 years, the climate change can revert the effects of land uplift and stop coastal regression, which would probably stop the formations of shifting dunes and further accelerate the overgrowth of sandy beaches and dunes.

Vattaja is the most extensive and representative area of coastal sandy biotopes in Finland and also in Boreal Zone of Europe. At present Vattaja is a military exercise area as well as a popular recreation area. In addition to the overgrowth by trees, the erosion of the dunes caused by military training and recreational use forms the most significant threat to area´s natural values. To reconcile the various uses and natural values, a wide range of management and restoration actions was implemented in an EU Life project during 2005-2009, e.g. re-introduction of sheep grazing, tree removal from artificially forested heath areas and restoration of structurally damaged dunes using excavators. Eroding effects were also minimized by standardizing and relocating the routes and locations of military and recreational activities and facilities. All these actions must be carried on also in the future.

The performed actions have managed to stop the declining progress of habitat quality and area, locally, on the operation sites. But the threats and pressures affecting on dune areas are of continuous nature and the actions taken far too small scoped to prevent the depletion of surface area of the open dune biotopes of declining the habitat quality as a whole. So, all the actions taken this far will be needed extendedly to halt the negative progress of the open coastal sandy biotopes.

The soil and bedrock in Åland are calcareous and they make the habitats unique and fertile and suitable for many demanding species. For example, the relative area of Calcareous rocky slopes with chasmophytic vegetation (HT 8210) is higher than in mainland Finland. The data of rocky habitats, dunes and sparsely vegetated land habitats should be inventoried in more detail to find out the need for management both in Natura sites and beyond them.

Measures needed to maintain or restore favourable conservation status

Need for management measures of coastal habitats has increased mainly because of overgrowth of shrubs and trees and probably will increase in future because of climate change. However, restoration and maintaining the mosaic is a delicate job on small islands where extinctions of small populations are likely to happen if something goes wrong. Methods of the management, and management target of semi-natural grasslands are not usable here as such. Mosaic-like environments are specialty of the archipelago, and they need alternative measures and careful planning.
Grazing is effective and suitable measure for most of the coastal habitats. At outer archipelago habitats 1610, 1620 and 8210 don’t necessary need grazing but clearing and burning are needed due to eutrofication from sea and nutrient deposit.

Restoration and management of coastal sandy habitats have been undertaken and are still needed to re-establish open landscape and wind erosion, which are necessary to maintain the habitats. Restoration methods include removal of tree saplings and shrubs, re-introduction of grazing (mostly by sheep) and mechanical exposing of mineral soil to promote natural eolian processes of dune areas. Too intensive erosion caused by recreational use must be controlled also in the future.

Rosa rugosa, an aggressively spreading alien species, has become a major threat during the last twenty years on coastal sandy areas, especially on dune types 2120 and 2130 and on esker island 1610. Management of coastal areas by grazing or manual clearing of seedlings is necessary to keep the dunes and esker islands open.

Invasive alien predators, mink and raccoon dog, can cause serious damage among breeding birds in archipelago and have dramatic effect on their breeding success. To prevent the damages caused by invasive alien predators, sufficient catching should be arranged.

Many habitats of the shoreline and archipelago will need lots of research, combination of conservation actions and testing of new methods to reach the favorable conservation status. For example, new tools and methods for restoration and management measures for terrestrial part of *Estuaries* (HT 1130) and the connecting terrestrial habitats (*Alluvial forests with Alnus glutinosa and fraxinus exelsa* (HT 91E0) & *Fennoscandian deciduous swamp woods*) should be developed.
The management of the mosaic of coastal habitats needs co-operation between Nordic countries to change information and innovative management design and piloting projects. Co-operation is also needed between marine and terrestrial actors.

Prioritization of measures to be implemented during the next MFF period

The conservation status of the prioritized habitats in this habitat group range from U1 to U2- and they have high red listed statuses in Finland. Many of these habitats require continuous, annually recurring actions and their resource need needs to be solved and addressed in sustainable way in near future. Their priority is based on spatial prioritization using Zonation approach (see also chapter A.3.), maximizing cost-effectiveness of the improvement (restoration and management) effort over all habitats. The spatial prioritization process emphasized the habitats' conservation statuses and rarity of each habitat, average habitat specific costs for actions, site level information of current state of the habitats, landscape level connectivity and occurrences of threatened species (national red listed species data). The cost-effective methods and the costs are based on the Finnish Restoration Prioritization project (http://www.ym.fi/download/noname/%7BB9F54F49-11D7-4955-98E6-E36B9FC3956D%7D/109588) and include grazing and clearing of shrubs and small trees for open and semi-open habitat structures. ***The total area for this habitat group to be improved in Natura 2000 sites in 2021-2027 is approx. 1 400 hectares.*** The numbers of Åland are not yet included in the list.

The need for management of this habitat group is obvious also outside Natura 2000 -sites. The basic data of the habitats and needs for management should be inventoried before exact objectives of the prioritized measures can be set. The experts of this habitat group estimate that the area to be improved outside Natura 2000 sites is at least 1000 hectares of private areas. The numbers of Åland are not yet included in the list.

List of prioritized measures to be carried out, and estimated costs for these measures

- within Natura 2000 sites designated for the targeted habitats and species

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
The terrestrial part of *Estuaries* (HT 1130) & *Alluvial forests with Alnus glutinosa and fraxinus exelsa* (HT 91E0) & *Fennoscandian deciduous swamp woods* (HT 9080): new tools and methods needed for management; The terrestrial part of *Estuaries* (HT 1130): maintaining open habitat structure through grazing (average annual cost per hectare: 1000 €)	Recurring	150	150 000	
Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation (HT 1610): Creating natural semi-open vegetation structure typical for the habitat (average annual cost per hectare: 500 €)	One-off	500 ha	35 000	
Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation (HT 1620) in outer archipelago and open sea zones: restoration of meadow patches and openness of the island, removal of reed	One-off	?	?	
Boreal Baltic sandy beaches with perennial vegetation (HT 1640): Achieving natural openness through grazing (average annual cost per hectare: 1000 €)	Recurring	130 ha	130 000	
Boreal Baltic narrow inlets (HT 1650): Achieving natural openness through grazing (average annual cost per hectare: 1000 €)	Recurring	10 ha	10 000	
Embryonic shifting dunes (HT 2110): Achieving natural openness through grazing (average annual cost per hectare: 1000 €)	Recurring	6 ha	6 000	
Shifting dunes along the shoreline with Ammophila arenaria ("white dunes") (HT 2120): Achieving natural openness through grazing (average annual cost per hectare: 1000 €)	Recurring	55 ha	55 000	
Fixed coastal dunes with herbaceous vegetation ("grey dunes") (HT 2130): Achieving natural openness through grazing (average annual cost per hectare: 1000 €)	Recurring	150 ha	150 000	
Decalcified fixed dunes with Empetrum nigrum (HT 2140): Achieving natural openness through grazing 70 ha and clearing of tree saplings to maintain the natural openness 50 ha (average annual cost per hectare: 1000 €)	Recurring	120 ha	120 000	
Wooded dunes of the Atlantic, Continental and Boreal region (HT 2180): Restoration of the tree structure for deciduous or herb rich forests (average annual cost per hectare: 500€)	One-off	50 ha	3 500	
Humid dune slacks (HT 2190): Achieving natural openness through grazing (average annual cost per hectare: 1000 €)	Recurring	25 ha	25 000	
Dry sand heaths with Calluna and Empetrum nigrum (HT 2320): Achieving natural openness through grazing (average annual cost per hectare: 1000 €)	Recurring	70 ha	70 000	
Dry sand heaths with Calluna and Empetrum nigrum (HT 2320): Recurring clearing of tree saplings to maintain the natural openness (average annual cost per hectare: 1000 €)	Recurring	35 ha	35 000	
Dry sand heaths with Calluna and Empetrum nigrum (HT 2320) and *Decalcified fixed dunes with Empetrum nigrum* (HT 2140): Mechanical exposing of mineral soil preventing overgrowth by mosses and lichens and advancing natural eolian processes and shrub growth (*Empetrum nigrum* and *Calluna vulgaris*). Annual cost per hectare: 300 €	One-off	105 ha	4 500	
Calcareous rocky slopes with chasmophytic vegetation 8210: clearing of shrubs, small trees and ground layer vegetation to achieve natural openness typical for the habitat (average annual cost per hectare: 450 €)	One-off	10 ha	650	
Removal of invasive alien plant species, Rosa rugosa				
Eradicating of invasive alien predators in archipelago	Recurring	1500 islands or inlets	400 000	
Planning the management and restoration measures in Natura 2000 sites; 2 person-year/year during the PAF period 2021-2027 (average annual salary and travel costs 70 000 €)	Recurring	14 person years	140 000	
TOTAL		**1 416**	**1 334 650 €**	

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Management of rocky habitats, dunes and sparsely vegetated land outside Natura 2000 sites (average annual cost per hectare: 1000 €)	Recurring	1000	1 000 000	
Planning the management and restoration measures; two person-year/year during the PAF period 2021-2027 (average annual salary and travel costs 70 000 €)	Recurring	14 person years	140 000	
TOTAL			1 140 000	

* indicate whether the measure is recurring or one-off

Expected results for targeted species and habitat types

Conservation status of these habitats cannot be lifted to favourable in the 2021-2027 funding period, but the representativeness will improve slightly in Natura 2000 sites. Implementation of the proposed actions will suffice for the areas' most needing actions (for the habitats listed above) to be maintained during the 2021-2027 period. As the listed prioritized habitats need constant management the used actions make a substantial increase compared to situation where no actions would be carried out. However, more profound actions are needed to fully safeguard the biodiversity of these habitats. Since these habitats need repeated improvement actions, a substantially higher annual amount of resources is needed to fully cover the areas in need for actions. Management actions covering all areas in need are, however, also operatively and administratively hard to achieve and the figures presented here are at the moment within realistic possibilities, while being chosen so that the actions presented for all habitats in this PAF assessment will maximize the cost-effectiveness for the used resources.

Expected results: other benefits

The above measures for management of rocky habitats, dunes and sparsely vegetated lands are expected to contribute to several ecosystem services and socio-economic benefits that are very much the same as the benefits for the grasslands E.2.4.:

The management of these habitats support the local economies. This includes farmers and local entrepreneurs. As animals are grazing on the natural pastures, the fields can be used for crops. The farming industry benefits from additional grazing areas and funding received through agri-environment contracts. Local small enterprises receive job opportunities, such as removing of trees, reed or making fences.

Dunes and sparsely vegetated lands are very important for pollinators and predator insects as they offer good feeding and nesting possibilities. Some habitats can be used for honey production.

Dunes are important for the carbon sequestration. With their year-round plant cover and thick root layer, dunes are efficient carbon storages. Properly done grazing and using natural pastures can help to reverse climate change.

As unfertilized areas, dunes and sparsely vegetated lands have a negative nutrient flow. More nutrients are taken away from the habitats by grazing animals or mowing biomass than is the nutrient income. Grazing and mowing effectively remove nutrients from the habitats, reducing further nutrient leaching and eutrophication of water bodies.

Participating in biotope management, for example by volunteering, is an experiential way of strengthening your personal relationship with nature. Volunteer camps are already a well-established concept. Camps are arranged by associations, such as WWF and Finnish Association for Nature Conservation, together with Metsähallitus Parks & Wildlife Finland. Year after year most of the camps are fully booked immediately after the registration is opened. During the volunteering week your work concretely for the biodiversity of dunes and sparsely vegetated lands.

E.2.8. Freshwater habitats (rivers and lakes)

Current status of habitats and species, conservation measures taken until now and their impact so far, remaining pressures and threats

Annex I Freshwater habitats

There are 9 freshwater habitat types listed in Annex 1 of the Habitats Directive occurring in Finland. Two of these occur only in the alpine region and their conservation status has been assessed as favourable. In addition, two spring habitats of Annex 1 are dealt with under this chapter, otherwise listed under the category "wetlands" by the MAES classification, because of their direct connection to the freshwater habitats. All Annex 1 habitat types listed below are assessed as unfavourable in the Boreal region and require additional measures to reach favourable conservation status. The range and area are considered as favourable for all the habitats below, but problems occur in their structure and function. Those habitats occurring also in the Alpine region are considered as favourable there, so the focus of all actions is in the Boreal region. The definition and occurrence of the habitat type "Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea 3130)" is currently unresolved in Finland, and this habitat is not subject to any active measures.

The habitats considered in this chapter are:

- Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) (3110)
- Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. (3140)
- Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation (3150)
- Natural dystrophic lakes and ponds (3160)
- Fennoscandian natural rivers (3210)
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation (3260)
- Fennoscandian mineral-rich springs and springfens (7160)
- Petrifying springs with tufa formation (Cratoneurion) (7220)

Many of the habitats listed above are generally common and widespread but rather poorly represented in the Natura 2000 network, and they require more measures taken in the landscape outside than within the Natura 2000 network. These include especially the oligotrophic (3110) and dystrophic (3160) lakes, which are threatened by diffuse pollution from land use practises, such as agricultural and forestry activities, and further dispersal of shoreline habitation. Nationally most of the largest lakes are also regulated for flood protection and hydropower production purposes, which changes the zonation of aquatic vegetation, destroys bird nests and weakens the fry production of fish. Hard oligo-mesotrophic (3140) and natural eutrophic (3150) lakes also have rather low representation within the Natura 2000 network, but they have significant values related to Habitats and Birds Directive species. The status of lake habitats in general is being improved by the implementation of the River Basin Management in Finland, and no other prioritized actions are demanded for most lake habitats. However, **there is an action package for the natural eutrophic (3150) lakes under section E.3**., targeting at bird species but simultaneously improving the status of the habitat within the Natura 2000 network.

Of the riverine habitats, the Fennoscandian natural rivers (3210) are, as interpreted in Finland, rather well-preserved sections of rivers or entire river or tributary systems and are relatively well presented in the Natura 2000 network. In contrast, the smaller streams (3260) habitat type comprises all the small streams (catchment area <100 km2), which are very common and widespread but rather poorly presented within the Natura 2000 network. Rivers and streams form an inter-dependent network, and both riverine habitat types suffer from similar issues impairing their structure and function. In the past century the river systems in Finland have been thoroughly channelized and dredged for timber floating and flood protection, which in connection with extensive catchment area drainage and damming for hydropower has damaged their water quality, structure, and ecological connectivity significantly.

Out of about 35 rivers historically bearing natural Atlantic salmon and/or brown trout populations, there exists only two salmon rivers and less than 10 rivers in which sea trout is still able to migrate draining to Baltic Sea. Most of these rivers are regulated for hydropower production, and only some fishways exist to enhance migration of fish, other biota or sediment transportation exist. Besides ca. 700 hydropower dams, nearly 120 000 culverts and other stream crossings form locally significant migratory barriers to many kind of organisms in headwater streams (Eloranta & Eloranta, 2016; Moilanen & Luhta 2018).

According to the most recent assessment of the conservation status of habitat types in Finland, more than 90% of headwater streams are degraded, and all river and stream habitat types occurring in the boreal region are considered to be nationally red-listed (NT-CR) or too poorly known for assessment (DD) (Kontula & Raunio 2018). Among with damage to migratory fish species' populations, the degradation of rivers and streams has severely damaged the conservation status of the Annex II and V mollusc species, freshwater pearl mussel (*Margaritifera margaritifera*), which is a keystone species in the boreal river systems. The species' conservation status is assessed as Unfavourable-Bad (U2) in the boreal region, with problems in range, population, as well as habitat extent. Solutions to the problems faced by riverine systems must include measures both within and outside the Natura 2000 network, as well as species-specific measures which are presented in section E.3.

Fennoscandian mineral-rich springs and springfens (7160) are naturally common and widespread in Finland, but they have suffered extensively from land-use (drainage for forestry, agriculture, urbanization and construction) and less than 10% are included in the Natura 2000 network (Kontula & Raunio 2018), and even less are in natural or near-natural state in the Boreal region. There are also cases, where groundwater abstraction poses potential threats to springs within the Natura 2000 network. In contrast, the Cratoneurion springs (7220) are well represented in the Natura 2000 network (>60%) and their status has also been improved by restoration activities within the network. Hence, while the status of current Cratoneurion springs can still be improved both within and outside the Natura 2000 network, the focus should be on improving the status of Fennoscandian mineral-rich springs and springfens, especially outside the network.

The most wide-spread means of improving the conservation status of all lake and riverine habitats listed above is the implementation of Water Framework Directive (WFD). Measures taken include actions both within the water bodies as well as their catchments to reduce the diffuse loading to freshwaters and the Baltic Sea. The aim for good ecological status of water bodies is in most cases parallel to the aim for favourable conservations status of Annex 1 habitats, and WFD actions are especially valuable outside the Natura 2000 network. In addition, 469 Natura 2000 sites are included in a water body register of protected areas according to Article 6 of the WFD. The annual needed running costs of full implementation of WFD are estimated to be appr. 1,5 billion € in the current period on implementation (2016-2021). However, good ecological status has not yet been achieved for 35% of rivers (per length) and 15% of lakes (area).

Also measures carried out to achieve the goals of national Fishway and Salmon and Trout Strategies (Ministry of Agriculture and Forestry, 2012, 2015) serve the aim for improving the conservation status of riverine habitats in Finland. Currently up to 9 M € of national state funding is allocated for the years 2020-22 to improve the status of migratory fish populations by building fish passes and removing barriers for migration, habitat restoration, and revising legislation to ensure the obligation for building a fish pass in hydropower plants, where such an obligation does not exist. The funds are distributed by the MoAF for projects, that have at least 50% of own funding. These funds are available mainly for actions in the main channels, but some funds can also be directed to actions in the tributaries. Ongoing governmental migratory fish programme ´Nousu` continues this work and guides about 12 M € for future migratory projects, including small dam removal, to enhance migratory fish populations. Notice, as the construction of fishways to pass hydropower dams and dam removal has only started in past years, there exists high number of targets in a need of funding, and these will not be covered by state. In addition, the legal processes to update current obligations of hydropower companies are ongoing, and future resource needs depend also the outcomes of these legal process.

Besides these and smaller national funds and projects, habitats listed in this section (especially 3150, 3210, 3260, 7160 and 7220) have been managed in a number of LIFE projects in the past. Currently two large LIFE projects are running that aim to improve the status of freshwater habitats. FRESHABIT LIFE IP (2016-2022) aims at improving the networks and processes for freshwater habitat management, and Hydrology LIFE (2017-2023) focuses on peatland restoration but includes also restoration actions for small lakes and headwater streams. FRESHABIT LIFE IP also has a number of complementary projects (currently with a total combined budget of >100 M€) that implement complementary habitat, species, and catchment area actions as well as knowledge exchange and policy actions to improve the status of freshwaters in Finland. In addition, special attention has been paid to the migratory barrier effect of bridges and culverts where roads cross over streams, and inventory as well as management actions have been taken in local or regional projects. The national Helmi habitats programme for improving the conservation status of habitats in Finland, run by MoE with a total budget of 42 M€ for the year 2020, addresses stream and bird wetland restoration among other themes and thus provides additional funding both within as well as outside the N2000 network. The freshwater actions of the Helmi programme are directed especially to the headwater streams.

Measures needed to maintain or restore favourable conservation status

Estimated restoration needs per habitat type

The following estimates are given for the Boreal region for each habitat dealt with in this section, based on background data collected for the forthcoming Article 17 reporting. The status range of comparable WFD surface water types are given when applicable:

Habitat	Total area ha	% <Good WFD	N2000 area ha	N2000 needs for restoration ha	Priority 2021-28
3110	1 430 000	7,4 - 10,0%	257 000	<1 000	Low
3140	4 800	N/A	130-470	<10	Low
3150	54 000	N/A	7 300	>100	High
3160	1 640 000	10,3 - 40,4%	295 000	>3 000	Low
3210	80 000	N/A	25 000	<100	Low
3260	N/A	N/A	>3 500	>300	High
7160	2 800	N/A	<400	<80	High
7220	14	N/A	12	<1	Low

Catchment area management and restoration

Further measures and continuation of the ongoing measures to improve the water quality are needed in the forthcoming planning period 2021-27 for the implementation of WFD in Finland. These measures involve a number of different sectors, the largest being waste-water management of human settlements and industry, and agriculture. These actions require good cross-sectoral co-operation and they serve as an overarching means to improve the conservation status of habitats and species of the nature directives. These measures are primarily taken outside the Natura 2000 network within the implementation of the regional River Basin Management Plans. Restoration of drained peatlands within the Natura 2000 network is effectively catchment area restoration and can be included in the within-network actions. In addition, restoration of freshwater habitats can be included in peatland restoration projects. Catchment area management outside the Natura 2000 network is the main measure for improving all lake habitat types both within and outside the Natura 2000 network, except for the eutrophic lakes (3150), which merit a package of measures of their own (see E.3.2.1) Small-scale habitat restoration will be implemented for these lake habitats as well, when feasible and usually within local restoration projects.

Additional measures in river basin management plans of the WFD (green infra measures beyond N2000)

The measures are not bound by EU or national legislation but they are identified in the national river basin management plans. There are 7 river basin districts in mainland Finland and one management plan for each district. The measures can be for example controls to reduce point source emissions, measures to reduce diffuse emissions (e.g. impact of agriculture and forestry) and measures to reduce impacts of hydrological and morphological alterations.

Needs for large-scale habitat restoration

Tributaries of larger rivers and headwater streams (3260) are a priority habitat type for restoration due to their unfavourable-bad conservation status. Large-scale conservation and restoration measures of this habitat are needed, mainly outside the Natura 2000 network, where most of the habitat is located. There are still knowledge gaps regarding the total amount and degree of deterioration of this habitat type. Detailed plans for prioritizing the streams to be restored therefore require field surveys prior to planning. The needs for these inventories are outlined in this chapter. The first overall estimates for the extent and restoration needs for this habitat were given in the report of the ELITE working group on a prioritization plan for improving the status of habitats (Kotiaho et al. 2015; Luhta, Ilmonen & Käkelä 2014, unpublished), and they have been elaborated further for this purpose. Estimates for the Boreal region are:

- The total length of the habitat type 3260, small rivers and headwater streams in Boreal region of Finland is ca.130 000 km. There is no comprehensive GIS database for the habitat type and the estimate has been calculated by using the available GIS data for streams by the National Land Survey of Finland. Approximately 20% of the habitat is on state-owned land.

- Most of this habitat type is located outside the Natura 2000 network: in total 17 000 km (13%) of 3260 is located within the Natura 2000 network in the Boreal region of Finland, and ca. 40% of these streams are on state-owned land.

- Ca. 30% of stream length outside the Natura 2000 network is in need of direct habitat restoration, based on more than 2300 km of stream inventories (1998-2020)

- Based on earlier experience by Metsähallitus, the cost for stream restoration (planning costs included) is appr. 15 000 €/km of stream length restored

- Consequently, in total ca. 30 000 km of streams is in need of direct habitat restoration outside the Natura 2000 network, and the cost for full restoration of these would be 450 000 000 €

- Within the Natura 2000 network the need for restoration is lower, approximately 15% or 2 500 km, with the total cost of 37 500 000 €.

- In addition, there are ca. 90 000 culvert structures for road crossing in Finland. Ca. 70% of these are in headwater streams and roughly half of these pose problems to migration in at least some flow conditions. Culvert structures need to be inventorized and modified where urgently necessary. However, the Act for private roads has been recently reviewed and now includes a responsibility to assure that the structure is passable by fish when it is renewed, if state is to subsidise the action. In the long run this assures the passability of road culverts probably to a significant degree, but targeted actions are still likely needed

- Due to the limited inventory of streams, detailed planning for restoration needs to be preceded by spatial prioritization and comprehensive field inventories. The field inventories are targeted to streams that are prioritized for restoration. Whole streams are inventorized, which provides the baseline data for stream habitat restoration in selected sections. The cost for stream inventory (personnel and travel costs included) is appr. 400 €/km of streams

- Habitat restoration needs to be complemented by catchment area restoration and removal of migration barriers.

Fennoscandian mineral-rich springs and springfens (7160) are mostly located outside the Natura 2000 network, and they have suffered extensively from land-use (drainage for forestry, agriculture, urbanization and construction). Attention should be focused on improving the conservation status of springs outside the network, especially in the areas of commercial forestry. Past drainage has decreased the conservation status of most springs in intensively utilized areas, where restoration actions are necessary. In addition, if not properly recognized, ongoing forestry and other land use practises continue to degrade or maintain the degraded status of springs in the future. Therefore, it should be ensured that location of springs is inclusively available to forest operators in commercial forests. It should also be examined if common forest management practices need further adjustments to take better into account sustaining nature values of springs. The data on springs and springfens (7160) is summarized as follows (Kontula & Raunio 2018):

- There are ca 32 500 springs in the Boreal region of Finland in topographic maps of the National Land Survey of Finland. The true number is estimated to be approximately 100 000. Approximately 20% of springs are on state-owned and 80% on private land
- Ca. 2 000 (6%) of the mapped springs are located in Natura 2000 sites
- At least 90% of the springs in southern Finland are degraded
- In Natura 2000 sites ca. 800 springs totalling an area of ca. 70 ha are in need of restoration based on habitat inventories. With the need for restoration of the surrounding peatland habitats the total targeted restoration area is appr. 1 000 ha. With the average peatland restoration cost of 800 €/ha, planning included, the total cost of restoring all springs in the Natura 2000 network would thus be 800 000 €
- Inventories are necessary to prioritize the targets for restoration outside Natura 2000 network. With an average rate of 3-5 springs/day inventorized, the cost per spring (personnel and travel costs included) is up to c.a. 60 €/spring for initial inventory of restoration needs.

Time for more detailed restoration planning is 1-2 days per restoration site, which may contain more than one spring, the cost thus being on average 300 €/spring.

In the Boreal region the estimated number of degraded springs, potentially in need of restoration is up to 29 000 (those on topographic maps). With an average estimated restoration cost of 1 000 €/spring restored, the total cost may sum up to 29 000 000 €. However, not all degraded springs need active restoration, and the total number of springs is uncertain.

Prioritization of measures to be implemented during the next MFF period

For small streams (3260) further inventories are needed both within and outside the Natura 2000 network before measures can be planned. There is enormous need for inventories and restoration especially outside the network. Restoration activities are needed both within and outside the Natura 2000 network, and actions need to be carefully prioritized. Other targets, such as improving the fish migration, conservation of freshwater pearl mussel populations, and other national priorities can be used to prioritizing the need for stream restoration. The aim should be on resolving the problems at as large scale as possible, concentrating the effort on selected river basins and implementing the restoration both within and outside the Natura 2000 network, where necessary.

For springs (7160) the prioritized measures for 2021-27 within the Natura 2000 network include the restoration of the most cost-effective 25% of the springs potentially in need of restoration. Measures will be targeted towards those springs that benefit most from the actions, and where the surrounding habitats can be restored at the same occasion. Outside the Natura 2000 network the knowledge-base of springs is far lower and prioritizing demands inventories. Restoration planning and implementation needs to be implemented by the authorities and organizations, such as forestry companies, consultants, and associations.

List of prioritized measures to be carried out, and estimated costs for these measures

- within Natura 2000 sites designated for the targeted habitats and species

Name and short description of the measures	Type of measure *	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Springs (7160): restoration of prioritized springs • Prioritization of the most cost-effective 25% of total need • Restoration includes the nearby surrounding as necessary (app. 250 ha in total area) • Average cost of appr. 800 €/ha. Total cost appr. 250 000 €	One-off	250 ha	36 000	LIFE
Streams (3260): field inventories for prioritizing and restoration planning • Field inventories of 1000 km of selected streams • Roughly 80 months of work (40 months * 2-person inventory teams) + travel costs • Total cost appr. 400 000 €. Annualized for the whole period, but should be implemented at the first half if the period • Fund other than LIFE are applicable when implemented within projects with scope beyond Natura 2000	One-off	1 000 km	57 000	LIFE, ENI CBC, ERDF, EMFF, EARDF
Streams (3260): restoration of prioritized streams, selected based on inventories • Restored stream sections selected based on inventories (est. 15% restoration need of all streams) • Average cost of appr. 15 000 €/km. Total costs appr. 2 250 000	One-off	150 km	320 000	LIFE, ENI CBC, ERDF, EMFF, EARDF
Total			**413 000 €**	

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure *	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Streams (3260): field inventories for prioritizing and restoration planning • Field inventories of 3000 km of selected streams • Roughly 240 months of work (120 months * 2-person inventory teams) + travel costs • Total cost appr. 1 200 000 €. Annualized for the whole period, but should be implemented at the first half if the period	One-Off	3 000 km	171 500	ENI CBC, ERDF, EMFF, EARDF
Streams (3260): restoration of prioritized streams, selected based on inventories • Restored stream sections selected based on inventoriesAverage cost of appr. 15 000 €/km • Total costs appr. 15 000 000	One-off	1 000 km	2 100 000	ENI CBC, ERDF, EMFF, EARDF
Streams (3260): necessary catchment area restoration/improvement of water protection around restored streams • Rough estimate of 1 000 ha restored catchment area • Average cost app. 1 000 €/ha. Total cost appr. 1 000 000	One-off	1 000 ha	140 000	ENI CBC, ERDF, EMFF, EARDF
Springs (7160): Initial inventories for identifying restoration needs • Inventories of 3 000 springs • Costs appr. 60 €/spring. Total costs appr. 180 000. Annualized for the whole period, but should be implemented at the first half if the period	One-off	3 000 pcs	26 000	ERDF, EARDF
Springs (7160): Detailed restoration planning • Plans for 1 000 springs prioritized by biodiversity benefits and cost-efficiency • Costs appr. 300 €/spring. Total costs appr. 300 000	One-off	1000 pcs	43 000	ERDF, EARDF
Springs (7160): Habitat restoration • Restoration of 1 000 springs prioritized by biodiversity benefits and cost-efficiency • Costs appr. 1 000 €/spring. Total costs appr. 1 000 000	One-off	1000 pcs	140 000	ERDF, EARDF
Streams (3260) and springs (7160): Compensations for private land owners for extended buffer zones near spring and headwater streams in commercial forests • Enhanced security for stream riparian zones against harmful impacts • Extending requirements of obligatory directions of law • Based on voluntarity • Average cost appr. 8 000 €/ha. Total cost appr. 8 000 000	One-off	1 000 ha	1 150 000	METSO
Additional measures in river basin management plans of the WFD Annual costs include capitalised investment costs and annual operation and maintenance costs. Share of agriculture is 270 000 000 € of this 500 000 000 €. It includes the voluntary based measures under CAP and measures for sustainable water management (drainage and wetlands).	recurring	the whole mainland Finland	500 000 000	ENI CBC, ERDF, EMFF, EARDF
Total			**503 770 500**	

* indicate whether the measure is recurring or one-off

Expected results for targeted species and habitat types

The actions planned for the period 2021-27 can cover only a relatively small proportion of the needs outside Natura 2000 network. Consequently, the impact of the planned actions on the habitat types outside the Natura 2000 network will not be enough but will improve the habitat types and enhance a positive trend. With spatial prioritization the local and regional impact can be much stronger than the overall impact, end entire stream systems may be improved to or nearly to favourable conservation status. In addition to general increase in the habitat's structure and function, spatially prioritized conservation measures for this habitat would also improve the status of many threatened freshwater pearl mussel populations and complement the efforts for improving the status of migratory fish populations in larger rivers.

Expected results: other benefits

Restoration of streams and springs improves the value of areas for recreational use and increases possibilities for fishing and fishing tourism in target catchments.

E.2.9. Others (caves, etc.)

There are no habitat types included in this chapter in Finland.

E.2.10. References for site-related maintenance and restoration measures within and beyond Natura 2000

Kemppainen, R. & Lehtomaa, L. 2009: Perinnebiotooppien hoidon tila ja tavoitteet: Valtakunnallinen kooste perinnebiotooppien alueellisista hoito-ohjelmista. Lounais-Suomen ympäristökeskuksen raportteja 2/2009. ISBN:978-952-11-3368-8

Komonen, A., Kuntsi, S., Toivanen, T. & Kotiaho, J. 2014. Fast but ephemeral effects of ecological restoration on forest beetle community. Biodiversity and Conservation 23:1485-1507.

Kontula, T. & Raunio, A. (toim.) 2018. Suomen luontotyyppien uhanalaisuus 2018. Luontotyyppien punainen kirja. Osa 1: Tulokset ja arvioinnin perusteet. Suomen ympäristökeskus ja ympäristöministeriö, Helsinki. Suomen ympäristö 5/2018. 388 s. ISBN:978-952-11-4816-3

Kontula, T. & Raunio, A. (toim.) 2018. Suomen luontotyyppien uhanalaisuus 2018. Luontotyyppien punainen kirja. Osa 2: Luontotyyppien kuvaukset. Suomen ympäristökeskus ja ympäristöministeriö, Helsinki. Suomen ympäristö 5/2018. 926 s. ISBN: 978-952-11-4819-4

Kotiaho, J.S., Kuusela, S. Nieminen, E., & Päivinen J. 2015. Elinympäristöjen tilan edistäminen Suomessa. Suomen ympäristö. 8/2015. ISBN 978-952-11-4462-2

Mavi 2016: Ympäristösopimusalueiden paikkatietoaineisto 4/2016. Maaseutuvirasto

Pasanen, H., Junninen K. & Kouki, J. 2013. Restoring dead wood in forests diversifies wood-decaying fungal assemblages but does not quickly benefit red-listed species. Forest Ecology and Management 312: 92-100.

Raatikainen, K. (toim.): Tavoitteet teoiksi! Metsähallituksen Luontopalvelujen suuntaviivat perinnebiotooppien hoidolle 2025. Metsähallitus. 79 s. ISBN 978-952-295-231-8

SAKTI 2018: Suojelualueiden kuviotietojärjestelmä 12/2018

Website references:

https://nature-art17.eionet.europa.eu/article17/

E.3. Additional species-specific measures not related to specific ecosystems or habitats

E.3.1. Species-specific measures and programmes not covered elsewhere

E.3.1.1. The freshwater pearl mussel (*Margaritifera margaritifera*)

Current status of the species

The freshwater pearl mussel (*Margaritifera margaritifera*) is considered to be in Unfavourable - Bad (U2) in most member states and bioregions in the EU, as well as in the Boreal Alpine bioregions in Finland. The reasons for the inadequate conservation status are in the general decline of the status of the species' habitat, rivers and streams, and loss of host fish populations. In some, especially southern and coastal rivers the poor water quality, in addition to poor habitat quality and loss of host fish populations, may be a limiting factor to breeding, and a number of populations are prone to go extinct unless immediate conservation actions are taken.

Also the knowledge of the species is still relatively poor. Currently ca. 120 pearl mussel populations are known from Finland, and the viability of the population is unknown for about 50 of them. Some major river basins, such as those of Kemijoki, Tenojoki, and Simojoki remain poorly studied and they may host yet unknown populations.

Measures needed to maintain or restore favourable conservation status

The potential habitats for the species need to be further inventorized to improve the knowledge-base for the conservation status assessment of the species, and the status of the currently known but non-assessed populations needs to be assessed.

The concrete actions to maintain or restore the conservation status of the species include:
- Habitat restoration, water quality improvement, and migratory fish population restoration in streams and rivers inhabited by the species. These are actions that are dealt with in chapter E.2.8.
- assisted breeding. Some populations have not been able to breed for decades due to multiple reasons, and t the remaining individuals may be in too poor condition to breed naturally. Breeding stations have been established across Europe to aid in the breeding of a number of mussel species, but none have been set up in Finland so far. It was discovered, however, in the FRESHABIT LIFE IP project that populations and individuals that are in too poor condition to breed naturally may be revitalized in a breeding station. The activity has so far been only a small-scale experiment. Breeding stations are needed, preferably one in Southern Finland and two for northern populations. The stations have set-up and running costs, which are estimated below.

Prioritization of measures to be implemented during the next MFF period

Status of the unknown populations needs to be assessed to improve the knowledge-base for the species' assessment. Breeding stations need to be set up and maintained to facilitate breeding of the most endangered populations. These stations cause both set-up costs and continuous maintenance costs as supply and staff costs.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Inventories of new populations; total costs 315 000 €	One-off	3 river basins	45 000	CBC, ERDF, Interreg, LIFE
Viability assessment of poorly known populations; total costs 300 000 €	One-off	50 populations	43 000	CBC, ERDF, Interreg, LIFE
Setting up the breeding stations; total costs 600 000 €	One-off	3 stations	86 000	??
Maintenance of the breeding stations and populations; annual costs 150 000 €, total costs 1 050 000	Recurring	3 stations	150 000	??
TOTAL			324 000 €	

* indicate whether the measure is recurring or one-off

Expected results for targeted species

Conservation status assessment can be based on far better data when the viability of all or at least most populations has been assessed. There are a number of currently non-breeding populations in especially southern Finland, for which captive breeding and reintroduction of young mussels after their most vulnerable life stages may be the only way to save the populations. Captive breeding will also enhance the viability of many other populations that may still be breeding to some extent.

E.3.1.2. Bird wetlands

Current status of the species

Current status of many waterfowl and shorebird species is alarming (see below the summary on Finland's reporting under article 12 on the Birds Directive). Their populations have decreased remarkably in last decades in Finland and many of them have high red list statuses. Main reasons for their threatened and decreasing populations are connected to both the decrease of suitable wetland habitats and the deterioration of their habitat quality on the remaining breeding habitats. Many of suitable shore habitats and wetlands for wetland birds require continuous, annually recurring actions due to eutrophication-caused overgrown by the reed, bushes and water plants as well as one-of measures to increase open water area. In addition to habitat deterioration, increasing numbers of invasive alien predators, mink and raccoon dog, reduce on their breeding success dramatically in places. Some of the valuable bird-lakes needs manual removal of cyprinids.

Anas acuta jouhisorsa	Short Term -31-79%	Long Term -71-84%
Anas crecca tavi	ST -8-30%	LT -10-25%
Anthus pratensis niittykirvinen	ST=	LT -21-44%
Aythya ferina punasotka	ST -73-93%	LT -88-94%
Aythya fuligula tukkasotka	ST -34-54%	LT -56-65%
Bucephala clangula telkkä	ST -17-30%	LT -5-17%
Calidris alpina schinzii etelänsuosirri	ST -21-31%	LT N/A
Calidris pugnax suokukko	ST =	LT -76-95%
Calidris temminckii lapinsirri	ST N/A	LT N/A
Chlidonias niger mustatiira	ST N/A	LT N/A
Emberiza schoeniclus pajusirkku	ST -22-41%	LT -45-64%
Fulica atra nokikana	ST -63-79%	LT -66-76%
Larus ridibundus naurulokki	ST u	LT -67-80%
Limosa limosa limosa mustapyrstökuiri	ST +N/A	LT + N/A
Mareca penelope haapana	ST -34-55%	LT -45-57%
Mareca strepera harmaasorsa	ST +N/A	LT +N/A
Motacilla citreola sitruunavästäräkki	ST =	LT +N/A
Motacilla flava keltavästäräkki	ST =	LT -65-78%
Numenius arquata arquata kuovi	ST +4-31%	LT =
Podiceps auritus mustakurkku-uikku	ST -N/A	LT -N/A
Podiceps cristatus silkkiuikku	ST -10-35%	LT -27-40%
Podiceps grisegena härkälintu	ST -4-48%	LT =
Spatula clypeata lapasorsa	ST -13-56%	LT -15-44%
Spatula querquedula heinätavi	ST =	LT -44-79%
Sterna hirundo kalatiira	ST -20-42%	LT =N/A
Tringa stagnatilis lampiviklo	ST +N/A	LT +N/A
Tringa totanus punajalkaviklo	ST =	LT -33-61%
Vanellus vanellus töyhtöhyyppä	ST +45-95	LT +29-116

Measures needed to maintain or restore favourable conservation status

Target for the measures is to restore and maintain of the waterfowl and shorebirds listed above. All the measures are meant to be carried out on the bird wetlands included in Natura SPA-network. Many sites are also listed as SAC areas, and the actions taken improve the quality of the habitat type 3150.

Waterfowl and shorebirds need open habitats on breeding and staging areas. Open areas are important as well on shores and on water area. To maintain and improve stage of the bird populations listed above, important wetlands for birds needs restoration and management to prevent overgrowing and restore their previous, more open, characteristics. Black-headed gull (*Larus ridibundus*), which is important key species in many bird-lakes, prefers isolated islets as breeding habitats.

The main measures needed to maintain and restore open shore meadows are clearing, mowing and grazing.

The main measures needed to maintain and restore open water area dredging, water level management and mowing of the water plants. These actions benefit the typical species and the structure of the habitat type 3150.

On sites where black-headed gull has disappeared, there is a need to build artificial islet, where it is possible, or to clear existing islets from overgrown vegetation.

Invasive alien predators, American mink and raccoon dog, can cause serious damage among breeding birds on wetlands and have a dramatic effect on their breeding success. To prevent the damage caused by invasive alien predators sufficient control should be arranged in cooperation with local hunting associations and other NGOs. Measures are needed in the SPA areas and in areas linked to them (so called “buffer zones”).

Cyprinids compete for food with many of the waterfowl species. Biomanipulation by manual removal of cyprinids is needed in lakes where changes in avifauna refers to adverse structure in fish stock. On most of the sites experimental fisheries is needed to find out the need and possibilities for biomanipulation.

The number and the total area of the bird wetlands included in Natura SPA-network group to be improved in 2021-2027 is 210 and 84 611 hectares, respectively.

Life Nature funding has enabled eight Life Nature projects related to waterfowl habitats: Liminganlahti Life (LIFE95NAT/FIN/000156), Yyterinniemen Natura 2000-alueiden biodiversiteetin hoito (LIFE96NAT/FIN/003028), Viikki-Vanhankaupunginlahti: Lintuparatiisi keskellä Helsinkiä (LIFE97NAT/FIN/4105), Lapin lintuvesihanke Lounais-Suomen arvokkaiden kosteikkojen hoito- ja kunnostushanke (LIFE99NAT/FIN/006278): Siikalahden arvokkaan lintuveden suojelu ja hoito (LIFE00NAT/FIN/7061); Lintulahdet-LIFE (LIFE03NAT/FIN/000039): Kokemäenjoki-LIFE (LIFE06NAT/FIN/000129).

The measures implemented in the projects include grazing, mowing, dredging and raising the water level. Grazing has been the most extensive of the measures and has had a significant impact on the birds of coastal meadows, especially in Ostrobothnia. A study of the effects of the Lintulahdet-LIFE project on birds found that all groups of birds benefited at least from one rehabilitation measure used. Most importantly red-listed species and species with special conservation concern as outlined by the EU showed positive correlations with management actions, underlining the conservation value of wetland management. All the measures should, however, be taken even more extensively and management of the bird wetlands should be continuous.

Prioritization of measures to be implemented during the next MFF period

All measures listed above are equally important and are chosen by their suitability on each site where restoration and management are needed. The prioritization is indeed most plausible to do by prioritizing the focal wetland sites based on bird values, cost-efficiency and practical reasons. The needed measures and related costs are separately evaluated for all the 210 sites.

Beyond Natura 2000:

Strengthen invasive alien small predator species controlling measures and management outside SPA-areas.

Restoration and management of Natura 2000 sites and green infrastructure investments in wider countryside fail to deliver all desired responses on target species conservation status if non-natural level of predation caused by non-native invasive alien predators is not adequately addressed also in the wider countryside outside SPAs.

Effective management of Invasive Alien Predators, mainly Raccoon Dog and American Mink, at Natura 2000 areas is largely dependent on wider countryside invasive species management to reduce the number of recruiting animals to SPA areas especially while management in wider countryside also contributes to favourable conservation status of dispersed breeders in habitats outside of site network.

The wider countryside Invasive Alien Predator Management framework is a coordinated approach to organize landscape-level effective invasive species management at cost-effective way which utilizes the voluntary efforts of hunters and their organizations.

Green infra measures: Establish and restore approx. 300 bird wetlands outside N2000 area network. Decline of wetland water birds at large scale is related inter alia to landscape level changes in habitat availability and quality. Declining populations of still common species are at large extent dispersed at wider landscapes, and therefore successful conservation requires significant measures also beyond SPAs. On EU's and Finland's Red Lists majority of huntable water bird species have been listed as threatened or they have declining trends, and the favourable conservation status cannot be achieved without significant level of action at wider countryside level.

The need for action at wider environment was also highlighted as objective 4 of Strategic Plan for 2019-2027 for Agreement on the conservation of African-Eurasian migratory water birds: To ensure there is sufficient quantity and quality of habitat in the wider environment for achieving and maintaining favourable conservation status for migratory water bird populations.

Following the good experiences on funding mechanism in Finland for multifunctional wetlands during MFF 2014-2020 and the example of Return of Rural Wetland LIFE+ project 2010-2015 the restoration or construction of multifunctional wetlands at wider environment will be continued. The level of implementation is increased substantially to 1) have tangible results in field and 2) better meet the demand and potential among landowners and local actors of the wider environment and from biodiversity point-of-view. The funding for establishing multifunctional wetlands during 2014-2020 was 11 699 €/hectare, which is adequate level of funding for delivering sufficient level of quality.

The funding mechanism for management of multifunctional wetlands is continued and covers previous and new multifunctional wetlands. Management actions include vegetation management of the wetland and shore areas, maintenance and repair of dams, dikes and structures, removal of sediments and effective control of invasive alien species with focus on predation. In previous MFF's 390 farms/associations has established wetlands and has management contract by EAFRD funding. In addition there is estimated 2 500 wetlands restored with other, mostly national, funding sources which are managed by landowners and local associations. Current level of subsidy for maintenance is 450 €/ha annually, which is adequate level to cover the management costs.

Re-enforce the N2000 area network by adding 70 hunting restriction areas outside N2000 area network with voluntary commitments.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Mowing (crushing the reed)	recurring	1927 ha	221 000	
Mowing (aquatic plants)	recurring	411 ha	697 850	
Clearing (setting up pasture)	one-off	1523 ha	765 900	
Fencing (setting up pasture)	one-off	117800 m	2 356 000	
Clearing (other)	recurring	384 ha	252 014	
Milling	recurring	79 ha	24 546	
Dredging	one-off	1713500 m^3	1 713 500	
Artificial islet	one-off	10 sites	14 428	
Dam (Raising water level)	one-off	19 dams	100 427	
Compensation for the land become waterlogged (Raising water level)	one-off	9 sites	43 000	
Planning, follow-up	one-off	133 plans	417 642	
Active control measures of invasive alien predators	recurring	168 sites	2 000 000	
Experimental fisheries	one-off	63 sites	72 143	
Biomanipulation (fisheries)	recurring	25 sites	131 142	
TOTAL			**8 809 592 €**	

* indicate whether the measure is recurring or one-off

- additional measures beyond Natura 2000 (wider green infrastructure measures)

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Restoration and re-creation/construction of wetland sites to multifunctional open water wetlands outside of Natura 2000. (average 3 ha, 300 wetlands)	One-off	900 ha	2 000 000	
Management of multifunctional wetlands outside of Natura 2000	Recurring		700 000	
Regional wetland restoration coordination projects to ensure timely and quality delivery of wetland restoration, construction and management in wider countryside	Recurring	5 wetland restoration, coordinators delivering 300 multifunctional wetlands	250 000	
National level Invasive Alien Predator Management framework in the wider countryside.	recurring	3 full time coordinators establishing and implementing Invasive species management at wider countryside. Support and inventive payments for specialized hunting groups top enhance the concrete conservation activities. Estimated 50 groups with annual 5 000 € support	Annual total cost 200 000 € for coordination and 250 000 for support of concrete actions. Total of 450 000 €/year	EAFRD, ERDF, LIFE strategic nature project EMFF in archipelago
TOTAL			3 400 000	

Expected results for targeted species

The aim of the measures suggested is to stop and turn the adverse development of the population mentioned above to positive. Their breeding success is enhanced due to better food availability and better shelter for nesting birds due to structural changes in the vegetation. By forming artificial islets for the gull colonies and by controlling invasive alien predators, the populations of black-headed gulls are expected to recover at the wetlands. Black-headed gull is a key species on bird-wetlands which defends aggressively its nests against predators and the breeding success of the waterfowl is better on the shelter of black-headed gull colony. It is expected that the reproductive success of other birds nesting in association with gulls is improved by the restoration and management means suggested.

Finland is the key breeding area of many water birds in EU. As plenty of existing and potential breeding habitat lie outside the SPA network, the importance of wider countryside management to meet objectives of the Birds Directive is high relation to many other countries. The conservation actions taken to benefit migratory water- and shorebirds have strong flyway-level context through which the actions contribute to achieving favourable conservation status also at the EU level.

To achieve expected biodiversity responses, especially in case of many rapidly declining ground nesting birds, the non-natural level of predation mainly caused by Invasive Alien Species needs to be adequately addressed.

Expected results: other benefits

In addition to wetland birds, a number of other threatened species and habitat types, including those of semi-natural natural grasslands often surrounding SPAs, do benefit from the management measures targeted for wetland habitats and species. Moreover, many other ecosystems services as water quality, landscapes and recreational use of sites are expected to benefit from changes in the wetland ecosystems. Recovery of the wetland bird populations benefits also recreation activities, e.g. bird-watching and, where applicable, hunting of waterfowl. Further the local livelihood benefits as the business opportunities are enhanced for entrepreneurs specialised on e.g., bird tourism, nature photography and hunting.

E.3.1.3. Harbour porpoise (Phocoena phocoena)

Current status of the species

The Baltic Proper subpopulation (also considered as “separate management unit”) of harbour porpoise (*Phocoena phocoena*) is listed as critically endangered by the IUCN and HELCOM. The first abundance estimate, which resulted in ca. 500 animals, was made in 2016 in the SAMBAH LIFE+ project. The regular distribution of the subpopulation ranges from German and Southern Swedish waters in south to Åland Sea and Northern Baltic Proper in the north. In Finland, including the province of Åland, acoustic monitoring shows regular presence of animals in the southwestern offshore waters and individuals are occasionally encountered in Bothnian Sea, Archipelago Sea and Gulf of Finland. In the latest Habitats Directive reporting and national red list assessment, harbour porpoise was not assessed, being considered as occasional visitor.

The current primary threats include incidental bycatch in fishing gear, environmental contaminants and increasing anthropogenic disturbance (such as underwater noise, marine constructions and ship traffic), however the magnitude and quantified impact of these threats is data deficient. This, as well as the uncertainties in population size and especially trends, as well as in health status, complicates the conservation status assessments and implementation of (cost) effective direct conservation measures.

Measures needed to maintain or restore favourable conservation status

To restore favourable conservation status of the species, the direct measures need to be targeted mostly to the core distribution areas in the southern Baltic Sea, and to be especially focused to reduce bycatch and other anthropogenic removal close to zero. Currently there are critical data gaps in many fundamental parameters (e.g. subpopulation size and trends, life history) to make proper conservation status assessments and scientifically justified direct conservation measures. Taking in account the highly mobile behaviour of the species, there is a need for strong international co-operation and coordination of scientific and conservation actions between the species' range states.

Prioritization of measures to be implemented during the next MFF period

The most important measures to be implemented are:

- International, subpopulation wide abundance and distribution survey
- Subpopulation wide holistic threat and conservation status assessment
- National monitoring programme, including passive acoustic monitoring in areas of regular occurrence and opportunistic sightings collection from the whole sea area
- Continued and improved international co-operation in research and conservation actions

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
International, subpopulation wide survey of distribution and abundance and holistic status and threat assessment (planned to be implemented in 2021-2026), total of 16 M€, Finnish part ca. 1,2 M€. More detailed plan and cost estimation is included in SAMBAH II LIFE (LIFE20 NAT/DE/001080) full proposal, which was submitted to Commission in February 2021.	One-off	Finnish Sea area	200 000	LIFE+
Acoustic monitor of the regular occurrence area, opportunistic sightings collection, co-operation with stakeholders. Continuous acoustic monitoring of the regular occurrence area (ca. 15 stations in SW offshore area), including field work personnel (ca. 5-6 working months including analysis), travel and equipment costs, opportunistic sightings collection (ca. 1 work month) and stakeholder work and communication (ca. 2 work months).	Recurring	Finnish Sea area	80 000	EMMF?, national sources
TOTAL			280 000 €	

* indicate whether the measure is recurring or one-off

Expected results for targeted species

Improved knowledge, obtained from the actions described above, is expected to fill most of the critical data gaps on the status of the Baltic Proper harbour porpoise subpopulation, allowing authorities to implement effective and targeted direct conservation measures and head towards improved conservation status of the species.

E.3.1.4. Sea spawning grayling (*Thymallus thymallus*)

Current status of the species

Grayling (*Thymallus thymallus*) is a salmonid species listed in Annex V of Habitats Directive (U2-). Although a freshwater fish, there are brackish water spawning populations occurring in the Northern Gulf of Bothnia. Two ecotypes, sea spawning and anadromous, river spawning grayling occur in the Gulf of Bothnia. The endemic sea spawning Baltic populations are considered critically endangered (HELCOM redlist), and the populations are under multiple pressures. Grayling used to be common species in the coastal area of the Gulf of Bothnia, but during the last five decades the stocks have collapsed and observations of grayling are scarce. In Sweden, the sea-spawning grayling populations have also decreased, but natural reproduction has been observed in the Quark and Bothnian Bay coastal areas. In Finland, a stock management program has been done for sea spawning grayling, but the suggested actions have not been implemented yet.

The main recruitment areas of sea-spawning grayling are shallow, exposed rocky shores that are subject to climate change and coastal eutrophication. Likely the reasons for stock declines are failure in natural reproduction due to near shore eutrophication, other ecosystem level changes as well as human induced shoreline development. Both recreational and commercial fisheries are assumed to have had an impact on numbers and size structure of the stocks as part of the collapse. The species is occasionally caught as bycatch of other fisheries in the entire Gulf of Bothnia area and thus, minor populations are expected to occur. To enhance the status of sea spawning grayling, an urgent need is to develop methodology to preserve the grayling in areas where it occurrs and to re-introduce it in areas where it has gone extinct or occurrs in very low numbers.

Measures needed to maintain or restore favourable conservation status

Natural Resources Institute Finland (LUKE) has a breeding stock of sea-spawning grayling that originates from Krunnit area in the northernmost Bothnian Bay. The larvae or fingerlings produced in the hatchery could be used to support or initiate natural reproduction. Before introductions, actions should be taken to assure that there are no breeding fish in the Bothnian Sea, Quark or in the southern Bothnian Bay. If breeding fish are found, the possibilities for establishment of parent fish population for each sub-population should be evaluated and considered. Before re-introductions, there is a need to determine the optimal habitat requirements for the recruitment of sea spawning grayling. In locations, where minor breeding still takes place, the exact breeding locations and habitats should be mapped and evaluated. . The genetic stock identification of sea-spawning grayling has been conducted for sea-spawning grayling originating from the Krunnit area, but if grayling are found in other locations, DNA sampling and stock identification would be needed for each subpopulation.

In addition to this, the habitat enhancement methods for roe and larval habitats should be developed and tested in the locations selected for re-introductions. All stocked larvae or fingerlings should be tagged and the stocking success followed by monitoring with mark-recapture method to estimate the impact of stockings and habitat enhancement. A future monitoring program for sea-spawning grayling should also been established, covering the locations where possibly occurs natural reproduction or where stockings are used to return the species.

Prioritization of measures to be implemented during the next MFF period

The most important measures to be implemented are:

A. Maintaining grayling brood stock in hatcheries;
B. Mapping potential grayling reproduction habitats, stock identification, in co-operation with Sweden;
C. Re-introducing grayling in suitable coastal habitats to support the natural population.
D. Evaluating need and practises for restoring spawning habitats and for additional management actions, such as marine protected areas with fishing restrictions.
E. Planning a suggestion for future monitoring programme for the success of measures.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
A) Maintaining critically endangered grayling brood stock in hatcheries	Recurring	LUKE Keminmaa hatchery	20 000	
B) Mapping potential grayling reproduction habitats, stock identification	Recurring	Gulf of Bothnia, several sub-areas	30 000	
C) Re-introducing grayling in suitable coastal habitats to support the natural population.	Recurring	3 sub-areas in the Gulf of Bothnia	15 000	
D) Evaluating need and practices for restoring spawning habitats and for additional management actions	Recurring	3 sub-areas in the Gulf of Bothnia	50 000	
E) Planning a suggestion for future monitoring programme	One-off	The Gulf of Bothnia	30 000	
TOTAL			145 000	

* indicate whether the measure is recurring or one-off

Expected results for targeted species

Strengthening of the sea-spawning grayling stock size in the Northern Quark -Bothnian Bay area and improving the status of its spawning sites. Identified management action needs and suggestion for spawning and larval habitat restorations and suggestion for a feasible monitoring programme for sea-spawning grayling stocks.

E.3.1.5. Fisheries bycatch

Current status of species, conservation measures taken until now and their impacts so far, remaining pressures and threats

The incidental capture of non-target species, i.e. bycatch occurring due to fishing activities, both commercial and recreational, is a problem for many marine species globally. In the Finnish marine area, by-caught animal groups include marine mammals, birds and some fish species. Of marine mammals both grey seals (*Halichoerus grypus*) and Baltic ringed seals (*Pusa hispida botnica*) are caught incidentally in fishing activities. Several seabird species, categorized as threatened according to the 2013 HELCOM red list, such as long-tailed duck (*Clangula hyemalis*), common eider (*Somateria mollissima*), red-breasted serrator (*Mergus serrator*) and black guillemot (*Cepphus grylle*) are bycaught. In addition, bycatch e.g. of the naturally producing sea trout is adding pressure to already endangered trout stock.

However, there are several knowledge gaps concerning the magnitude of the problem. There is an obligation to affirm seal as well as harbor porpoise bycatch to national authorities (Luke), but not all bycatch is declared. Informing bird bycatch in log-books is currently voluntary for commercial fishermen. A questionnaire has recently been made to get further information of the bycatch in the commercial fishery, but the data is not comprehensive. In the Finnish coast, gillnets are widely used by recreational fishermen as well. In many areas, the total gillnet fishing effort by recreational fishery likely exceeds the effort of commercial fishery. Currently, there are still no data of the bycatch in recreational fishery.

Measures needed to maintain or restore favourable conservation status

There is a need to increase the knowledge of the levels of bycatch and the main risk areas, times and fishing methods. Risk assessment, including fish, birds and mammals, need to be carried out. Reporting needs to be updated to better answer the current knowledge gaps, including both commercial and recreational fishery. Collaboration with fishermen and fishing control is needed, and the current data collection program with fishermen need to be evaluated and improved to fill the current data gaps.

Thereafter it is possible to assess the effects of bycatch on the population levels, to develop potential prevention measures in collaboration with fishermen and local fisheries areas. Outreach of the results and better methods is a key component in the mitigation process.
Measures regarding harbor porpoise is mentioned in chapter E.3.1.3.

Prioritization of measures to be implemented during the next MFF period

The most important measures to be implemented are:
1) Collating comprehensive overview report on present knowledge of the bycatch problem.
2) High-risk areas, timing and fishing methods to be identified. Including both commercial and recreational fisheries.
3) In high-risk areas more detailed information to be collected on the bycatch levels as well as distribution and timing of the fishing effort.
4) Data analysis and modelling with new data.
5) Recommendations made for best-practices in mitigation and future data collection.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Assessing current fisheries bycatch numbers (data collating and analysis)	recurring	EEZ wide analysis	16 500	EMFAF
Data analysis, identification of high risk areas and developing mitigation measures. New recommendations for mitigation and best practice.	recurring	EEZ wide	33 300	EMFAF
TOTAL			49 800	

* indicate whether the measure is recurring or one-off

Expected results

Increased knowledge of the levels and means of bycatch will guide to correctly targeted mitigation measures to reduce bycatch problem in Finnish fishing activities. Readjustment of the monitoring programs or establishment of new effective monitoring programs will produce reliable information of the level of bycatch in Finland in the future.

E.3.1.6. The Golden Eagle (*Aquila chrysaetos*)

Current status of the species

The Golden Eagle (*Aquila chrysaetos*) is included in the Birds Directive annex I. On the Red List of Finland it is assessed as vulnerable (VU). It is fully protected by the Nature Conservation Act. The Golden Eagle range is as well in the Boreal bioregion as in the Alpine bioregion of Finland. The reasons for the inadequate conservation status are persecution in previous decades, the general decline of the status of the species habitat remote forest and marshlands.
The knowledge of the species is quite good. Currently about 450 occupied territories of the Golden Eagle are known from Finland mostly in the Northern Finland and 43 percent of all are situated in Natura-2000 areas. Short Term trend for the population of the Golden Eagle in Finland is +18 % and Long Term trend +465 %.

Measures needed to maintain or restore favourable conservation status

To ensure remote and undisturbed areas for breeding and preying are essential for the Golden Eagle. In forestry is important to take good care of nest trees and their environment. Not only the good food resources but also possibility to prey are critical for achieving favourable conservation status.

The concrete actions to maintain or restore the conservation status of the species include:
- to continue good cooperation with reindeer herders because of territory based compensation system
- to develop forestry methods to take better account of the Golden Eagle
- restoration natural stage to drainage peatlands particularly in the Southern Finland

Prioritization of measures to be implemented during the next MFF period

To save enough good quality breeding and hunting habitats

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Inventories of known population	Recurring	550 territories	50 000	
To find out new territories and nests	Recurring	15 territories	10 000	CBC, ERDF, Interreg, LIFE
To study feeding situation	One-off	3 studies	15 000	CBC, ERDF, Interreg, LIFE
To restore drainage peatlands in Southern Finland	one-off		15 000	CBC, ERDF, Interreg, LIFE
TOTAL			90 000	

Expected results for targeted species

In 2030 population of the Golden Eagle is stable in the Northern Finland and in the Southern Finland is at least ten new territories

E.3.1.7. The Gyrfalcon (*Falco rusticolus*)

Current status of the species

The Gyrfalcon (*Falco rusticolus*) included EU Bird Directive annex I. On the Red List of Finland it is critically endangered (CR) and it is protected by the Nature Conservation Act. The Gyrfalcon range is as well in the Alpine bioregion as Boreal bioregion of Finland. Population has been longer at level 40-50 pairs but has decreased during last decades and is now about 25 pairs. Short Term trend for the population of the Gyrfalcon in Finland is -39-63 % and Long Term trend – 36-55 %. Except one all now known nest sites are situated in Natura-2000 areas. The Willow Grouse is Gyrfalcons main food in Finland and its population has decreased during last 20 years. This could be one reason that number of Gyrfalcon has decreased.

Measures needed to maintain or restore favourable conservation status

To ensure remote and undisturbed areas for breeding and hunting are essential for the Gyrfalcon. Because of the Gyrfalcon is very dependent on Willow Grouse it is important to inventory the Willow Grouse population and take care that it keeps enough high level for Gyrfalcon. The concrete actions to maintain or restore the conservation status of the species include:
- to control Willow Grouse hunting in main breeding areas so that population stay enough high level for Gyrfalcon
- to take into consideration Gyrfalcons nesting sites in all land use
- annual monitoring of population

Prioritization of measures to be implemented during the next MFF period

To be aware any changes in the population of Gyrfalcon and Willow Grouse

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Inventories of known population	Recurring	47 territories	15 000	
To find out new territories and nests	Recurring	15 territories	5 000	
To study Willow Grouse situation in the breeding area	One-off	3 studies	15 000	CBC, ERDF, Interreg, LIFE
TOTAL			35 000	

Expected results for targeted species

In 2030 Finnish Gyrfalcon population is 30-35 breeding pairs

E.3.1.8. The Peregrine Falcon (*Falco peregrinus*)

Current status of the species

The Peregrine Falcon (*Falco peregrinus*) included EU Bird Directive annex I. On the Red List of Finland it is vulnerable (VU) and it is protected by the Nature Conservation Act. The Peregrine Falcon range is as well in the Alpine bioregion as Boreal bioregion of Finland. Total population in Finland is about 300 hundred pairs. Short Term trend for the population of the Peregrine Falcon is N/A (+1) and Long Term trend +391 %. Known nest sites 43 percent are situated in the Natura-2000 areas. Earlier the Peregrine Falcon was breeding in whole Finland but now range is only in the Northern Finland. While reason for decreasing was environmental toxins also many old nest sites in the Southern Finland have been destroyed due human effects and marshlands drainage. Also breeding success in the north has declined during last 20 years maybe for decreasing waders, the main food of Peregrine Falcon in the north.

Measures needed to maintain or restore favourable conservation status

To ensure undisturbed areas for breeding and hunting for Peregrine Falcon. Because of it unclear what are the reasons for the decline of breeding result in the north so must start studies to find out reasons for this.
- to reserve undisturbed nest sites in the Southern Finland
- study reasons for the decline of breeding success in the Northern Finland
- to do annual monitoring of population

Prioritization of measures to be implemented during the next MFF period

- to reserve undisturbed nest sites in the Southern Finland
- study reasons for the decline of breeding success in the Northern Finland
- to do annual monitoring of population

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Monitoring of known population	Recurring	300 territories	15 000	
To find out new territories and nests	Recurring	15 territories	5 000	
To find out good nest sites in the Southern Finland	One-off	3 years	15 000	CBC, ERDF, Interreg, LIFE
Studies for reason for bad breeding success in the Northern Finland	One-Off	3 studies	10 000	CBC, ERDF, Interreg, LIFE
TOTAL			45 000	

Expected results for targeted species

In the 2030 is stable in the Northern Finland and at least ten new pairs in the Southern Finland

E.3.1.9. Lesser White-fronted Goose (Anser erythropus)

Current status of the species

Lesser White-fronted Goose (later LWfG) (Anser erythropus) is one of the most threatened goose species in the world. The species is recognized as globally vulnerable by the IUCN Red List and Critically Endangered within the EU by the 2015 European Red List of Birds. It is listed in Annex I of the EU Birds Directive.

The Fennoscandian LWfG population, which migrates along distinct migration routes to distinct wintering sites, is critically endangered. It declined from over 10,000 individuals in the beginning of 1900's to only 60-80 individuals in 2005. Since then the population has increased slightly, but is still estimated at only ca 105-120 individuals, equivalent to ca. 30-35 adult breeding pairs.

The breeding grounds are only partially known, and the share of unknown pairs will increase as the population increases. Breeding LWfG were still located in northern Finland in the 1990's, but since then LWfG is observed during migration from/to Norwegian breeding grounds in the Oulu region of Finland. The reported number of 0-5 breeding pairs in Finland is a rough estimate, as although no breeding areas in Finland are known at present all potential areas cannot be fully monitored. Potential unknown breeding areas may still exist in vast wilderness areas of northern Fennoscandia.

Measures needed to maintain or restore favourable conservation status

The breeding grounds in northern Finland where LWfG was breeding in the 1990's have not changed significantly and therefore it is expected to find breeding pairs also on the Finnish side of Fennoscandia as the population is slowly increasing.

<u>The most important measures to restore favourable conservation status:</u>
1: Locating the breeding grounds in Finland
2: Monitoring the breeding success of the Finnish population
2: Assessing the needed conservation measures to secure breeding success
3: Implementing such efforts based on the Finnish NAP

Prioritization of measures to be implemented during the next MFF period

Locating current breeding grounds in the former Finnish breeding area is the main priority and this is implemented in the newest LIFE-project (LIFE19 NAT/LT/000898) during years 2020-2025. Monitoring and assessment of found breeding grounds and potential conservation efforts is done outside this LIFE-project and continued also after the project as well as the work for locating breeding grounds.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Locating the breeding grounds in Finland (after ongoing LIFE); total costs 20000 €	Annual	3 weeks fieldwork annually 2026-2027	10000	CBC, ERDF, Interreg, LIFE
Monitoring found breeding grounds; total costs 30000 €	Annual	1-3 breeding grounds	5000	CBC, ERDF, Interreg, LIFE
Assessing the needed conservation measures to secure breeding success (field monitoring during breeding); total cost 20000 €	One-Off	1-3 breeding grounds	3000	CBC, ERDF, Interreg, LIFE
Implementing conservation efforts on breeding grounds (rex fox removal, etc.); total cost 50000 €	Annual	1-3 breeding grounds	10000	CBC, ERDF, Interreg, LIFE
TOTAL			28 000 €	

* indicate whether the measure is recurring or one-off

Expected results for targeted species

Locating the possible unknown breeding areas is of high priority, since no precise conservation measures can be taken without exact knowledge. Monitoring the breeding success and assessing and implementing possible actions needed to secure safe breeding is the next step. After these actions, LWfG breedings in Fennoscandia are better known and monitored and necessary actions are made to prevent disturbance lowering the breeding success and viability of this threatened species.

E.3.1.10. The Artic Fox (*Vulpes lagopus*)

Current status of the species

The Artic Fox (*Vulpes lagopus*) is included in EU Habitat directive annex IV. On the Red List of Finland it is critically endangered (CR) and it is protected by the Nature Conservation Act. The Artic fox occur in the Alpine bioregion of Finland. One hundred years ago number of individuals was maybe 1000. The last sure litter have registered in 1996 but still 5-10 individuals are observed annually. All known den sites are situated in Natura-2000 areas. The Finnish Artic Fox population is very connect to Sweden and Norway. The situation of the Artic Fox seems now better due the effective conservation actions in Finland, Sweden and Norway. First reason for the decrease was hunting but reasons why the decline continued after protection in 1940 are partly unclear. Now climate warming and for this reason population of the Red Fox, which is the competitor to the Artic Fox, has increased in the mountain area.

Measures needed to maintain or restore favourable conservation status

To ensure remote and undisturbed areas for breeding and preying. Because of the Red fox is main obstacle to the return of the Artic Fox it is important to prevent Red Fox increasing to the mountain. Also is important to minimize food competition between Artic Fox and Red Fox by using feeding stations to Artic Fox.

The concrete actions to maintain or restore the conservation status of the species include:
- to control Red Fox population in mountain areas and around mountains by culling
- special feeding stations for the Artic Fox
- no extra food for the Red Fox, good waste management in mountains and surrounding villages
- annual monitoring of Artic Fox population

Prioritization of measures to be implemented during the next MFF period

-Special feeding stations and Red Fox culling
-Inform people in villages and tourists in mountain about good waste management
-annual monitoring of Artic Fox
-cooperation with Sweden and Norway

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Annual monitoring	Recurring	220 densites	10 000	
Red Fox culling	Recurring	500 Red Foxes	20 000	CBC, ERDF, Interreg, LIFE
Special feeding stations	Recurring	25 stations	5000	CBC, ERDF, Interreg, LIFE
info campaign about waste management	one-off two years	media and public occasions	2500	CBC, ERDF, Interreg, LIFE
TOTAL			40 000	

Expected results for targeted species

In the year 2030 in Finland is five litters of Artic Fox.

E.3.1.11. Saimaa ringed seal (*Pusa hispida saimensis*)

Current status of the species

The Saimaa ringed seal is the only endemic mammal in Finland. It has been land-locked in a freshwater lake over9 000 years. It is an endangered (IUCN status of EN), strictly protected, and also in the Habitats Directive classified as species in need of strict protection (Council Directive 92/43/EEC, Annex IV). The Saimaa seal was hunted until the 1950s but was protected in 1955 by a statutory decree based on the Hunting Act. In 1993 game animal status was removed and legal protection of the Saimaa ringed seal was transferred to the Nature Conservation Act, and the responsibility for management to the Ministry of Environment (MoE) and in practice to the MHPWF. A conservation strategy and action plan was adopted in 2011 and updated in 2017 largely utilizing the LIFE Saimaa seal (LIFE13NAT/FI/000367) project results. The plan is updated every five years. The Saimaa ringed seal population has increased slowly being currently ca. 400 individuals. Threats to the population are by-catch mortality by fishing, climate change, small and fragmented population, and disturbance during the breeding season. The effects of climate change have been more acute than anticipated and further development and establishment of monitoring and conservation methods are needed.

Lake Saimaa is a fragmented lake complex of several water basins. At present, around half of the seal population is found in the central parts of the lake; Haukivesi and Pihlajavesi basins. There are 11 N2000 sites where the Saimaa ringed seal has been one of the criteria for the selection as part of the network. N2000 sites cover a total of 189 364 hectares (33 751 ha land, 155 614 ha water). Most of the lake and shore areas are privately owned and other form of use than conservation prevail. Conservation goals of N2000 network and National Shore Conservation Program have been implemented by establishing around 9500 ha conservation areas on state-owned land and water areas.

Since 2012 around 60-85 Saimaa seal pups have been born annually. During good ice and snow conditions the pre-weaning mortality is about 8%, but it has increased to near 30% in mild winters. Furthermore, only 20% of pups born reach the age of maturity, mainly due to bycatch and pup mortality during the nursing period. The current seal population may overcome detrimental effects of singular threat, but the combined effects of different threats may be fatal to the population.

Measures needed to maintain or restore favourable conservation status

Successful breeding of the Saimaa ringed seal depends on ice and snow cover, and hence climate change poses a major risk for the long-term survival of the species. Man-made snowdrift method, developed in LIFE Saimaa seal (2013-2018), has provided an excellent tool for improving juvenile survival. However, long term climate models indicate milder and occasionally even totally snowless winters in the Saimaa region. Therefore, also artificial nests and nest structures for safeguarding seal's breeding success will be needed.

Climate change has negative effect also on traditional monitoring methods. In recent years, warming climate has created unfavourable conditions for lair censuses for monitoring the Saimaa ringed seal population and thus hindered population size estimation. Therefore, there is a need for alternative and complementary monitoring methods that are not affected by winter conditions. These non-invasive methods will be developed in recently started Our Saimaa Seal LIFE (LIFE19NAT/FI/000832) project based on tissue samples and on genetic approach using DNA samples and newest genomic methods. Moreover, remote sensing approaches i.e. photo-ID based on recognition of individual fur patterns provide several applications for population monitoring.

Bycatch mortality is one of the main threats to the endangered Saimaa seal population. For decreasing bycatch mortality, springtime net fishing bans and full year fishing gear type restrictions have been established. The government decree (259/2016) of fishing restrictions cover 61% of the lake. It is set to reduce bycatch mortality of weaned pups (fishing with gillnets are forbidden during 15.4.-30.6.) and most dangerous fishing methods (e.g. strong mesh nets, large fish traps and fish-baited hooks) are forbidden. However, July is still dangerous month for the weaned pups when the gillnets are again permitted. Observance of fishing regulations still require both

education and communication and patrolling. To improve the cost-effectiveness and sustainability the water district owners should have major role in surveillance of the regulations.

The genetic diversity of the Saimaa ringed seal is extremely low, and it is further divided into subpopulations, which forms a serious threat to the population. During Our Saimaa Seal LIFE project in 2020-2025, a genetic rescue plan will be produced, and translocations of individuals within Lake Saimaa will be carried out for improving gene flow.

Overall, informative actions to local citizens, summer residents and tourists are considered highly important for the Saimaa ringed seal. E.g. tourism has increased considerably in recent years also in the seal's central distribution areas and during the breeding season. In collaboration with entrepreneurs, environmental authorities, and seal experts, guidelines for seal friendly tourism will be developed for Saimaa Nature Tourism, also to increase awareness of the seal and its conservation.

Majority of the costs of these actions are covered by the Our Saimaa Seal LIFE (LIFE19NAT/FI/000832) project during 2020-2025. The project costs do not include the recurring conservation work in Regional Environmental Centres and Metsähallitus on e.g. land use planning issues, impact assessment of land use development projects and other promotion of interests of the seal as well as compensations to water district owners and to commercial fishermen. However, those costs are included in the table below. The costs include all costs (personnel, travel, possible equipment and its maintenance, and consumables).

Prioritization of measures to be implemented during the next MFF period

Methods to safeguard the breeding success of the Saimaa ringed seal in warming climate are crucial, as well as decreasing the bycatch mortality through both informative and concrete measures, i.e. surveillance of the fishing restrictions. New monitoring methods that ensure reliable population estimation is of high importance in the future. More detailed list of measures:

- Monitoring of the population (Metsähallitus)
- Ringed seal conservation work (Regional Environmental Centers)
- Development of new non-invasive monitoring methods
- Artificial nests and manmade snowdrifts
- Surveillance of fishing restrictions
- Compensations to water district owners
- Compensations to commercial fishermen

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Monitoring of the population (Metsähallitus)	Recurring	2 man-years	156 000€	
Ringed seal conservation work (Regional Environmental Centers)	Recurring	1 man-year	270 000€	
Development of new non-invasive monitoring methods; total costs 585 000€	One-off	Whole population	83 500€	LIFE
Artificial nests and manmade snowdrifts; total costs 840 000 €	Recurring		120 000€	LIFE
Surveillance of fishing restrictions; total costs 350 000 €	Recurring	Population area	50 000€	LIFE
Compensations to water district owners; total costs 4 690 000 €	Recurring	3 000ha (2,5€ per hectare)	670 000 €	
Compensations to commercial fishermen; total costs 546 000€	Recurring		80 000 €	
TOTAL			1 429 500 €	

* indicate whether the measure is recurring or one-off

Expected results for targeted species Monitoring of the Saimaa ringed seal population size is reliable also in warming climate. Also, the annual breeding is secured even during mild winters without ice and snow. Bycatch mortality is reduced and information on seal friendly fishing and tourism is given. As a result, the Saimaa ringed seal population can slowly increase towards to the favourable conservation status.

E.3.2. Prevention, mitigation or compensation of damage caused by protected species

E.3.2.1. Barnacle Goose (Branta leucopsis)

Current status

The size of the Russia/Germany & Netherlands population, which is one of the three Barnacle Goose populations, has increased by 30 times than it was in the 1980s. The population size was about 1.2 million individuals in 2014/15. The Russia/Germany & Netherlands population has expanded its breeding range to the Baltic and North Sea area where it continues to expand to inland areas. These increases are demographically driven by reduced mortality as the result of reduced taking in Russia and hunting bans introduced at various times across the range but applied more widely and in a less flexible manner after the Birds Directive came into force and it is reinforced by the ability of the species to utilise intensively managed agricultural areas.

Until the early 1970s, the Russian/Northwest European population bred exclusively in the Russian Barents Sea region, confined to the islands of Novaya Zemlya and Vaygach. Since then they have established breeding colonies in new areas such as the mainland Yugorski Peninsula, Kolguyev Island, Kola Peninsula and the Kanin Peninsula. The Kanin Peninsula is also one of the first staging area when the breeding areas are left in autumn. Further south staging areas in the White Sea and the Baltic Sea (especially the Swedish islands Gotland and Öland, western Estonia and eastern Finland) are used before the wintering areas finally are reached. Since 2006 has hundreds of thousands of Barnacle Goose began to rest in the eastern and southern Finland at the end of September and October. The core wintering areas for the Russian group as well as the Baltic/North Sea are located in the Netherlands, Germany, Denmark and southern Sweden. The main moulting areas for the Russian group are confined to the coasts of Novaya Zemlya.

Current status in terms of prevention, mitigation and compensation for damages

This population increase, combined with the increasing year-round presence of the species, has led to increasing human-wildlife conflicts, particularly in relation to agricultural damage. Various management measures are applied in Finland to control and minimize the crop damages; non-lethal measures, such as different scaring schemes or other preventive measures and alternative reserved feeding areas, i.e. accommodation fields. In the most prone areas where serious damage has been occurred, it has led to killing individuals under derogation in response to conflicts with various societal and conservation interests.

Agricultural damage prevention has been tested in project “Prevention of crop damage by barnacle goose”.

Following methods has been tested during 2019-2020 to prevent damages:

- Chasing off by approaching and drone
- Preventing to settle by using balloons
- Preventing to settle by using hawk-shaped kites

Total budget of project was 469 267 €. The tentative conclusions of the study is that the wide range of measures is likely to be more effective than using only one measure alone.

Because of increased population of Barnacle Goose, agricultural damages and economic compensation for farmers, paid by the Ministry of the Environment, have multiplied during the last five years. Annual economic compensation for harvest losses due to Barnacle goose in spring 2020 were 2,7 million € (table 1.). From 1991 compensations for agricultural damages caused by Barnacle Goose have been paid according to the decision of a ministry (1991/1626).

Recent experiments on different scaring methods and devices indicate, that their effect is not long lasting and geese flocks return to their foraging fields soon after departure. It is also apparent that the birds become accustomed to the sound or other scaring effect quite soon.

Table 1.

Year	Cost (€)
2012	299 000
2013	232 000
2014	349 000
2015	567 000
2016	500 000
2017	1 449 000
2018	1 468 000
2019	1 648 000
2020*	2 713 000
Total	**9 225 000**

The figures are approximations rounded to the nearest thousand euros.
Compensation for agricultural damages caused by Barnacle goose in 2012-2020.
* Figure does not include compensation for damages caused in the Autumn 2020.

Measures needed

There's need to improved knowledge and understanding:

- prevention of crop damages and especially the relationships between different managements;

- the accommodation fields: for example size of the fields, crop selection;

- behavior and use of resources by barnacle geese in relation to the relative availability of the resource

Prioritization of measures to be implemented during the next MFF period

All measures above are considered as prioritized

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Accommodation fields - The common agricultural policy (CAP) for the period 2021-27	recurring	approx. 700 ha	2,1 M €	
Accommodation fields –project (2021-2022) - financed by ministry of the environment	one-off	approx. 500 ha	1,0 M €	
Compensation scheme	recurring	approx.. 13 000 ha	2,0 M €	
Total costs			5,1 M €	

Expected results:

Results will increase the acceptability of conservation and mitigate conflict between geese and farmers.

E.3.2.2. Golden Eagle

Current status in terms of prevention, mitigation and compensation for damages

The present population of golden eagles (*Aquila chrysaetos*) estimate (2019) is 340 to 470 couples. Current population of golden eagles has described in detail in 3.1. Compensation scheme for losses caused by golden eagles to the reindeer (*Rangifer tarandus*) is based on nesting and reproduction of the species according the Council of State Decree on Compensation of the Losses Caused to Reindeer Husbandry by the Golden Eagle 8/2002. The incentive scheme is not related to individual losses. The purpose of the compensation scheme has been to support the protection of golden eagle and its breeding success.

In 2020 about EUR 967,000 was paid in compensations for damages (table 2). The amount of compensations paid has been growing steadily due to both the growth of the golden eagle population and increase in the value of reindeer meat.

Table 2.

Year	Cost €
2002	354870
2003	402808
2004	416835
2005	367242
2006	350720
2007	368328
2008	350988
2009	355286
2010	432979
2011	618914
2012	626960
2013	568758
2014	698138
2015	703546
2016	749749
2017	763220
2018	806110
2019	990350
2020	967017

Measures needed

The economic resources for compensation scheme for losses caused by golden eagles should be secured.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Compensation scheme	recurring		1,0 M€	

* indicate whether the measure is recurring or one-off

Expected results for targeted species Expected results: other benefits

Results will increase the acceptability of conservation.

E.3.2.3. Great Cormorant (Phalacrocorax carbo sinensis)

Current status in terms of prevention, mitigation and compensation for damages

The population size of Great Cormorant (*Phalacrocorax carbo sinensis*) – a protected piscivorous generalist bird – has increased along the Finnish coast in two decades, from ca 1 000 pairs to over 25 000 pairs. The increase seems to be stabilized during the last years. The population increase has been similar in other parts of the Baltic Sea. Cormorants have caused locally profound human–wildlife conflicts, especially where large breeding colonies are located close to human settlements or various activities such as summer resorts, fisheries or aquaculture. Moreover, commercial fisheries are worried about negative effects on the fish stocks and physical damages on fish being caught in the net. Perch (*Perca fluviatilis*) and zander (*Sander lucioperca*) are typically considered as the fish species causing the largest conflicts of interest. Cormorants without doubt consume large amounts of fish, including the mentioned species, and the latest scientific evidence is clear. Cormorants have identifiable, clear and measurable negative effect on some fish stocks at local level.

Further research of high priority includes more precise quantification of the spatial and temporal effects of cormorants on fisheries. A vital step for planning ways for preventing serious damage on fisheries is to produce a publicly available heat map (and GIS-layer) of the predation pressure caused by the cormorants along the Finnish coast. Given that the effects of cormorants on fish stocks are fairly local, such information could, for example, be used to manage the conflict between cormorants and various fisheries groups as well as to identify the most prone areas where serious damage may occur, not only to human activities but also to biodiversity such as migratory fish species as well other fish stock considered endangered. Finally, a heatmap and GIS-layer with quantitative information on cormorant-induced predation would be an invaluable tool in the planning and implementation of possible compensation schemes.

Measures needed

1. GPS tagging of 60 Great Cormorants along the Finnish coastline, to collect data on their fishing behaviour and foraging habitat selection.
2. Data cleaning and interpretation of GPS-data and compiling of environmental GIS-layers. Environmental niche modelling, providing a model-based estimate of the species' use of foraging habitat. Further estimation of predation pressure.
3. Production and publication of a quantitative heatmap and GIS-layer of Cormorant habitat choice and predation pressure.
4. Identification of potential conflict hotspots, by assessing the degree of overlap between Cormorant predation pressure maps, main fishing areas and essential fish habitats.

Prioritization of measures to be implemented during the next MFF period

All measures mentioned above are prioritised and depend on one another.

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
GPS-loggers on Great Cormorants (planned over four years)	One-off	60 loggers (15 / year)	44500	EMFAF
Data analysis and modelling (planned over three years)	One-off		19500	EMFAF
Publication and identification of conflict hotspots (planned over two years)	one-off		12500	EMFAF
TOTAL			**76 500**	

* indicate whether the measure is recurring or one-off

Expected results for targeted species

The prioritized actions are expected to mitigate the conflict between Great Cormorants and fisheries and therefore to result in wider acceptance or tolerance of the conservation status of the species. This in turn would likely decrease illegal actions taken to reduce the Cormorant population. Further, possible special permissions to banish of kill Great Cormorants, could then be limited to the most acute cases, where the effects are expected to be the largest. If there will be a need to further establish compensation schemes for Cormorant-induced damages, the measures described here provide tools for better implementation of such schemes.

E.3.2.4. Large carnivores

Current status in terms of prevention, mitigation and compensation for damages

The most prominent source of damages caused by protected species in Finland are those caused by large carnivores (wolverine, wolf, bear and lynx). All four large carnivore species cause substantial annual losses to reindeer husbandry by depredation of semi domestic reindeer. In addition, large carnivores cause damages and concern due to depredation of livestock (mainly sheep), demolishing beehives (by bears) and killing dogs (mainly by wolves), as well as damages to harvested crops (by bears). These damages (e.g. wolves killing hunting dogs) occur mainly south from the reindeer management area, but damages caused by bears on sheep farming occur also in the reindeer management area.

In terms of economic compensations for the damages caused by large carnivores, depredation of semi domestic reindeer comprises major part (94 %) of the annually paid compensations in Finland. During last decade, from 3000 to over 5000 semi domestic reindeer killed by large carnivores have been found and compensated annually. All reindeer killed by large carnivores, especially those depredated during summer period, are not found. The loss of calves of the year and exceptionally high damages in certain districts has been addressed in specific paragraphs of the Game Damage Law. However, in the amendment of Game Damage Law in 2019, the paragraph for district specific compensations for exceptionally high damages was omitted from the compensation scheme, and all reindeer herding districts are currently compensated on equal basis.

The compensations are paid to the owner of the reindeer (if the owner is possible to determine) according to the found and documented carcasses. In addition, a specific calf loss compensation is paid for each reindeer herding cooperative according to a certain formula based on the assessment of the level of calf losses caused by large carnivores and reindeer calf production (derived from research projects). It is noteworthy to mention that European Commission has restricted the annual compensations paid to Finnish reindeer husbandry to a maximum of 10 M€ (EC decision 31.3.2016, C (2016) 1752 final). The compensations are paid according to the Game Damage Law and within the limits of the State budget. In 2016 and 2017, the compensation claims for reindeer killed by large carnivores exceeded 10 M€ and thus the compensations had to be cut from each damage by 4 % and 26 % in 2016 and 2017, respectively. In 2018 and 2019, compensations for reindeer damages were in total 7,2 M€ and 6,9 M€, respectively. Thus, reindeer damages in 2018-19 were compensated without any cuts.

The damages caused by protected species create a substantial conflict of interest between the biodiversity targets specified in the Habitats directive and business opportunities in rural areas. In addition to direct impacts on livelihoods and industry, the damages caused by protected species such as large carnivores may also affect the feeling of security among those people living and working in rural areas causing tangible challenges to conservation of protected species.

With current knowledge and practices, prevention of damages to free-ranging semi domestic reindeer has been shown to be extremely difficult as the damages often occur during night time. In winter, free ranging reindeer are commonly herded and monitored during daylight, but during the night protecting animals from predation is challenging. On the other hand, during summer when there is light night and day, reindeer killed by large carnivores are difficult to find (in time) as carcasses are scavenged or decompose rapidly. Especially small reindeer calves of the year (depredated or being succumbed for other causes) disappear quickly.

However, some preventive measures have been applied also to prevent damages to semi domestic reindeer. The use of GPS-collars and so-called mortality collars (working on VHF frequencies) have become common in many parts of the Finnish reindeer management area. By following the movements of GPS-collared reindeer, the herders can monitor if something unusual takes place in the specific herd and may target their effort in such events to prevent further damage. By using mortality collars, the areas with increased depredation risk are detected quicker and with better coverage than without mortality transmitters, and monitoring effort can be further allocated with more intensity to the high-risk areas. Currently, location systems based on IoT-technology are also being tested and applied for better surveillance of semi domestic reindeer.

When considering preventive measures to protect semi domestic reindeer from depredation, taking reindeer in winter corrals for supplementary feeding for winter months is a common practice in many herding cooperatives in the eastern border. However, there is currently an ongoing discussion whether winter corralling should be reduced, and reindeer be managed more in the free ranging practice (with some supplementary feeding to help herding). This discussion stems from the fact that costs related to feeding are high while at the same time productivity of the reindeer stock has been decreasing leading to decreased number of reindeer slaughtered and sold to market.

The problems with damages to semi domestic reindeer are mainly economical (from the perspective of reindeer herders and State budget, respectively) but also social and psychological as well as cultural. Though the annual compensations paid for other damages than those for semi domestic reindeer are less than 0,5 M€, prevention of damages to livestock, mainly sheep, but also to hunting dogs, is of ultimate importance for successful management of the protected species, and subsequently, for achieving and maintaining the favourable conservation status of these species. Thus, all means to increase the awareness and to enhance the use of preventive measures to prevent damages to e.g. livestock, beehives or dogs are important.

There is currently underway a LIFE BOREALWOLF -project which conveys information about wolves and their behavior, promotes local interaction and provides tools for prevention of adverse impact and losses caused by wolves. The project started in October 2019 and it will end on 30th September 2025

We hereby list some prioritized actions, which should be considered in order to improve the social acceptance for the large carnivore species such as wolf, brown bear, lynx and wolverine, and thus mitigate the conflict between people and large carnivores leading to improved conservation status of the protected species during MFF 2021-2027.

Measures needed

The economic, material and human resources for preventive measures should be secured by allocating sufficient funding for this purpose. Currently, funding for preventive measures has not been adequate to provide e.g. electric fences to all those farms, which have applied materials to protect their livestock. Neither has there been enough resources for many other needed actions and measures. These measures include (but are not exclusive):

- securing sufficient funding for preventive measures (electric fences and other measures)
- securing that enough materials for electric fences are available (contracts with suppliers)
- securing that enough labor is available in building up electric fences (good local practices)
- compensations for extra work needed to build and maintain electric fences (non-productive investments)
- allocating (human) resources for planning the best solution for each case (innovative planning)
- allocating (human and material) resources for rapid response (storing materials near risk areas)
- allocating (human) resources for monitoring the functionality of measures (contracts with farms)
- allocating (human) resources for promoting new innovative measures (e.g. protective vests for dogs)
- awareness raising on prevention and mitigation of damages (local/regional advising and education events)
- training of municipality authorities in conducting damage inspections (local/regional education events)
- strengthening the capacity of large carnivore contact network (local/regional education events)
- increased information on large carnivore occurrence to prevent damages for semi domestic reindeer
- increased monitoring of large carnivore movements and cross-border immigration (e.g. wolves)
- increased monitoring of large carnivore populations in the reindeer management area

- promoting use of guardian dogs in protecting livestock

Prioritization of measures to be implemented during the next MFF period

Monitoring of large carnivores in the reindeer management area

Large carnivores cause substantial losses to reindeer husbandry. Annually 3000-5000 semi domestic reindeer have been found and compensated as predator-kills. However, all reindeer killed by predators are not found, especially during the snow-free period (including predation on calves of the year). During recent years, the annually claimed compensations for reindeer damages have varied from 7-10 M€. However, compensations are paid within the limits of the State Budget (and EU-regulations) and therefore cuts to full compensations have been applied in 2016 (4 %) and 2017 (26 %), respectively.

The Finnish reindeer husbandry area hosts all four large carnivores (wolf, brown bear, lynx and wolverine). Most of the compensated damages to semi domestic reindeer in Finland are caused by wolverine, which causes annually more damages than three other predator species together. However, for example most of the calves of the year predated by brown bears or wolves are not found. There is a need for more information on occurrence (number of animals) and movements (cross-border and within area movements) as well as behavior (including predation patterns) of all large carnivores in the Finnish reindeer management area.

Monitoring occurrence and movements of all large carnivore species in the reindeer management area would help to identify damage hot-spots and to get better assessment of the large carnivore populations within the boundaries of the reindeer management area. Reindeer management area is about one third of the surface area of Finland and comprises the area where wolves, wolverines, brown bears and lynx may also migrate over the borders from and to Sweden, Norway and Russia. More information on occurrence and movements of the large carnivores in the reindeer husbandry area would also support the transboundary management of large carnivores in Finland, Sweden and Norway.

By improved knowledge and understanding of the movement patterns and behavior (including predation) of large carnivores within and across the borders of the reindeer management area the targets defined in the species-specific management plans would be better addressed, thus promoting conservation of the species in a broader context of wider green infrastructure.

This measure includes annual training and feedback events in the local level in cooperation with all relevant stakeholders and agencies. The aim is to create a more efficient large carnivore contact person network to reindeer management area to provide observations into electronic large carnivore observation database for monitoring purposes and eventually for the use of local stakeholders and reindeer herders for planning and deciding different management actions.

DNA-sampling of wolf, wolverine and brown bear would be organized to get better assessment of the populations within the Finnish reindeer management area, and to enhance information exchange with Sweden and Norway on the cross-border connections. Especially cross-border and near-border observations on wolves are important in supporting and securing the genetic diversity of the Scandinavian wolf population. Yet, in addition to connectivity to Scandinavian populations, movements of large carnivores from and to Russia as well as from other parts of Finland would be monitored for improved information on the genetic drift between different metapopulations in a wider geographical area.

DNA-sampling would be organized as a specific research project assisted by the network. In addition, municipality agricultural officers would be trained annually for damage inspections.

Electric fences to protect livestock from all carnivores

Electric fences are a universal measure in protecting livestock from the damages caused by large carnivores. In Finland, main part of damages to domestic livestock are comprised of sheep killed or wounded by wolves and brown bears. Also, lynx and wolverine cause some damages to sheep. Damages on other livestock (cattle, horses and other livestock) are not as common as the damages on sheep, but occur frequently, and should not be forgotten in planning preventive measures.

Although livestock damages caused by large carnivores are compensated from the State budget, these events cause concern, which is far beyond the economic importance of the damages and have impact on peoples' attitudes towards all large carnivores, but especially on wolves. Therefore, by allocating sufficiently resources on electric fencing in areas with existing or emerging risk for damages, this measure has far reaching implications for the conservation of large carnivores and maintaining the functionality of the ecosystems within a concept of wider green infrastructure.

There are currently ca. 1 300 farms with in total 145 000 sheep in Finland (1). In addition, there are ca. 10 000 farms with cattle. Only a fraction of these farms has applied and received materials for building electric fences to protect their livestock. The State of Finland supports purchasing materials for preventive measures with an annual allowance for the Finnish Wildlife Agency (which distributes the materials based on applications). However, in current situation with new wolf territories being distributed more in the western Finland with higher density of farms and livestock, the needs for preventive measures such as electric fences have emerged and increased rapidly, and as a consequence quite many applications, which have been rejected due to insufficient resources.

During few recent years (2016-2020), annually from 50-80 farms have been provided with 100+ kilometers of electric fencing (130 km in 2019). The number of protected farms has been increasing steadily as in 2013 there were 37 km of fence materials provided to 21 farms, 59 km/35 farms in 2014, and 75 km/41 farms in 2015, respectively. The need for electric fence materials is still growing especially in areas with recently established wolf territories. In 2020, ca. 130 km of fence material has been distributed to 71 farms. Of this, LIFE BorealWolf, has provided 22 km to nine farms.

In this measure, on average 5 fence packages per active wolf territory (size on average 1200 km^2 varying from 650-1900 km^2(2)) should be allocated annually (according to probabilistic inference, there existed 46 wolf territories in Finland in March 2020) during the MFF 2021-27. In addition, there are also needs for electric fencing due to the damages caused by brown bears. Considering gradually reducing needs after initial phase, on average ca. 150 fence packages comprised of in total of 300 kilometers of electric fence materials should be allocated to this measure annually.

It must be underlined, that planning, contracting as well as supervising building process and maintaining of electric fences requires substantial amount of human resources (i.e. Finnish Wildlife Agency personnel). Costs of two personnel years are included in the estimated annual costs.

Electric fences to protect beehives

Light electric fences are used to protect beehives from brown bears. Annually from 100-250 fence packages have been delivered to honey producers. The financial allocation for protecting beehives in Finland is from 60 000 – 80 000 € per year.

There are about 2 000 brown bears in Finland and compensations for damaged beehives (ca. 100-150 events per year) to honey producers vary annually from 100 000–150 000 €.

To avoid the need of lethal control (damage-based derogations) on bears and to promote also pollination services, which bees provide, there must be enough electric fence materials available also for honey producers. The State of Finland supports purchasing materials for preventive measures with an annual allowance for the Finnish Wildlife Agency. However, as the Finnish bear population is still expanding to new areas, there is need to be prepared for more preventive measures during the MFF 2021-2027.

Support for building and maintaining electric fences

Currently, building fences and maintaining electric fences functional is a responsibility of a farmer or honey producer. Maintaining electric fence causes extra work, which is recurring through whole grazing period. Extra costs for building and keeping electric fences functional should be paid using instruments (non-productive investments) available e.g. in EAFRD.

Novel methods for easier maintenance of fences by keeping constantly growing vegetation out of the lowest electric wires should be developed in a specific project. In this project, also promotion of cooperation among local stakeholders would be promoted by organizing education events and producing guide materials on building and maintaining electric fences.

Promoting use of guardian dogs in protecting livestock

Besides few small projects, the use of guardian dogs has not been actively promoted in Finland as a measure to prevent predator-caused damages. There are, however, some 50 farms in Finland, which have used guardian dogs to protect their livestock, and their experiences have been mostly encouraging. Even though farmers and livestock producers are obviously aware of the concept of guardian dogs, there might still be hesitation or other restrictions in using guardian dogs. The use of the guardian dogs has not been advertised causing also a lack of information on this measure.

Even though the livestock systems in Finland are different compared to the systems in central and southern Europe, using guardian dogs would provide additional means to protect livestock in certain conditions also in Finland. It has been shown that the mere presence of guardian dogs may prevent large carnivores to approach fenced pastures and inflict damage. In Finland, the dogs have to be kept inside the fenced areas/pastures.

In this measure, a formal network for guardian dog breeders, experts and livestock producers would be established. Sharing information from the experienced guardian dog owners to those considering this option would be facilitated in training events and farm visits. Acquiring guardian dog pups to new farms would be reimbursed to promote the interest in using also guardian dogs in preventing damages caused by large carnivores, and to ease the concerns on the welfare of livestock even in distant pastures (e.g. in traditional biotopes maintained by sheep grazing). One guardian dog adviser would be employed to provide services and materials to the network and to the public.

Protection of dogs from wolf attacks

Dogs, especially hunting dogs, are vulnerable to wolf attacks in areas occupied by wolves. Annually from 30-50 dogs (mainly hunting dogs) are killed or wounded by wolves in Finland. The value of the compensations for wolf-killed dogs has varied annually between 80 000 and 160 000 €. However, the compensations are not a key issue when a dog gets killed by a wolf. Instead, the loss of a dog is perceived as a loss of a friend or a family member. In case of hunting dogs, training process and qualifying as a good hunting dog may have taken several years, which makes the loss of such dog difficult to accept complicating further the attitudes towards wolves. Thus, protecting dogs from wolf attacks is central in promoting ways for better coexistence with wolves.

A specific project focusing on protecting dogs from wolf attacks should be launched. Emphasis will be put in developing and utilizing a structural model of all suitable methods to decrease the probability of dog-wolf encounters, and ultimately to prevent dogs getting killed or wounded by wolves. Testing and further developing protective vests suitable for different kinds and sizes of hunting and companion dogs would be essential part of the project. The prices, availability and functionality of such vests are not currently attractive for dog owners due to lack of manufacturers and limited markets. In addition to protective vests, other novel methods to reduce the probability of dog-wolf encounters would be promoted for example by innovation competition. Part of the project would focus on raising awareness on best practices in protecting dogs. At least one project coordinator would be employed.

Advice on preventive measures on a local/regional level

A LEADER project "SusiAita-hanke", which was carried out in 2016–2017 (project no. 27219), was a good example of awareness raising and intense promotion of preventive measures in a local scale. The project area was situated in southwestern Finland, where several wolf packs have their permanent territories, and new territories have been formed. Education events with expert speakers, guidelines designed for damage situations and promoting collaboration among local stakeholders e.g. in building predator-proof electric fences were all examples of good practice, which were perceived very positively by locals. However, the project could not have succeeded without a dedicated project coordinator.

This measure includes organizing stakeholder meetings and education events, as well as promotion of collaboration in a local scale between local people and stakeholders e.g. in applying preventive measures. Novel practices and local innovations in preventing damages would be essential part of the stakeholder collaboration.

The project would take advice on the good practices attained in SusiAita -project and transfer the similar, but locally adapted, approach to other regions as well as provide materials to the wolf territory specific co-operation groups (currently 26 groups).

One essential measure included here would be increased awareness and up-to-date information on the presence and movements of wolves and other large carnivores. Regional project coordinators would be employed.

(MMF = Multiannual Financial Framework 2021-2027)

- monitoring occurrence and movements of all large carnivore species in the reindeer management area, including exchange of information with Sweden and Norway on cross-border migration of wolves and other large carnivores; annual training and feedback events in the local level among all stakeholders and agencies
- securing sufficient funding and adequate resources to build predator-proof electric fences to protect livestock especially in areas with new or emerging wolf territories, and to protect beehives from bear damages
- support for building and maintaining electric fences incl. compensations for extra monitoring and measures

- measures to protect (hunting) dogs from wolves: development, testing and sharing up-to-date information (i.e. awareness raising) on protective vests and other innovative gear and measures to avoid wolves killing dogs
- enhancing awareness on large carnivores' presence: advice on preventive measures on a local/regional level (SusiAita-project as an example of good practices; transferring experience and good practices to other regions)
- Promoting use of guardian dogs in protecting livestock

List of prioritized measures to be carried out, and estimated costs for these measures

Name and short description of the measures	Type of measure*	Target (Unit & quantity)	Estimated cost in Euros (annualised)	Possible EU co-funding source
Monitoring of large carnivores in the reindeer management area This measure includes annual training and feedback events in the local level in cooperation with all relevant stakeholders and agencies. DNA-sampling would be organized as a specific research project assisted by the network. In addition, municipality agricultural officers would be trained annually for damage inspections. At least one coordinator would be recruited to organize the monitoring events and network for assisting DNA-sampling.	recurring	10 training events annually in different parts of the reindeer management area. A specific project for DNA-sampling. A project coordinator.	1 000 000 €	EAFRD + ERDF + (Interreg) LIFE-program
Electric fences to protect livestock from all carnivores In this measure, on average 5 fence packages per active wolf territory (size on average 1200 km^2 varying from 650-1900 km^2should be allocated annually (according to probabilistic inference, there existed 46 wolf territories in Finland in March 2020) during the MFF 2021-27. In addition, there are also needs for electric fencing due to the damages caused by brown bears. Considering gradually reducing needs after initial phase, on average ca. 150 fence packages comprised of in total of 300 kilometers of electric fence materials should be allocated to this measure annually. Costs of two personnel years (planning, contracting as well as supervising building process and maintaining) are included in the estimated annual costs.	recurring	Starting from 200 LC-proof electric fences per year: on average 150 new electric fence packages (300 km of materials including delivery to the farm) annually during the whole MFF	1,0 M€	EAFRD + ERDF + LIFE-program
Electric fences to protect beehives Light electric fences are used to protect beehives from brown bears. Annually from 100-250 fence packages have been delivered to honey producers. The financial allocation for protecting beehives in Finland is from 60 000 – 80 000 € per year. The State of Finland supports purchasing materials for preventive measures with an annual allowance for the Finnish Wildlife Agency. However, as the Finnish bear population is still expanding to new areas, there is need to be prepared for more preventive measures during the MFF 2021-2027.	recurring	250 light electric fences annually during the whole MFF	100 000 €	EAFRD + ERDF + LIFE-program
Support for building and maintaining electric fences Extra costs for building and keeping electric fences functional should be paid using instruments (non-productive investments) available e.g. in EAFRD. Novel methods for easier maintenance of fences by keeping constantly growing vegetation out of the lowest electric wires should be developed in a specific project. In this project, also promotion of cooperation among local stakeholders would be promoted.	recurring	Subsidies for keeping electric fences operational by farmers. A specific project to find novel methods to ease the work in keeping the fences functional.	100 000 €	EAFRD + ERDF + LIFE-program

Promoting use of guardian dogs in protecting livestock In this measure, a formal network for guardian dog breeders, experts and livestock producers would be established. One guardian dog adviser would be employed to provide services and materials to the network and to the public.	recurring	A formal network of guardian dog breeders, experts and farmers. Promotion of using guardian dogs by establishing network and by producing materials (guides, internet, social media). Assisting to purchase guardian dog pups and reimbursing annually 10-20 new pups. Help in starting to work with GD.	100 000 €	EAFRD + ERDF + LIFE-program
Protection of dogs from wolf attacks A specific project focusing on protecting dogs from wolf attacks should be launched. Testing and further developing protective vests suitable for different kinds and sizes of hunting and companion dogs would be essential part of the project. Part of the project would focus on raising awareness on best practices in protecting dogs. At least one project coordinator would be employed.	recurring	a 3-year product development project 2021-2023 to be continued with marketing and awareness raising on best practices	100 000 €	EAFRD + ERDF + LIFE-program
Advice on preventive measures on a local/regional level This measure includes organizing stakeholder meetings and education events, as well as promotion of collaboration in a local scale between local people and stakeholders e.g. in applying preventive measures. Regional project coordinators would be employed.	recurring	annual transfer of best practices to 2-3 different regions per year	150 000 €	EAFRD + ERDF + LIFE-program
TOTAL			2 550 000	

* indicate whether the measure is recurring or one-off

Expected results for targeted species

By enhancing the use of preventive measures to decrease damages and mitigate conflict, one expected result is better general acceptance on large carnivore species (wolf, brown bear, lynx and wolverine). The positive impacts on attitudes, on the other hand, will help to improve protection status and to secure maintaining or achieving of favourable conservation status of protected species in Finland.

Expected results: other benefits

The decreased threat by large carnivores on livestock would increase feeling of security for the livestock owners. This would be good for the wellbeing of livestock and reindeer producers. The increased feeling of security and trust on the management authorities would consequently increase social acceptance for large carnivore species leading to reduced acceptance for illegal killing, thus promoting the conservation targets specified in the management plans.

E.3.3. References for additional species-specific measures not related to specific ecosystems or habitats

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(2) https://www.luke.fi/wp-content/uploads/2018/06/luke-luobio_27_2018.pdf (Wolf population in Finland in March 2018)

http://riistahavainnot.fi/static_files/suurpedot/kantaarviot/luke-luobio_37_2020.pdf (Wolf population in Finland in March 2020)

https://ec.europa.eu/info/news/amendments-state-aid-guidelines-agriculture-sector-better-address-damages-caused-wolves-and-other-protected-animals-2018-nov-08_en

F. Further added values of the prioritized measures