Natura 2000 Seminars

Continental, Pannonian, Black Sea and Steppic Biogeographical Regions

Kick-off Seminar
Luxembourg, 29 June – 1 July 2015

Seminar Input Document

12 June 2015

An initiative of the European Commission

NATURA 2000

Prepared by: ECNC, Arcadis, CEEweb, Eurosite, Europarc, ELO, ILE SAS

Authors: Hans van Gossum (Arcadis), Lubos Halada (ILE-SAS), Eduard Nedelciu & Malgorzata Siuta (CEEweb). Expert contributions are acknowledged in Annex 5.1.

Editing: Neil McIntosh, Mark Snethlage & Glynis van Uden (ECNC)

Funding: European Commission as part of contract number 07.0307/2012/60517/SER/B.3.

Table of contents

1 Introduction

This document forms the basic reference for the Continental, Pannonian, Black Sea and Steppic Natura 2000 Kick-off Seminar that will take place in Luxembourg from 29 June to 1 July 2015. It presents, in a digested form, the contributions from habitat management experts from the fifteen Continental, Pannonian, Black Sea and Steppic EU Member States[1]. These were identified by the members of the Continental, Pannonian, Black Sea and Steppic Steering Committee that met prior to the Kick-off Seminar to select habitats for priority consideration within this Process. This first-hand expert knowledge has been complemented with information presented in published sources, in particular, habitat-related guidance and publications published by the national authorities and the EC.

The introduction of this document provides an outline of the Natura 2000 Biogeographical Process, its purpose and objectives, along with main stages and milestones. Also, it places the Natura 2000 Biogeographical Process in the wider context of delivering the EU 2020 Biodiversity Strategy.

The primary purpose of the Process is to provide an added value, practical means to ensure progress towards achievement of the favourable conservation status (FCS) of habitats and species of European Community importance in the Continental, Pannonian, Black Sea and Steppic biogeographical regions. By focusing on common priorities and shared interests identified by experts as being important to improve habitat management, the objective of the Seminar is to help Continental, Pannonian, Black Sea and Steppic Member States and expert stakeholders to identify and agree a number of collaborative, concrete actions that can be followed up to address the main common priorities and shared issues identified.

The core of this document presents a summary account for the six habitat groups selected for priority consideration. Each habitat group chapter focuses on practical management issues, challenges and the scope for collaborative solutions. Each habitat group account is illustrated with a number of LIFE+ projects, a core delivery mechanism enabling adequate management of the habitats highly relevant to the Natura 2000 Biogeographical Process.

[1] Belgium, Bulgaria, Croatia, Czech Republic, Denmark, France, Germany, Hungary, Italy, Luxembourg, Poland, Romania, Slovenia, Slovenia, Sweden.

2 The Natura 2000 Biogeographical Process

2.1 Background

The Natura 2000 Biogeographical Process was launched by the European Commission in 2011 to assist Member States in managing Natura 2000 as a coherent ecological network. The Process provides practical means to exchange the information, experience and knowledge that is required to identify and define common solutions and develop cooperative actions, which can be delivered to ensure progress towards the EU 2020 Biodiversity Strategy targets.

Clearly, as responsibility for implementation of Natura 2000 and ensuring progress towards the EU's Biodiversity Strategy targets lies with Member States, they are key actors in the Natura 2000 Biogeographical Process. The Process also provides an opportunity to mobilise expert networks and inputs from other key stakeholders. This is important in order to tap into the direct experience of Natura 2000 practitioners, expert stakeholders and Member States' representatives with specific responsibilities for implementation of Natura 2000. This underlines the strategic and operational importance of the Process and the integrated inputs required from diverse actors.

2.2 Core messages of the Natura 2000 Biogeographical Process

The following points highlight key features of the Natura 2000 Biogeographical Process:

- Participation in the Natura 2000 Biogeographical Process is voluntary;
- The Process provides a valuable means to work collectively towards achieving the legal obligations of the Nature Directives;
- The Process offers a practical framework for networking, sharing information and experience and building knowledge about the most effective ways to reach and maintain favourable status for habitats and species of European Community importance – this includes opportunities to identify and promote the multiple benefits linked to such actions;
- The Process focuses on practical habitat management and restoration activities and provides a framework to share best practices, compare approaches, build contacts, exchange information and build new knowledge;
- The Process is supported by follow-up networking events designed to further build practical knowledge and capacity, along with a dedicated Natura 2000 Platform to communicate and share information.

The primary aims and objectives of the Natura 2000 Biogeographical Process are:

- To improve and strengthen implementation of Natura 2000 and ensure progress towards the EU 2020 Biodiversity Strategy targets;

- To strengthen common understanding of what it means in practice to achieve favourable conservation status for habitat types and species subject to protection in Natura 2000[2];
- To take agreed priority management actions designed to improve or maintain favourable conservation status for those habitats and species within Member States' territories;
- To develop new management insights, cooperation between Member States, stakeholder organisations, environmental NGOs and specialist networks that can lead to new 'know-how' to support the achievement of FCS;
- To strengthen recognition and action for management of Natura 2000 that also contributes to socio-economic objectives, through the multiple benefits that derive from such action.

As a dynamic and continuing process, Member States and their representatives are supported by the team of contractors and other actors working for and through the Natura 2000 Biogeographical Process.

2.3 The Natura 2000 Biogeographical Process contribution to the EU 2020 Biodiversity Strategy

The Natura 2000 Biogeographical Process is a vital means to ensure progress to delivering the EU 2020 Biodiversity Strategy. As a reminder, the headline target is:

> *'Halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss.'*

At the same time, ways to strengthen implementation of Natura 2000 through the Birds and Habitats Directives are the core subject of Target 1 of the Strategy:

> *'To halt the deterioration in the status of all species and habitats covered by EU nature legislation and achieve a significant and measurable improvement in their status so that, by 2020, compared to current assessments: (i) 100 % more habitat assessments and 50 % more species assessments under the Habitats Directive show an improved conservation status; and (ii) 50 % more species assessments under the Birds Directive show a secure or improved status.'*

However, ensuring progress towards implementation of Natura 2000 should also be considered in the wider EU agenda, in particular the following strategic objectives:

- **A more resource-efficient economy**: The EU's ecological footprint is currently double its biological capacity. By conserving and enhancing its natural resource base and using its resources sustainably, the EU can improve the resource efficiency of its economy and reduce its dependence on natural resources from outside Europe;

[2] There will be a need to examine ways of improving coherence with outcomes of work on assessing favourable conservation status through monitoring and reporting under Article 17, especially with regard to eventually determining how best to build a common understanding of what needs to be achieved for different habitats and species to reach FCS.

- **A more climate-resilient, low-carbon economy**: Ecosystem-based approaches to climate change mitigation and adaptation can offer cost-effective alternatives to technological solutions, while delivering multiple benefits beyond biodiversity conservation;
- **A leader in research and innovation**: Progress in many applied sciences depends on the long-term availability and diversity of natural assets. Genetic diversity, for example, is a main source of innovation for the medical and cosmetics industries, while the innovation potential of ecosystem restoration and green infrastructure is largely untapped;
- **New skills, jobs and business opportunities**: Nature-based innovation, and action to restore ecosystems and conserve biodiversity, can create new skills, jobs and business opportunities. The TEEB (The Economics of Ecosystems and Biodiversity) study estimates that global business opportunities from investing in biodiversity could be worth in the region of €1.7 to €5 trillion by 2050.

In the same way, synergies should be sought with the other five targets of the EU Biodiversity Strategy, which are:

- **Target 2**: By 2020, ecosystems and their services are maintained and enhanced by establishing **green infrastructure** and **restoring** at least 15 % of degraded ecosystems;
- **Target 3 A) Agriculture**: By 2020, maximise areas under agriculture across grasslands, arable land and permanent crops that are covered by biodiversity-related measures under the CAP so as to ensure the conservation of biodiversity and to bring about a measurable improvement[3] in the conservation status of species and habitats that depend on or are affected by agriculture and in the provision of ecosystem services as compared to the EU 2010 Baseline, thus contributing to enhance sustainable management**;**
- **Target 3 B) Forests**: By 2020, Forest Management Plans or equivalent instruments, in line with Sustainable Forest Management (SFM), are in place for all forests that are publicly owned and for forest holdings above a certain size[4] that receive funding under the EU Rural Development Policy so as to bring about a measurable improvement in the conservation status of species and habitats that depend on or are affected by forestry and in the provision of related ecosystem services as compared to the EU 2010 Baseline;
- **Target 4 Fisheries**: Achieve Maximum Sustainable Yield (MSY) by 2015. Achieve a population age and size distribution indicative of a healthy stock, through fisheries management with no significant adverse impacts on other stocks, species and ecosystems, in support of achieving Good Environmental Status by 2020, as required under the Marine Strategy Framework Directive;
- **Target 5**: By 2020, **Invasive Alien Species** and their pathways are identified and prioritised, priority species are controlled or eradicated and pathways are managed to prevent the introduction and establishment of new IAS;
- **Target 6**: By 2020, the EU has stepped up its contribution to **averting global biodiversity loss**.

[3] For both targets, improvement is to be measured against the quantified enhancement targets for the conservation status of species and habitats of EU interest in Target 1 and the restoration of degraded ecosystems under Target 2.

[4] For smaller forest holdings, Member States may provide additional incentives to encourage the adoption of Management Plans or equivalent instruments that are in line with SFM (to be defined by the Member States or regions and communicated in their Rural Development Programmes).

Therefore, through the Natura 2000 Biogeographical Process, there are vital opportunities available for all stakeholders to contribute to this wider agenda. Joint actions developed in the context of the Process create new scope to generate greater synergies, realise shared benefits and establish new ways to demonstrate the integral value of Natura 2000 for reaching societal goals and conservation objectives.

3 The Continental, Pannonian, Black Sea and Steppic Natura 2000 Biogeographical Process

The Continental, Pannonian, Black Sea and Steppic Process brings representatives from Member States, nature conservation organisations, NGOs and expert stakeholder networks together to discuss real problems linked to areas of shared priority. The added value of the Natura 2000 Biogeographical Process is to enable such stakeholders to work together to develop practical management actions on the common issues and shared priorities they identify. As a continuing learning process, stakeholders are afforded the opportunity to discuss and share views about the following critical questions:

- What problems and issues are experienced and which are the common priorities?
- What information and practical experience is present and can be shared?
- What are the possible solutions and what can we do together to implement these?
- What actions can we agree to commit to and work on together?

At the heart of the Process, networking offers a practical means to develop collaborative thinking, scope opportunities for joint action and focus attention on nature management matters of shared concern and priority, as that is required to build knowledge about ways to improve the conservation status of habitats and species of Community interest and achieve progress towards the EU 2020 Biodiversity Strategy targets.

The Continental, Pannonian, Black Sea and Steppic Kick-off Seminar is a key milestone in a continuing process to identify the main threats and pressures on Continental, Pannonian, Black Sea and Steppic habitats, develop practical solutions for common habitat management priorities and propose possible scope for precise cooperative actions. The Seminar is intended to be the catalyst for a continuing series of practical and feasible actions that will emerge from it. As such, it represents the starting point for a series of successful cooperative follow-up actions to be developed between stakeholders in Continental, Pannonian, Black Sea and Steppic countries. These actions should focus on the management and conservation of the habitats and species for priority consideration identified through the Process.

The Steering Committee of the Continental, Pannonian, Black Sea and Steppic Process is composed of representatives of the fifteen Member States and the European Environment Agency (EEA), the European Topic Centre on Biological Diversity (ETC/BD), the European Habitats Forum, the Natura 2000 Users Platform and the European Commission. Based on the pre-scoping document and the discussions of the Steering Committee, six focus habitat groups were selected: Coastal, Grasslands, Heaths and Scrubs, Rivers and Lakes, Wetlands, and Woodland and Forest. For the Continental, Pannonian, Black Sea and Steppic Process, a number of species have also been identified.

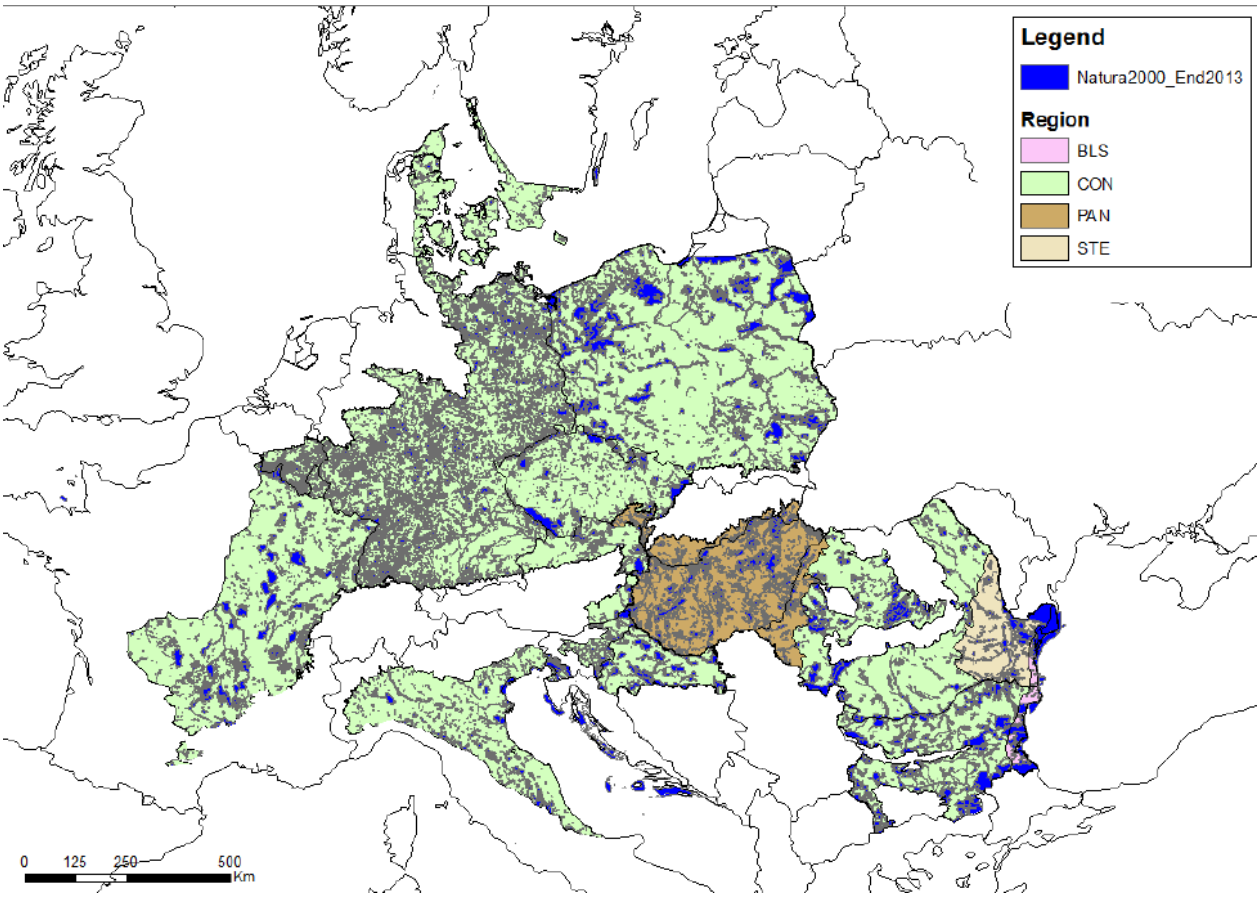
3.1 Habitats selected in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

The habitat types selected for priority consideration are presented in ascending order of their Natura 2000 code as introduced in Annex I of the EC Habitats Directive. These are listed at the start of each chapter for the habitat groups. The fact that other habitats, or indeed particular species, are not included does not mean that they are not a priority: these can still be discussed within the scope of the Natura 2000 Biogeographical Process. However, the main aim of identifying certain habitat types for priority consideration is to give attention to the scope that there may be to develop collaborations and cooperative actions for these habitat types. Of course, though, this is for the participants to the Process to discuss and agree.

Table 1 The 59 habitats selected for priority consideration within the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

HABITAT GROUP	***HABITAT***
Coastal	1130 – Estuaries
Coastal	1150 - Coastal lagoons
Coastal	1210 - Annual vegetation of drift lines
Coastal	1240 - Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp.
Coastal	1310 - *Salicornia* and other annuals colonising mud and sand
Coastal	1410 - Mediterranean salt meadows (*Juncetalia maritimi*)
Coastal	2110 - Embryonic shifting dunes
Coastal	2130 - Fixed coastal dunes with herbaceous vegetation ('grey dunes')
Coastal	2190 - Humid dune slacks
Grassland	1340 - Inland salt meadows
Grassland	1530 - Pannonic salt steppes and salt marshes
Grassland	2330 - Inland dunes with open *Corynephorus* and *Agrostis* grasslands
Grassland	2340 - Pannonic inland dunes
Grassland	6110 - Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion albi*
Grassland	6120 - Xeric sand calcareous grasslands
Grassland	6210 - Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)
Grassland	6230 - Species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)
Grassland	6240 - Sub-Pannonic steppic grasslands
Grassland	6250 - Pannonic loess steppic grasslands
Grassland	6260 - Pannonic sand steppes
Grassland	62C0 - Ponto-Sarmatic steppes
Grassland	6410 - *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
Grassland	6420 - Mediterranean tall humid grasslands of the *Molinio-Holoschoenion*
Grassland	6430 - Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

HABITAT GROUP	***HABITAT***
Grassland	6440 - Alluvial meadows of river valleys of the *Cnidion dubii*
Grassland	6510 - Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)
Grassland	6520 - Mountain hay meadows
Heathland and scrub	4030 - European dry heaths
Heathland and scrub	40A0 - Subcontinental peri-Pannonic scrub
Heathland and scrub	40C0 - Ponto-Sarmatic deciduous thickets
Heathland and scrub	5130 - *Juniperus communis* formations on heaths or calcareous grasslands
Rivers and lakes	3130 - Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
Rivers and lakes	3140 - Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
Rivers and lakes	3150 - Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation
Rivers and lakes	3160 - Natural dystrophic lakes and ponds
Rivers and lakes	3260 - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
Rivers and lakes	3270 - Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation
Sparsely and unvegetated land	8310 - Caves not open to the public
Wetlands	7110 - Active raised bogs
Wetlands	7120 - Degraded raised bogs still capable of natural regeneration
Wetlands	7140 - Transition mires and quaking bogs
Wetlands	7150 - Depressions on peat substrates of the *Rhynchosporion*
Wetlands	7210 - Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
Wetlands	7220 - Petrifying springs with tufa formation (*Cratoneurion*)
Wetlands	7230 - Alkaline fens
Woodland and forest	9110 - *Luzulo-Fagetum* beech forests
Woodland and forest	9160 - Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*
Woodland and forest	9170 - *Galio-Carpinetum* oak-hornbeam forests
Woodland and forest	9180 - *Tilio-Acerion* forests of slopes, screes and ravines
Woodland and forest	91AA - Eastern white oak woods
Woodland and forest	91D0 - Bog woodland
Woodland and forest	91E0 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)
Woodland and forest	91F0 - Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*)
Woodland and forest	91G0 - Pannonic woods with *Quercus petraea* and *Carpinus betulus*
Woodland and forest	91H0 - Pannonian woods with *Quercus pubescens*
Woodland and forest	91I0 - Euro-Siberian steppic woods with *Quercus* spp.
Woodland and forest	91M0 - Pannonian-Balkanic turkey oak–sessile oak forests
Woodland and forest	92A0 - *Salix alba* and *Populus alba* galleries
Woodland and forest	92D0 - Southern riparian galleries and thickets (*Nerio-Tamaricetea and Securinegion tinctoriae)*



Map 1 Natura 2000 sites in the Continental, Pannonian, Black Sea and Steppic biogeographical regions

The map shows all Continental, Pannonian, Black Sea and Steppic terrestrial sites and marine Continental, Pannonian, Black Sea and Steppic sites, except sites in the Northern Adriatic. Marine sites in the Spanish and Portuguese Marine Atlantic are not shown either.

3.2 The Continental, Pannonian, Black Sea and Steppic Seminar Input Document Document

The Continental, Pannonian, Black Sea and Steppic Seminar Input Document has been produced to serve the discussion and planning of the Kick/off Seminar for the Continental, Pannonian, Black Sea and Steppic biogeographical regions. The document was created to:

- Identify and prioritise key issues in relation to establishing FCS for the identified six habitat groups and the habitat types and species within them;
- Discuss and prioritise potential solutions to those issues;
- Identify possible actions and consider what kind of concrete actions could be envisaged to accommodate key associated species.

In addition, a number of species had already been identified in the Background Document[5] for discussion.

Table 2: Chairpersons and facilitators of the four working groups at the Kick-off Seminar

HABITAT GROUP	*Lead MS / CHAIR*	*Seminar support by the contractor*
Coastal	t.b.c.	Malgorzata Siuta (CEEweb)
Wetlands & Rivers and Lakes	Dr Jana Durkosova, Ministry of Environment, Slovak Republic	Agnes Zolyomi (CEEweb)
Grasslands & Heaths and Scrubs	Ms Sophie Ouzet, Ministry of Ecology, Energy, Sustainable Development and Spatial Planning, France	Mark Snethlage (ECNC)
Woodland and Forests	Mr Frank Wolff, Forest and Nature Agency, Luxembourg	Paulo Castro (EUROPARC)

3.3 The next steps in a continuing process

The purpose of the Kick-off Seminar and its expected outcomes is to discuss the issues reported and highlighted in this document, as well as others identified and agreed during the Seminar as being of common priority, and to formulate preliminary concrete ideas for collaborative actions that address practical habitat management priorities. Also, there is scope to make specific recommendations about how to take these actions forward as part of the preliminary planning for necessary follow-up activities through the Natura 2000 Biogeographical Process.

Where possible, the recommendations and conclusions that are identified during the Continental, Pannonian, Black Sea and Steppic Kick-off Seminar should confirm essential commitments to take agreed common priority actions forward. For example, this may include being willing to host a future workshop or ad hoc meeting in the coming months or years; also, it can include being willing to share available information, provide guidance or write up best practices in the form of case studies for upload to the Natura 2000 Platform. Therefore, the Seminar should seek to define clear timetables for the collaborative actions, agreeing a division of roles and responsibilities and, where possible, a willing lead within the region.

The following sections provide summaries for the six habitat groups. Each section is consistently structured. In particular, the subsections on ‘solutions’ and ‘opportunities for joint action’ (one for each habitat group) deserve particular attention, as these will be the focus of discussions during the Seminar.

As a reminder, as far as possible, the aim of our work during the Kick-off Seminar is to identify practical actions of common priority and shared interest, which can be agreed for implementation in the future and specified in terms of resource inputs, roles, responsibilities and planning. The objective is not necessarily to go into all details for the planned and agreed actions, but rather to confirm as a minimum

[5] Available for consultation on the Natura 2000 Communication Platform.

the ‘what’, ‘when’, ‘who’ and ‘how’ of the actions. As part of the Natura 2000 Biogeographical Process, Member States and other organisations present should seek to develop consensus and cooperative commitments about how to bring (a selection of) these actions to fruition in the near future. The contract team and facilitators will work with you during the Seminar and in the subsequent months to facilitate and support this continuing process.

4 Habitat group accounts

The information presented in this section is based on a number of sources:

- The revised pre scoping document prepared by the European Topic Centre on Biological Diversity (ETC BD) on the basis of the latest Article 17 reporting results (2007 – 2012)
- Expert feedback collected during the first months of 2015
- A review of publicly available literature and information (mainly through web search, references are provided in the annexes)

4.1 Overview of expert contributions

The experts selected by the members of the Continental, Pannonian, Black Sea and Steppic Steering Committee are listed in Annex 5.1. The experts have submitted detailed information about the ecology, threats and pressures and management solutions of the selected habitats. This expert information was completed with a review of selected published sources that are reported in the reference lists.

The graphs and tables in this report: semi quantitative analysis of the expert input

Throughout the report we present tables and charts summarising the expert input that was received as part of this process. The purpose is to provide a quick overview of the main pressures, management measures, barriers, solutions and opportunities for joint action highlighted for each habitat group. For the elaboration of these tables and charts, we coded all the entries that were received. In doing so, as far as possible we used existing classifications (such as the pressures and threats classification used in Article 17 reporting), but for other themes (such as opportunities for joint action), we developed the codes based on the input provided by the experts. Frequencies were calculated for each habitat and amalgamated for the habitat groups.

Table 3 shows that expert input was received for 12 of the 15 countries included in the Continental, Pannonian, Black Sea and Steppic biogeographical regions. The countries that did not provide any expert input are: Denmark, Italy and Slovenia. In four countries (Croatia, the Czech Republic, France and the Slovak Republic) input was provided by one expert. The countries with the most comprehensive expert input are: Belgium, Bulgaria, Germany, Hungary and Poland. In Poland, 13 experts provided input about 34 different habitats selected for priority consideration. In Bulgaria, 7 experts provided information about 31 habitats; in Germany, 12 experts provided information about 28 habitats; in Hungary, 7 experts provided information about 27 habitats; and in Belgium, 5 experts provided information about 25 habitats.

Table 3 Number of experts, number of forms submitted and number of habitats covered per Member State

COUNTRY	EXPERTS	FORMS	HABITATS
Belgium	5	9	25
Bulgaria	7	21	31
Croatia	1	1	15
Denmark	0	0	0
Czech Republic	1	1	1
France	1	1	6
Germany	12	27	28
Hungary	7	7	27
Italy	0	0	0
Luxembourg	2	6	6
Poland	13	42	34
Slovak Republic	1	3	8
Slovenia	0	0	0
Sweden	2	2	17
Romania	3	3	22
Total	**55**	**123**	**N/R**

Table 4 shows that expert input was submitted for 52 of the 59 habitats selected for priority consideration. All Rivers and Lakes habitats and all sparsely vegetated land habitats were covered by at least one expert.

Table 4 Number of habitats described and number of habitat descriptions received per habitat group

COUNTRY	HABITATS IN GROUP	HABITATS DESCRIBED	DESCRIPTIONS
Coastal	9	7	10
Grassland	18	17	92
Heathland and scrub	4	2	10
Rivers and lakes	6	6	57
Sparsely and unvegetated land	1	1	2
Wetlands	7	6	42
Woodland and forest	14	13	74
Total	**59**	**52**	**287**

Figure 1 shows that less than 3 expert habitat descriptions were received for about one third of the habitats selected for priority consideration (Table 25, in the annexes, shows that of these habitats, 7 did not receive any expert input at all). Two habitats selected for priority consideration (91E0 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae* and 3150 - Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* -type vegetation) received 15 or more expert descriptions.

Figure 1 Number of habitat descriptions submitted by experts through the habitat information form

The above overview shows that, in all, quite a considerable number of experts (55) responded to the request from the steering committee to share their knowledge for the benefit of the Continental, Pannonian, Black Sea and Steppic Biogeographical Process. They did so by submitting 123 habitat information forms covering 52 of the 59 habitats selected for priority consideration. However, the tables and graphs also show that there is a considerable variation in the level of input from the different countries involved in the process, in terms of number of experts involved and number of habitats covered. This should be kept in mind when reading this document, and especially when interpreting the graphs that summarise the expert input received for each habitat group. The general text describing the habitat groups is less subject to the uneven expert response as it is also to a large extent based on a review of available literature and the results of Article 17 reporting as provided by the ETC BD in the Revised Pre-Scoping Document.

4.2 Summary of issues and solutions in the Continental, Pannonian, Black Sea and Steppic biogeographical regions

The six habitat group accounts presented in the following chapters and their annexes give a detailed overview of the current state, pressures, management, barriers to conservation, solutions and opportunities for joint action for the habitats selected for priority consideration based on Article 17 reporting, published sources and expert input gathered as part of the Natura 2000 Biogeographical Process. This section gives a brief summary of the main barriers to conservation of the priority habitats,

and the existing solutions and opportunities for joint action that have been identified to overcome these barriers, as these form the main focus of the Natura 2000 Biogeographical Process.

For all habitats combined across all the regions, pressures related to agriculture, the modification of the natural systems (in particular hydrological modifications), natural processes (in particular ecological succession related to land abandonment) and pressures related to forestry are those mentioned most frequently by the experts, together making up more than 50 % of the responses (Figure 2).

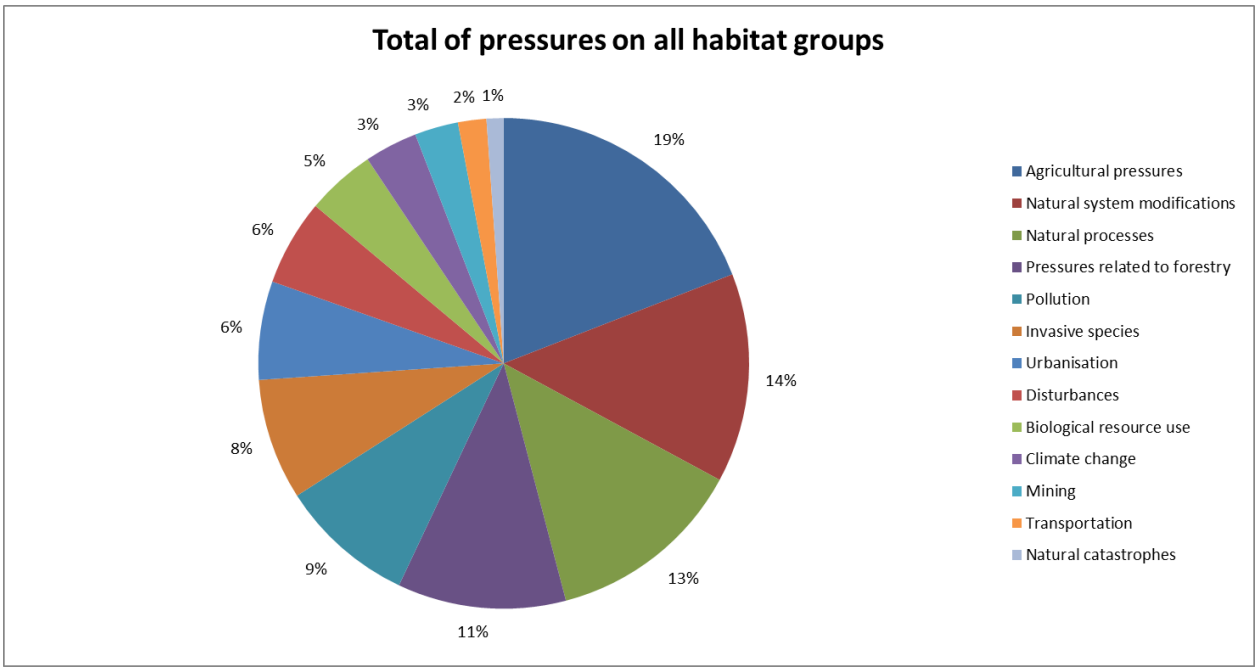


Figure 2 Results from Natura 2000 Biogeographical Process expert consultation: *Total general pressures on all habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

As shown in Figure 3, overall, the most frequently reported actual management practices to protect and conserve the habitats selected for priority consideration and to respond to the pressures are not surprising – most efforts go into habitat- and site-based actions: conservation (in particular applying appropriate mowing and grazing regimes, removal of invasive alien species and trees and shrubs to counter natural succession in semi-natural habitats), restoration (in particular of the hydrology) and management (in particular sustainable forestry).

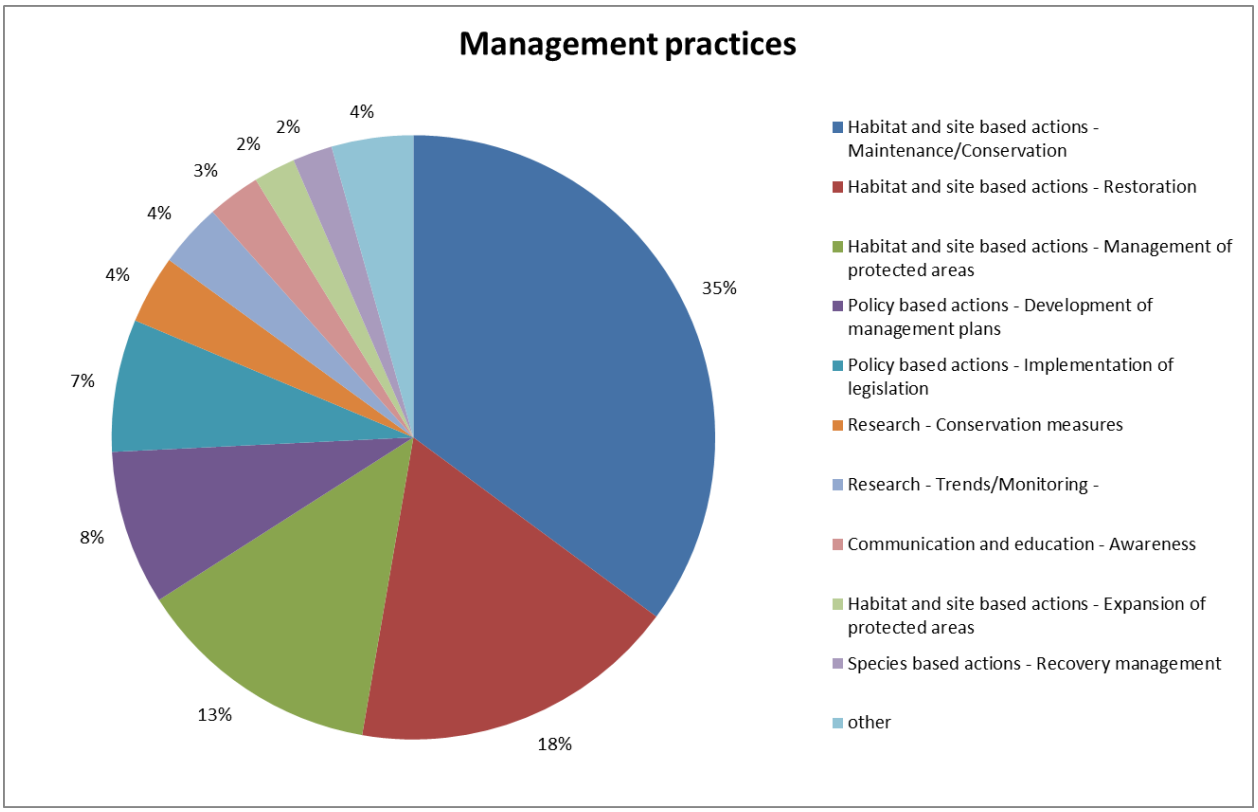


Figure 3 Results from Natura 2000 Biogeographical Process expert consultation: *General management measures for all habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

It is also to be noted that the development of management plans with support from research, in particular from monitoring, is clearly identified as an integral part of the management process, and herein the issue of agreeing on favourable reference values is seen as an essential part of the management process Table 5.

Table 5 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 specific management measures for all habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Management	***% responses***
Habitat- and site-based actions - Restoration - hydrology	11
Habitat- and site-based actions - Maintenance/Conservation - appropriate grazing	11
Policy-based actions - Development of management plans -	8
Habitat- and site-based actions - Maintenance/Conservation - appropriate mowing	7
Habitat- and site-based actions - Restoration - habitat	7
Habitat-and site-based actions - Maintenance/Conservation - removal of IAS / non-native species	5
Habitat- and site-based actions - Management of protected areas - sustainable forest management	5
Habitat- and site-based actions - Maintenance/Conservation - removal of trees and shrubs	5
Research - Conservation measures - favourable reference values	4
Habitat- and site-based actions - Maintenance/Conservation - lack of management practices	4

However, the implementation of the habitat management measures is hampered by a wide range of barriers, which have also been reported (Figure 4 and Table 6). Issues related to stakeholders, in particular their lack of cooperation, of knowledge and of awareness, in addition to an often negative attitude, often hamper the successful implementation of appropriate management measures. These difficulaties are often related to insufficient outreach and stakeholder engagement, for example in the development of management plans, in which owners of small properties are insufficiently involved. In addition, key players frequently have limited access to sufficient and accurate information to participate in the conservation management planning and implementation process. Financing the management and conservation of the habitats is also a major concern. This is especially true for direct funding of management measures, and for the lack of sufficient funds (subsidies) to compensate landowners and users for income forgone as a result of more sustainable but less profitable forms of land use.

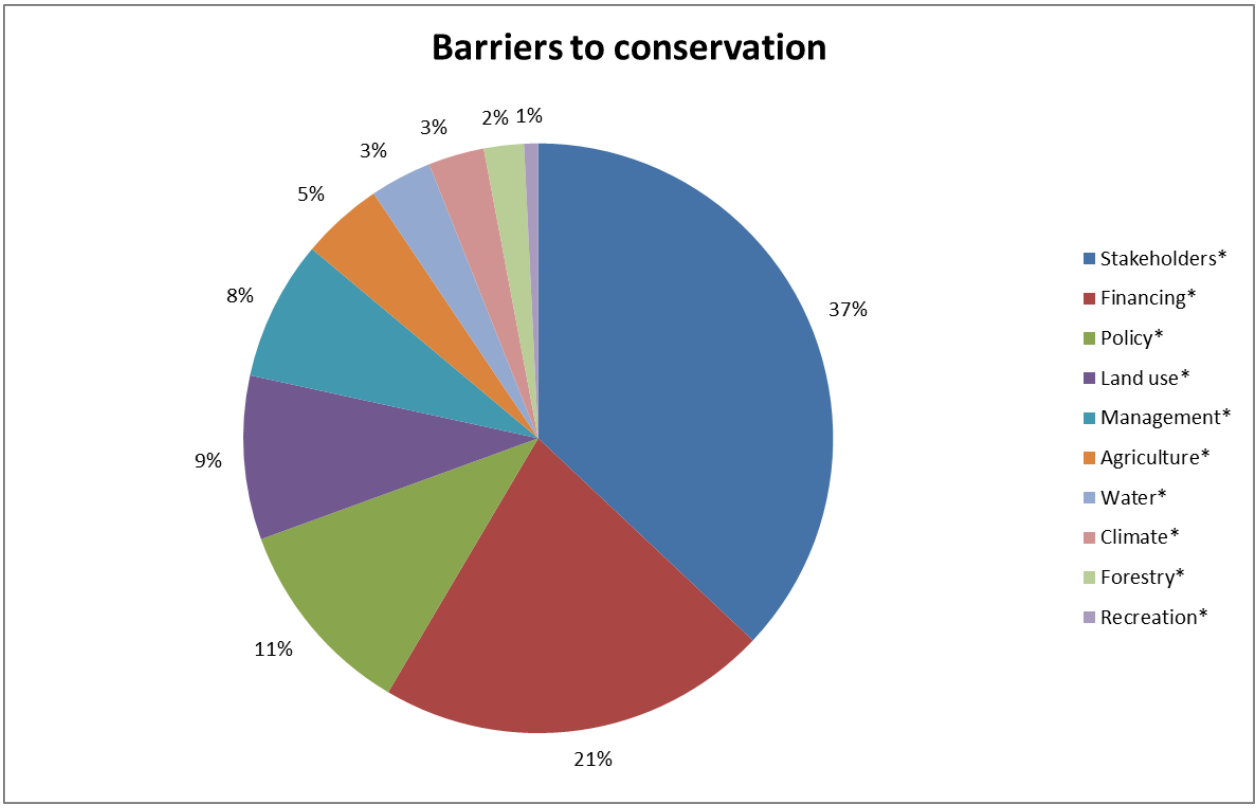


Figure 4 Results from Natura 2000 Biogeographical Process expert consultation: *Barriers to conservation based on inputs for all habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Also the complexity of the administrative process to access these funds can act as a barrier to better implementation of conservation measures. The lack of holistic, integrated approaches to conservation planning is a particular barrier for the development and implementation of management plans, which in many cases should ideally be developed and take into account ecological processes at the landscape or watershed scale. Policy-related issues hampering effective conservation management include, in particular, inadequate or mutually contradictory policies. Nature protection objectives set out in conservation policy instruments are often cancelled out by economic objectives as promoted by other policies. Finally, land-use issues, in particular land use polarisation, also play a role in the difficulties encountered in implementing successful management plans for habitats. In areas of intensive land use,

pressures such as habitat fragmentation, due in large part to land conversion and development of transport infrastructure, and pollution from agricultural origin prevail. This is especially challenging for habitats in those areas where there is a lot of demand for limited space, such as coastal and peri-urban areas.

Table 6 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 Barriers to conservation for all habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Top 10 specific barriers for all habitat groups	***% all responses[6]***
Financing - Lack of funds for conservation (and complicatedness / difficult access)	13
Stakeholders - Lack of cooperation	11
Stakeholders - Lack of knowledge / competence / data	10
Stakeholders - Lack of awareness / negative attitude	9
Financing - Lack of forgone income compensation (or subsidies)	8
Policy - Incorrect policy (and or law)	7
Stakeholders - Lack of skills	5
Land use - Fragmentation	4
Agriculture - Intensification	4
Climate - Change	3

The experts report a wide range of solutions and opportunities to overcome these barriers. In particular these include many forms of improved active stakeholder engagement (Figure 5). Such initiatives could focus on better communication, but also on training and capacity building in particular in the field of holistic, integrated and cross sectoral thinking. Examples of more integrated approaches include Integrated Coastal Zone Management and River Basin Management Planning. Involving a wide range of stakeholders in such processes is essential, and bottom up approaches to achieve this include concepts such as land stewardship. The communication and information efforts should include more emphasis on the wider benefits of habitat and species conservation, for example by including results and examples of ecosystem services valuation.

More and better guidance on how to access funds could help landowners, land users and site managers make better use of existing financial support. This information should enable a better access and use of EU financial mechanisms such as: LIFE Nature, Horizon 2020, European Social Fund, European Regional Development Funds and European Agricultural Fund for Rural Development. Reducing the administrative burden to access these funds should also improve their effective use in conservation initiatives. Cooperation between sectors and stakeholders is also recognised as a possible way to find solutions to stakeholder conflicts. Cooperation at the international level, for example in the context of regional conventions, also offers opportunities for more comprehensive conservation initiatives, in particular when addressing cross border issues.

[6] As the table only shows the top 10 barriers, the percentages do not add up to 100.

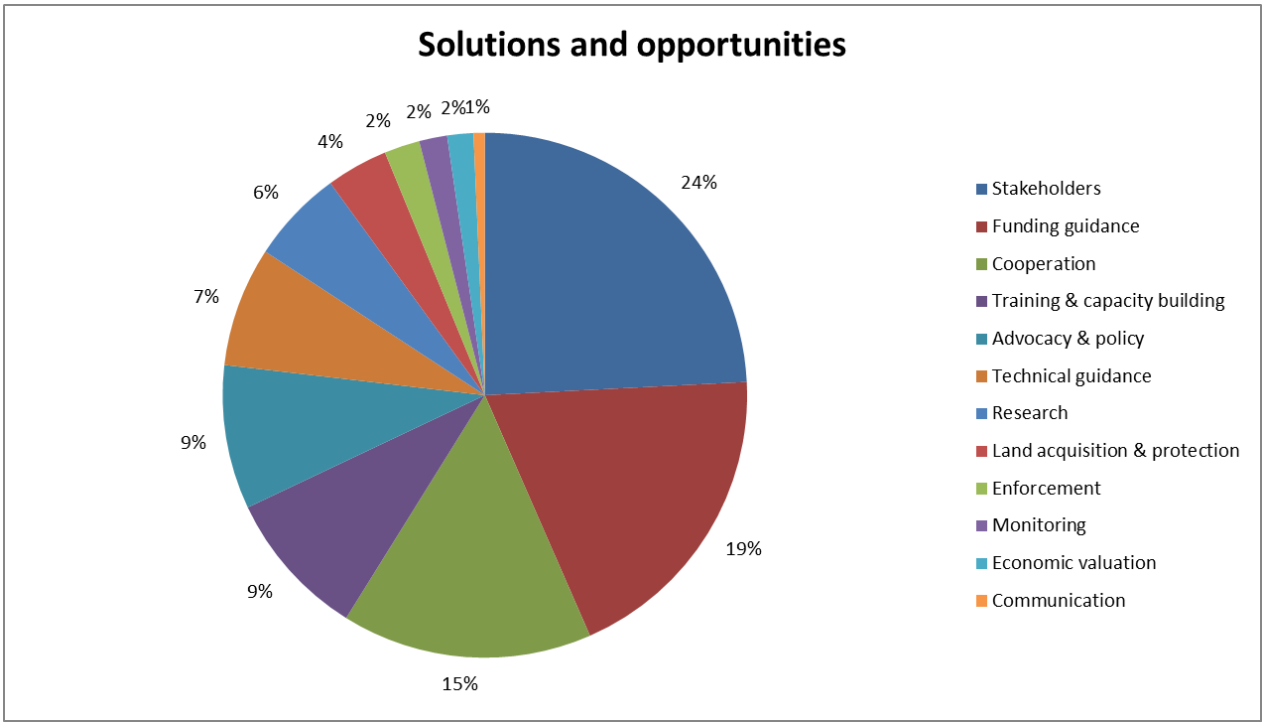


Figure 5 Results from Natura 2000 Biogeographical Process expert consultation: *Solutions and opportunities for better habitat management and conservation based on inputs for all habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

4.3 Coastal habitats

4.3.1 Summary description

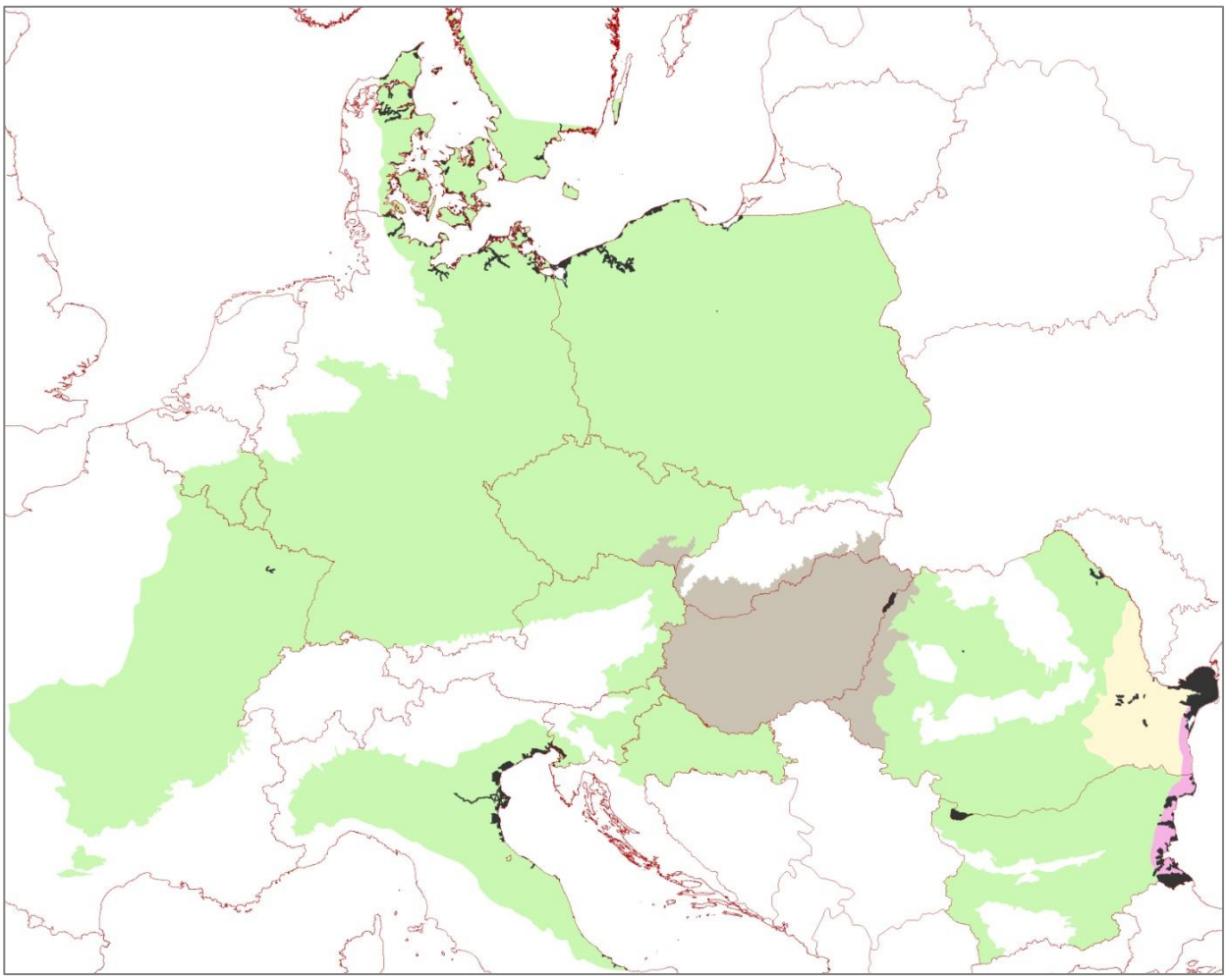
The coastal habitat group consists of habitats at or near the transition zone between marine and terrestrial environments. Three seas and their shores are relevant for this Seminar: the Baltic Sea (Continental), the Mediterranean Sea (Adriatic Sea, Continental part only) and the Black Sea (Steppic, Black Sea).

The Baltic Sea is one of the largest bodies of brackish water in the world. Its unique and fragile ecosystems are highly sensitive to all kinds of pollution. It is surrounded by many large cities and regions with intensive agriculture and industry, and contains some of the busiest shipping lanes in the world. Most sub-basins are negatively affected by eutrophication and hazardous substances, and the conservation of species is unfavourable. The human communities linked to the sea have been negatively affected by the deteriorating state of the Baltic Sea.

The Black Sea is the most isolated sea in the world. It is connected to the world's oceans via the Mediterranean Sea through the Bosporus Strait and the Straits of the Dardanelles and Gibraltar; the Kerch Strait connects it with the Sea of Azov in the north-east. The Black Sea has a large catchment area compared to its surface area, which makes it very vulnerable to pressure from land-based human activity; its health is equally dependent on the coastal and non-coastal countries in its basin. The Black Sea has been slowly recovering from the deep environmental crisis that it entered during recent decades, when it became one of the most environmentally degraded regional seas on our planet. The Black Sea continues to suffer from pollution from land-based sources. Biodiversity loss is being caused by pollution, invasive species and the destruction of habitats, and overexploitation of marine resources leading to a collapse of fisheries. The best coastal habitat sites are protected in the Natura 2000 network, as shown in Map 2.

Table 7 Coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

Habitats Directive code and name of Coastal habitats selected for priority consideration consideration
1130 – Estuaries
1150 - Coastal lagoons
1210 - Annual vegetation of drift lines
1240 - Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp.
1310 - *Salicornia* and other annuals colonising mud and sand
1410 - Mediterranean salt meadows (*Juncetalia maritimi*)
2110 - Embryonic shifting dunes
2130 - Fixed coastal dunes with herbaceous vegetation ('grey dunes')
2190 - Humid dune slacks



Map 2 Natura 2000 sites containing coastal habitats selected for priority consideration within the Natura 2000 Biogeographical Process

Based on Article 17 reporting by the Member States for the period 2007–2012, the conservation status of water habitats (1130, 1150) is unfavourable–bad in Continental/ Marine Baltic regions due to the structure and function and/or future prospect in Germany and Finland for 1130 and Germany, Denmark and Sweden for 1150. It is unfavourable–inadequate in the Black Sea/ Marine Black Sea due to future prospect classified in this category by Bulgaria for 1130 and by Bulgaria and Romania for 1150. From habitats of shoreline habitat 1210 is unfavourable–inadequate in both the Continental and Black Sea regions because of reporting of Germany, Italy, Bulgaria and Romania in this category (Sweden classified it as unfavourable–bad, but the habitat occupies a small area in Sweden). Habitat 1240 is favourable in the Continental region and unfavourable–inadequate in the Black Sea region (Bulgaria assessed it in this category). Among habitats of salty environments, habitat 1310 is unfavourable–inadequate in both the Continental and Black Sea regions (and unfavourable–bad in the Continental region in Poland and Sweden, which host small areas of the habitat) and 1410 is unfavourable–bad in the Continental region according to Italy's assessment, and unfavourable–inadequate in the Black Sea region. Sandy dunes habitats are unfavourable–inadequate in the Black Sea region and unfavourable–bad in the Continental region (except for 2110, which is unfavourable–inadequate).

Compared with the period 2002–2006, for the most part no real change in status was registered within all subgroups of habitats. When the status changed, it was mostly because of improved assessment methods. Genuine changes were reported only for the 1150 and (from U1+ to FV), 1410 in (from U1 to FV) in Continental Slovenia. Assessments for the Black Sea and Steppic regions are not available for 2002–2006, as Bulgaria and Romania were not obliged to report in this period.

If we downscale the comparison to the summaries of Member States' assessments of individual habitats (Figure 6), we see that half of the assessments indicate the status of coastal habitats to be unfavourable–inadequate, and one-quarter indicate unfavourable–bad. It is difficult to make comparisons with previous assessments as information for the period 2002–2006 does not include Romania and Bulgaria, which joined the EU in 2007 and so were not obliged to submit the report.

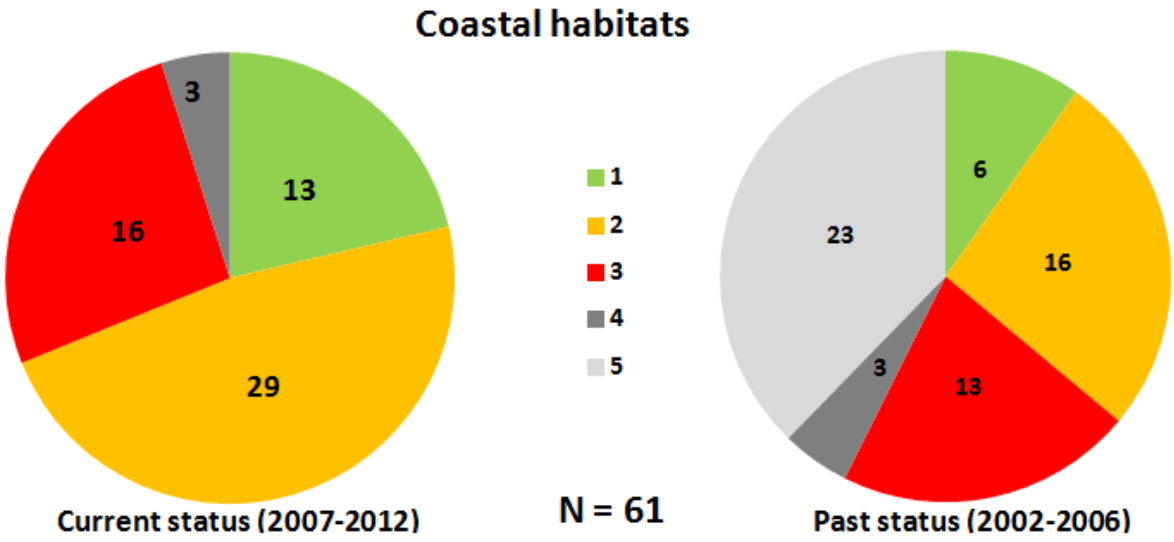


Figure 6 Current and past conservation status of coastal habitats based on Article 17 reporting. Numbers represent individual country/biogeographical region assessments (only habitats selected for priority consideration are included); N is the total number of assessments in each period. 1 = FV: favourable; 2 = U1: unfavourable–inadequate; 3 = U2: unfavourable–bad; 4 = XX: unknown; 5 = N/A: not assessed

4.3.2 Issues - pressures - threats

The main pressures and threats to the coastal water and water-dependent habitats (estuaries, coastal lagoons, as well as stony banks, sea cliffs, salt marshes, salt meadows and wet dune slacks) are related to natural system modifications, disturbances (e.g. from recreation), pollution (in particular from agriculture), industry, transport, and urbanisation (see Figure 7).

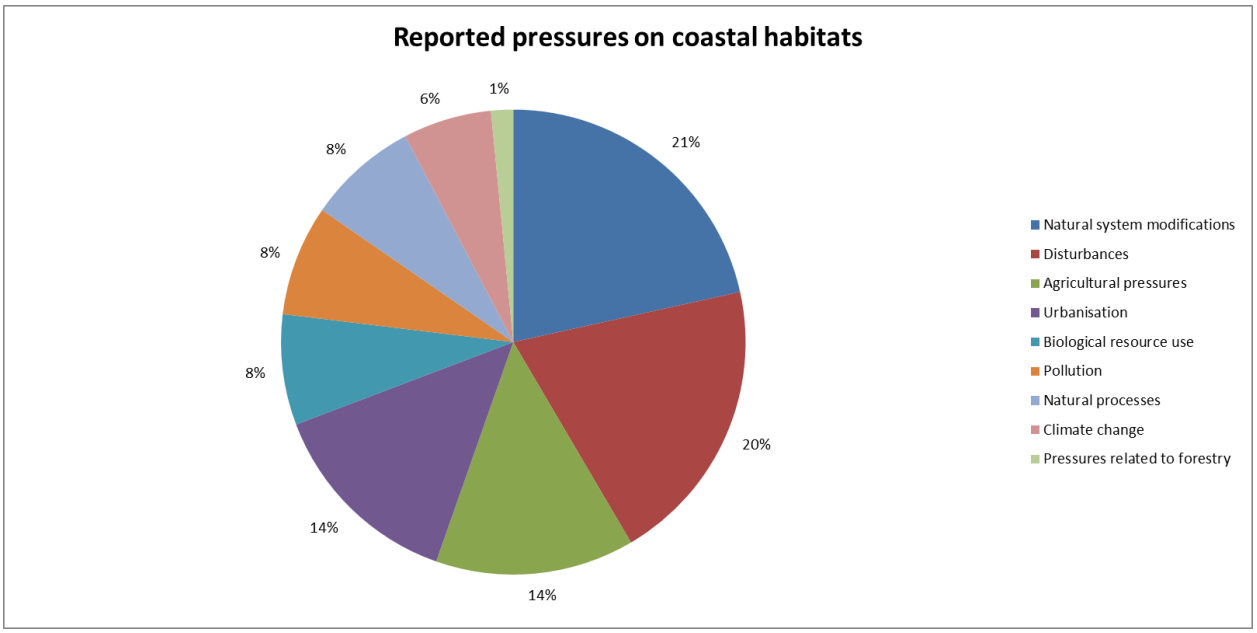


Figure 7 Results from Natura 2000 Biogeographical Process expert consultation: *Pressures on coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

In the case of Estuaries (1130) and Coastal lagoons (1150), pollution from the catchment areas of rivers flows through these habitats on its way to the sea. Hence their status also depends to a large extent on the actions carried out throughout the river basin. Eutrophication and pollution by drainage from agriculture and forestry (diffuse pollution to surface waters) as well as from other sources such as traffic (discharge related to shipping lanes) and industry (including toxic chemical discharge) pose serious threats to the estuaries and lagoon biotope complexes. Their status also depends on activities throughout the course of the rivers, in particular hydraulic engineering work, which leads to changing hydrological conditions. Such work includes canalisation and water deviation, modification of water flow (including tidal and marine currents), reclamation of land from sea, estuary or marsh, and wetland transformation into arable land. Anadromous fish need to be able to migrate upstream to their spawning grounds. At the local level, the habitats are most sensitive to incorrectly implemented regulations, strengthening the banks of riverbeds, and restriction of natural dynamics due to coastal protection measures (sea defence or coastal protection works, tidal barrages; wave exposure changes). Coastal engineering (e.g. enlargement of harbours and marinas) and other types of construction and urbanisation on the coastal zone usually have negative consequences for coastal habitats. Altered water quality caused by human-induced changes in salinity and by temperature changes is a specific pressure for these habitats.

The most frequently mentioned threats are irrational fishing and harvesting of aquatic resources, including poaching, trapping and poisoning; invasions of non-native species; and excessive tourism. The Black Sea coasts reported sand and gravel extraction, garbage and solid waste, and changes in abiotic conditions.

Table 8 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 level 1 pressures for coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Pressure	**%**
J03 - Other ecosystem modifications	14
G01 - Outdoor sports and leisure activities, recreational activities	9
A08 - Fertilisation	8
G02 - Sport and leisure structures	8
H01 - Pollution to surface waters (limnic & terrestrial, marine & brackish)	8
J02 – Human induced changes in hydraulic conditions	8
K02 - Biocenotic evolution, succession	8
A07 - Use of biocides, hormones and chemicals	6
E06 - Other urbanisation, industrial and similar activities	6
F03 - Hunting and collection of wild animals (terrestrial)	6

In Coastal lagoons (1150), altered water exchange due to the changes in the threshold that separates the lagoon from the sea can have major negative impacts on habitat and species composition. This habitat type is also significantly affected by outdoor sports and leisure activities, including motorised and non-motorised nautical sports. Facilities built near to lakes to provide services related to tourism, sport and leisure activities are also an existing pressure.

The accelerating eutrophication of lakes was also reported. This is caused by unregulated wastewater management in the lake basins and the use of fertilisers in agriculture, where the excess leaks into rivers and drainage systems connected to the lakes. Biocenotic evolution, succession, natural eutrophication and accumulation of organic material could play an important role as well. Threats and pressures originating outside the EU territory were also reported for the Black Sea region.

The habitats of shingle and stony beaches (Annual vegetation of drift lines – 1210 and Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp.) are highly threatened by coastal erosion (tidal wave, submersion, storms), but also by the restriction of natural dynamics as a result of coastal protection measures: dykes, embankments, sea defence or coastal protection works, tidal barrages, piers, tourist harbours or recreational piers, artificial beaches, and the management of aquatic and bank vegetation for drainage purposes. The recreational use of beaches represents another group of pressures, caused by outdoor sports and leisure activities and facilities, mechanical changes (trampling, paths, tracks, cycling paths), overuse, and mechanical cleaning of beaches during the summer season. The removal of beach materials, sand and gravel quarries, invasive non-native species (e.g. *Xanthium italicum*), water pollution (marine macro-pollution, garbage and solid waste) and non-intensive animal grazing represent further pressures. For the Adriatic Sea discontinuous urbanisation is also reported.

The most important group of pressures for the salt marshes and salt meadows (*Salicornia* and other annuals colonising mud and sand – 1310; Mediterranean salt meadows (*Juncetalia maritimi*) – 1410) is linked to human-induced changes in hydraulic conditions: embankments; dykes; artificial beaches; shipping and hydraulic engineering; canalisation; estuarine and coastal dredging; removal of sediments; water abstractions from groundwater; reclamation of land from sea, estuary or marsh and drying out; flooding modifications. Negative impacts are also caused by pollution of surface waters and groundwater,

especially by oil spills, heavy metals or wastewater discharges, landfills, disposal of industrial waste, fertilisation, cultivation and modification of cultivation practices, grazing, construction in the coastal areas, salt works, urbanisation. As is the case for other habitat groups, outdoor sports, recreational and leisure activities represent a significant pressure for salt marshes and meadows. Biocenotic evolution and succession, species composition change, and invasion of alien species (e.g. *Symphiotrichium ciliolatum, Xanthium italicum, Elaeagnus angustifolia, Ambrosia artemisiifolia*) are reported as further pressures. In addition, the abandonment of pastoral systems, lack of grazing, and conversion or abandonment of salt pans (salinas) are among the main threats. Intensive grazing and grassland removal for arable land were reported for habitat 1410.

Many coastal dune systems in Europe and worldwide have been heavily degraded over the last few centuries following exploitation of their natural resources, demographic expansion and industrial growth. Dune habitats (here Embryonic shifting dunes – 2110; Fixed coastal dunes with herbaceous vegetation (grey dunes) – 2130; and Humid dune slacks – 2190) are especially sensitive to embankments and construction in the coastal zone (dykes, artificial beaches, sea defence or coastal protection works, tidal barrages), usually accompanied by human-induced changes in hydraulic conditions and modification of water flow. The next group of pressures is linked to overuse of dune habitats by outdoor sports, recreational and leisure activities, such as off-road motorised vehicles, walking, trampling, horse riding and non-motorised vehicles. This also includes sport and leisure structures and facilities, camping and caravans. Ground-nesting birds are particularly sensitive to the intensive maintenance of beaches and their cleaning; dune vegetation is particularly sensitive to human trampling. The dune habitats are being invaded by non-native species (e.g. *Xanthium italicum, Conyza canadensis, Cuscuta campestris, Amorpha fruticosa,* spontaneous spreading or planting of *Rosa rugosa*). Other reported pressures are mining and quarrying (removal of beach materials, sand quarries), urbanisation of coastal areas, human habitation, removal of terrestrial plants, and sea-level changes.

Some pressures are typical for the particular habitat. The embryonic shifting dunes (2110) are often fragmented due to various disturbances, mainly related to tourism and recreational activities such as technical development of sea coasts, the construction of support facilities for tourist activities, and fertilisation due to the lack of public toilets in areas frequently visited by tourists. For the dune habitats with better developed vegetation (2130 and 2190), the abandonment of pastoral systems, lack of grazing followed by secondary succession, species composition change, and accumulation of organic material represent the most important pressures. Airborne pollution (acid rain, nitrogen input) is specifically reported for the Baltic coast. Pressures reported for habitat 2130 are land-use changes mainly related to agricultural activities and urban development, roads, paths and railroads, problematic native species, and lack of fires. The planting of trees by maritime officers in order to stabilise the dunes to protect the coast, as well as increasing tourist activities were also reported as existing pressures on grey dunes.

For humid dune slacks (2190), human-induced changes in the hydraulic regime represent the main important pressure. This includes surface drainage (on or adjacent to the dunes), groundwater abstraction (also for drinking water; there are heavy losses especially on the islands), reclamation of land from sea, estuary or marsh, and other forms of drainage resulting in a lowering of the water table. Sea defences, shoreline management and harbour management activities have limited the opportunities for the spontaneous formation of new primary slack features. The lack of natural dynamics is also caused by the fixation of dunes by planting *Ammophila arenaria*, scrub and trees (usually conifers). This has reduced dune mobility and, consequently, the formation of secondary slacks. Loss of grazing pressure

also causes accelerated succession to less valuable habitats and encroaching scrub, especially *Hippophaë rhamnoides*. Other pressures include nutrient inputs to the sensitive, nutrient-poor habitats on sandy soils, recreational use and overbuilding, anthropogenic reduction of habitat connectivity, and pollution of groundwater (point sources and diffuse sources). Where grazing levels are too low to prevent the establishment of coarse grasses, scrub and woodland, the vegetation communities of the younger, species-rich slack will be threatened.

The principal threats to the wetland habitats are water abstraction and drainage, a lack of natural dynamics leading to few 'embryo' slacks, under-grazing and scrub development. The natural formation of young primary slacks is also affected by shoreline management policies and coastal works. Climate change could pose a significant threat to the series of dune slacks in Europe. Most were formed by natural sand movement but now lie within more stable dune systems. If water tables fall, as predicted in some areas, the habitat could be left 'high and dry' (Houston, 2008). The increasing nitrogen deposition may accelerate the accumulation of organic matter in the substrate.

4.3.3 Main conservation requirements

The existing outstanding natural values of estuaries and coastal lagoons need to be preserved. Site-based conservation and restoration actions, and the implementation of existing legislation are the main conservation requirements (Figure 8). These actions should primarily help **reduce the inflow of nutrients** into rivers and **toxic pollution**; a drastic reduction of nutrient and pollution loads in the catchment areas of estuarine rivers is needed. Measures to reduce eutrophication by minimising out-release/leaching of nutrients (phosphorus and nitrogen) could be managed, for example through the Rural Development Programme, or water management (EU Water Framework Directive). Measures to remove industrial and communal pollution sources include building sewage treatment plants, filters for industrial emissions, increasing the treatment level for industrial and domestic waste water, and the elimination of dumps and other pollution sources. Other measures contributing to pollution reduction are reuse of waste water, development of buffer zones, transfer of landfills, especially industrial ones outside the catchment areas of lagoons, and the designation of watersheds as Nitrate Vulnerable Zones. Measures that can reduce nitrogen leaching and erosion from agricultural land are eligible for EU funding. In the coastal zones, the establishment of large agricultural farms and the application of manure should be prohibited, and the existing livestock should be decreased.

For estuary regions, if possible the natural hydrological regime should be kept along the entire course of the rivers, allowing, for example, periodic flooding of coastal lands and river erosion activity. Connectivity within and between sites and regions is a prerequisite for favourable conservation status; connectivity is reduced by small areas, long distances or difficult obstacles between areas. For shoreline protection and river regulation, the methods selected should change the natural character of the estuary regions as little as possible. Efforts should also be made to restore degraded fragments of estuaries, both on the riverbeds and within the delta. Water regime restoration measures should be implemented in wetlands where the water regimes have been damaged or considerably affected by human activities that are causing obvious ecosystem degradation. The actions undertaken should not adversely affect nesting, wintering and migrating species of birds.

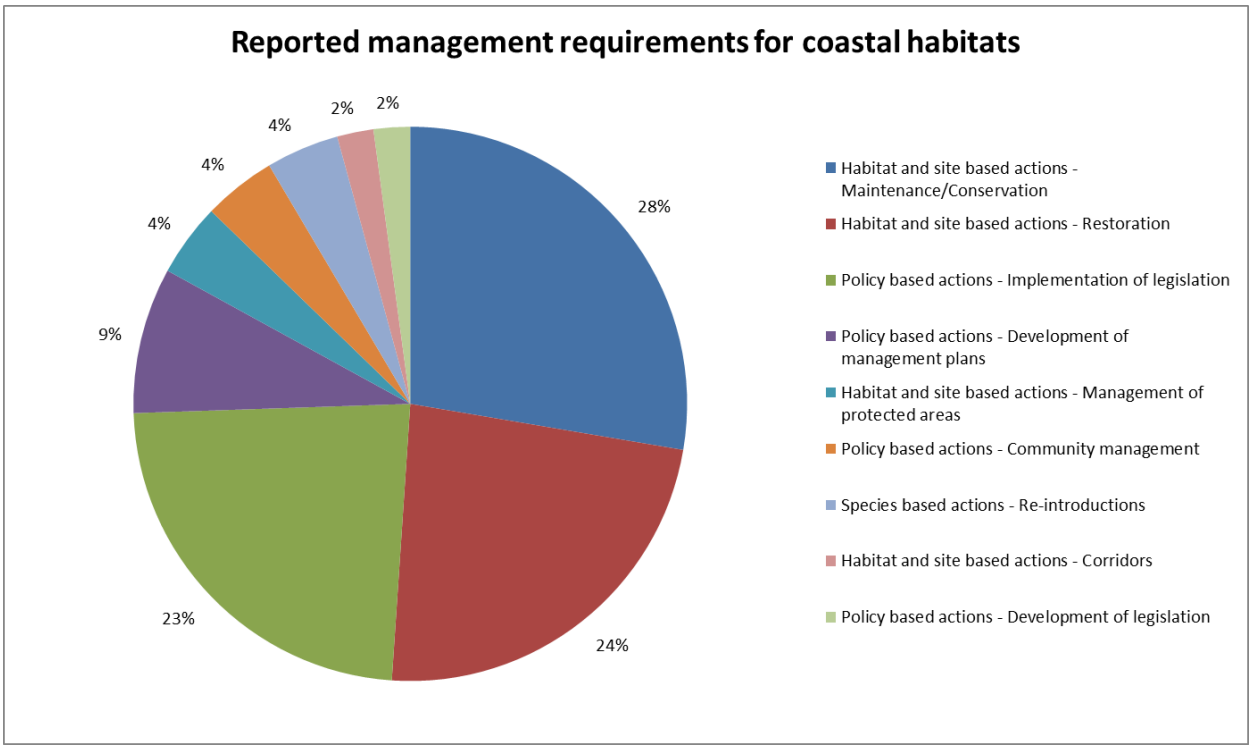


Figure 8 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation requirements for coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic regions*

Restrictions should be placed on the further deepening of shipping channels, construction of new port facilities and marinas, and any other building activities and constructions. Fisheries should be regulated, and growing tourism and harmful recreational activities should be controlled. The construction of hydraulic devices in catchment areas or directly in estuaries and lagoons should be subject to a comprehensive consultation with specialists in hydraulic engineering, hydrology and aquatic systems.

The introduction of ecologically sound fishing and farming methods is essential in order to reach a more favourable conservation status of the natural habitat types. The introduction of non-native fish, particularly of herbivorous fish, should be prohibited and where non-native species already occur, they should be eliminated or reduced by targeted fishing. Limits or restrictions should be applied to fish and shellfish farm concessions; the feeding of fish should be prohibited, as feeding accelerates eutrophication.

To protect the annual vegetation of drift lines (1210), more embankments should be avoided and water pollution should be reduced further. Areas where bathing is not allowed should be increased in the protected areas (especially SCIs) because drift lines are also the initial stages of dune formation and the habitat of highly specialised species.

To protect salt marshes and salt meadows (1310, 1410) natural flood and coastal migration dynamics (e.g. natural shift of the islands) should be secured. More embankments and any construction on the coast should be avoided. A reduction of pollutants should be sought. Larger areas in the Natura 2000 territories should not be used.

The protection or restoration of natural coastal dynamics and dune development is essential for the protection of sand dunes (2110, 2130). Tourism should be regulated in the larger coastal dune areas within the Natura 2000 network. The planting of *Rosa rugosa* in the dunes should be avoided.

For the management of humid dune slacks (2190) it is also important to understand the hydrology of the site. To make the best choices, the dune managers need to develop a basic understanding of how dune systems and humid dune slacks 'work' and how external factors such as drainage and abstraction can have a major impact on desirable objectives. Often, maintenance of the dune slacks is not required. However, systematic protection against drying-out (if necessary, restrictions on the abstraction of drinking water on the islands) and eutrophication is required. Housing developments or other direct enrichment should be excluded. Slacks can be 'created' by turf-stripping and removal of nutrient-rich soil, but such projects need careful planning if they are to succeed. An evaluation of projects found that it was difficult to maintain species richness without a mowing regime.

4.3.4 Management and conservation measures

Currently, coastal habitat management and conservation action focuses primarily on habitat restoration, the development and the implementation of management plans taking into account the results of conservation research and monitoring (Figure 9). This is illustrated by a series of concrete projects. Various steps were taken in preparation for a LIFE project that aims to secure long-term preservation of the coastal lagoon in Atanasovsko Lake, Bulgaria. These included elaboration of a detailed plan for repairing dykes and barriers and a repair plan for the bypass channel, and the development of a monitoring scheme for the Atanasovsko Lake. 2,790 m wooden barriers and 4,900 m dykes were repaired, increasing the nesting and roosting habitats for key bird species by 21,274 m^2. Two artificial islands were built to improve the nesting habitats for birds.

Conservation measures were also undertaken for Kaikusha marsh, a 160 ha wetland which is part of the former Danube floodplain outside the island of Belene. A project to improve the water regime by reconnecting the wetland to a small river in the plain was finalised in 2012. The project was implemented by Persina Nature Park administration and WWF, with funding contribution from the EU financial instrument LIFE+. With the new extended boundaries Kaikusha will become part of the Ramsar site Belene Islands Complex.

Embryonic shifting dunes – as reported - can be protected by ensuring the natural processes of coastal dune formation by laying out tourist trails and educational paths as well as designating places for sunbathing.

The designation of the protected areas (national parks, e.g. Woliński i Słowiński National Parks in Poland; natural parks; nature reserves) is a useful measure not only for nature conservation, but also for management if the protection plans of the national parks and nature reserves include suitable management measures, such as making only selected parts of lakes in the National Parks available for recreational activities during certain months of the year, taking bird breeding periods into account, designating sites for fishing, sunbathing or conducting extensive fishery management (catch limit, monitoring the quality and quantity of the fish caught), elimination of the stocking of invasive species.

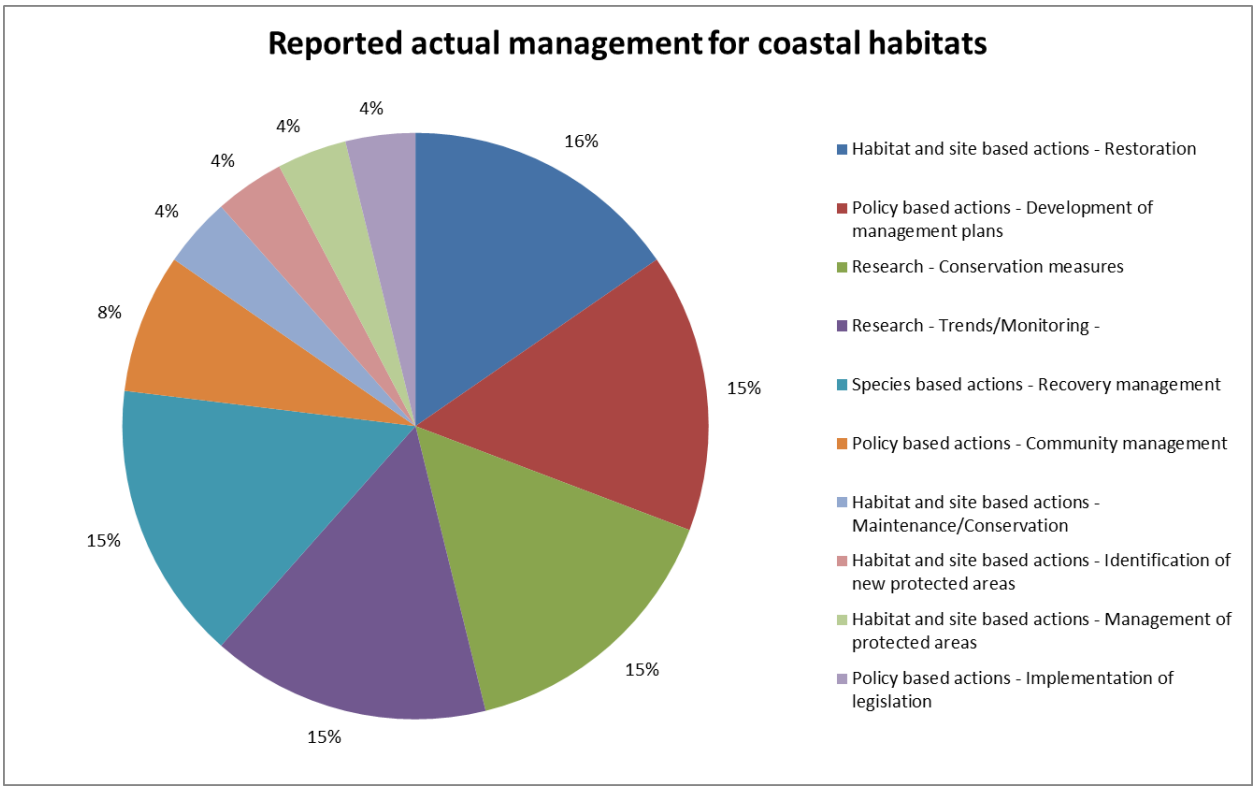


Figure 9 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation measures for coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

In the Baltic region, the Helsinki Commission (HELCOM) addresses eutrophication through the Baltic Sea Action Plan nutrient load reduction scheme. Provisional nutrient load reduction targets have been assigned to each Baltic Sea country. The actions aimed at reducing pollution of municipal, industrial and surface run-off must continue.

The reuse of large volumes of sediment from the dredging of lagoon canals has been used for habitat restoration. This produced an increase of 32 % in salt marshes and tidal flats of Venice Lagoon, creating EU community habitats of halophilous vegetation (including 1310 and 1410) that sustain birds and fishes listed in the Habitats and Birds Directives. The constructed salt marshes have a mosaic of habitats that can support several guilds of birds, since they can exploit many different patches.

Published experience related to management measures in the dune slacks (2190) comes in particular from projects addressing concerns about scrub invasion (especially by sea buckthorn) and threats to rare plants. Techniques applied include scrub cutting, mowing, grazing, turf-stripping and rewetting as well as identification and inhibition of drainage. Several restoration projects developed mowing regimes to maintain the low swards required by species such as Fen orchid. Mowing can prolong the younger species-rich stage of slack succession but cannot reverse the process. Rerouting of tourist paths to bypass humid dune slacks was reported as a way to avoid trampling them. On sites with a mosaic of habitats, grazing is the preferred management tool where the management of dune slacks can be integrated with a grazing plan for the whole system (Huston, 2008). There is considerable experience in the management of humid dune slacks, ranging from the maintenance of favourable conditions through grazing and mowing regimes to techniques which aim to mimic natural dune dynamics by using bulldozers to take the development of humid dune slack communities back to earlier stages in succession.

Present-day sod-cutting has proved to be an effective technique in restoring the slack to an earlier stage of succession. The sod-cutting itself can reveal the history of slack development from the pioneer stage to the mature stage, so it may be useful to analyse a test excavation.

4.3.5 Species-specific measures

The need for species-specific measures was indicated for Embryonic shifting dunes (2110), Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130*), Estuaries (1130), Coastal lagoons (1150), *Salicornia* and other annuals colonising mud and sand (1310), Mediterranean salt meadows (*Juncetalia maritimi*) (1410) and Humid dune slacks (2190). A general distinction made by experts was between active and passive conservation. While strict protection within a national park or reserve might be necessary, active protection is important to prevent Humid dune slacks (2190) from drying and to reinforce vulnerable species.

4.3.6 Bottlenecks - Problems

The lack of adequate engagement of stakeholders is a major bottleneck in achieving conservation targets in the coastal zone (Figure 10). Indeed, in addition to containing highly valuable and fragile habitats, the coastal zones are also very attractive areas for different human activities, and so different and often antagonistic interests, activities and plans are concentrated in a relatively narrow zone. The complexity of these interrelations represents a great challenge for the management of coastal habitats, which calls for a systematic approach, broad consultation and cooperation. Stakeholder involvement is inevitable and there is a lot room for improvement in this area.

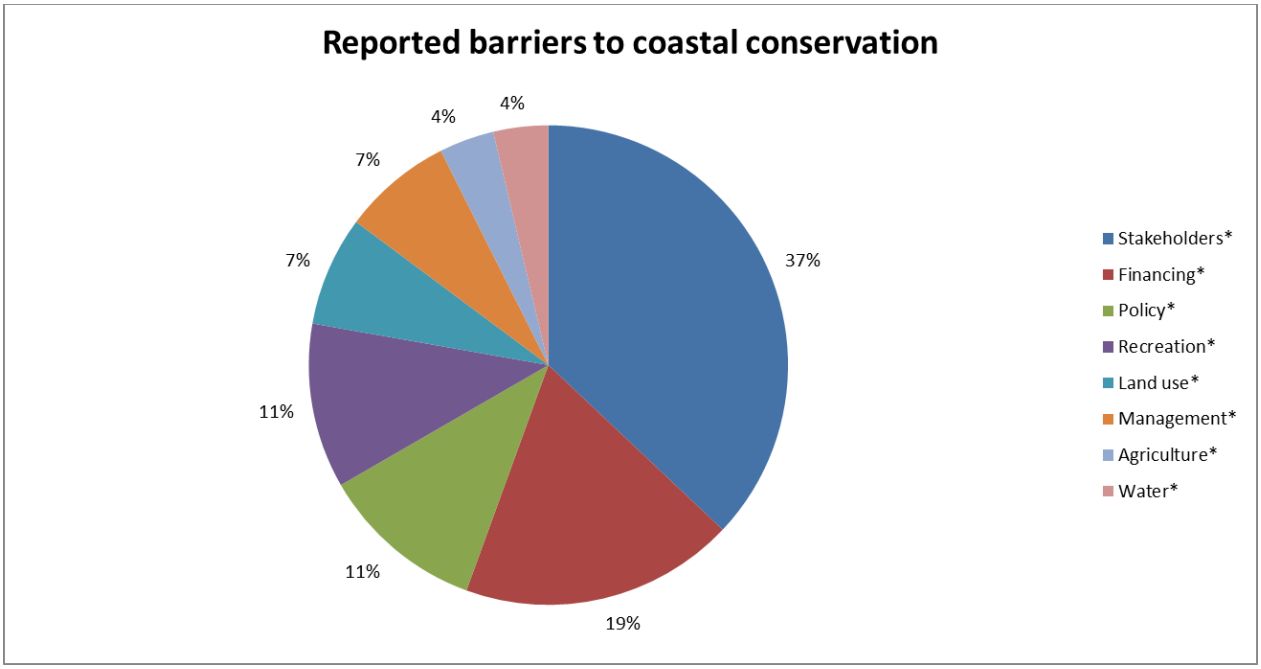


Figure 10 Results from Natura 2000 Biogeographical Process expert consultation: *General conservation barriers for coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Another important problem is how to ensure the suitable and adequate management of habitats in the long term. This problem has logistical and financial aspects, because the costs of management and restoration measures in the coastal habitats are often high.

Table 9 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 specific conservation barriers for coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Barriers and bottlenecks	% responses
Financing - Lack of forgone income compensation (or subsidies)	15
Stakeholders - Lack of awareness / negative attitude	15
Policy - Lack of policy / rules	11
Recreation - Tourism pressure	11
Stakeholders - Lack of cooperation	11
Land use - Construction	7
Management planning - Lack of management plans	7
Stakeholders - Lack of knowledge / competence / data	7
Agriculture - Nutrient input	4
Financing - Lack of funds for conservation (and complicatedness / difficult access)	4

4.3.7 Solutions and opportunities

Integrated Coastal Zone Management (ICZM), in accordance with EU recommendations, represents an important instrument for the long-term preservation of the coast. However, traditional land-use planning in line with Planning-based learning (PBL), is also very useful as it regulates the zoning of land, water and construction. These instruments help reconcile the often conflicting interests of a wide range of stakeholders (see Figure 11). In 2002, the European Parliament and Council of Europe adopted the Recommendation concerning the implementation of Integrated Coastal Zone Management in Europe (2002/413/EC); see also http://ec.europa.eu/environment/iczm/rec_imp.htm. It lists eight principles defining the essential characteristics of ICZM. Integration across sectors and levels of governance, as well as a participatory and knowledge-based approach, are hallmarks of ICZM. Based on these principles, the Recommendation outlines steps which the Member States should take to develop national strategies for ICZM.

Given the cross-border nature of many coastal processes, coordination and cooperation with neighbouring countries and in a regional sea context are also encouraged. EU financial instruments can support the implementation of a large variety of coastal projects and research. Depending on the nature of the project, funding possibilities are available under the EU structural funds and a broad range of other EU funding schemes. Shipman and Stojanovic (2007) identified four major gaps in ICZM implementation: (1) the complexity of responsibilities at the coast continues to prevent agencies from taking a 'joined-up' approach; (2) a policy vacuum is constraining implementation from national to local scales; (3) informational obstacles are significant in preventing coordination between science and policymakers, and between different sectors; (4) a democratic deficit is preventing implementation in

the working practices of coastal stakeholders, with little opportunity in decision-making for public comment or local accountability, especially offshore. The failures include: transient projects, lack of action at the implementation stage, no sustainable financing mechanisms, poor coverage of European coasts by ICZM projects, failure to engage communities and to internalise ICZM principles at the local level among other programmes, and failure to involve communities, businesses and industry in partnerships. Taking a more positive view, there is some evidence of continuous improvement and learning and benchmarking being implemented in European ICZM initiatives.

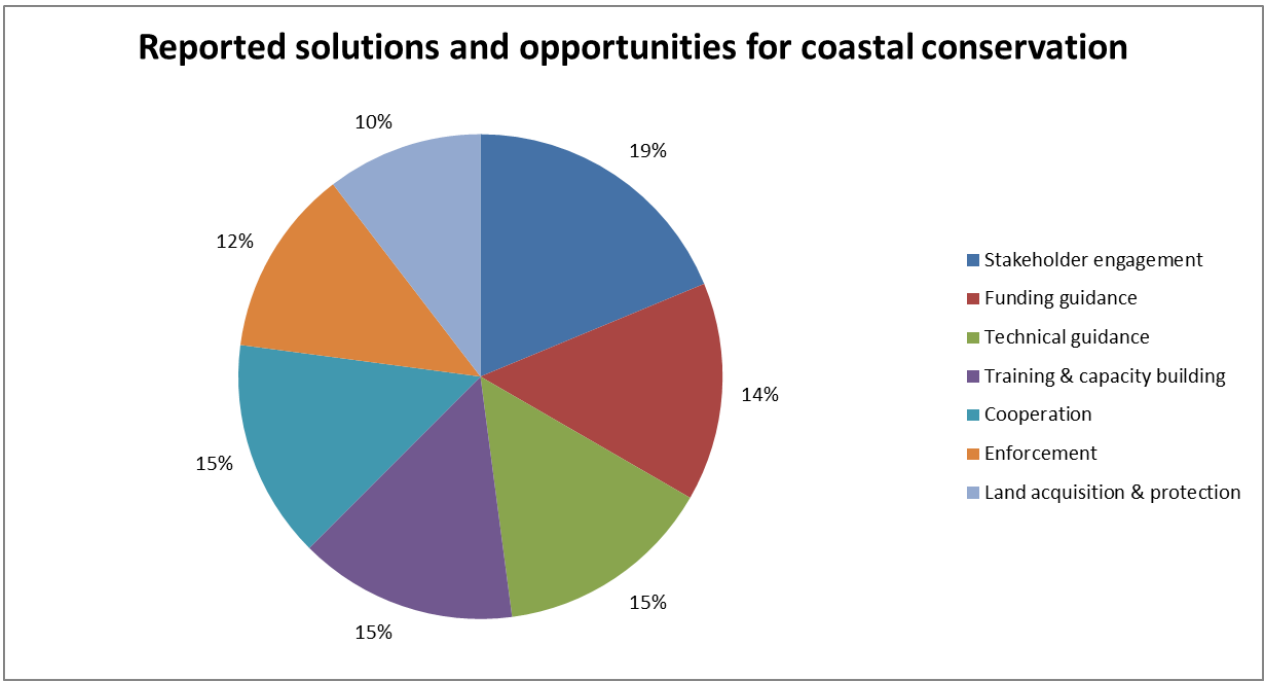


Figure 11 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation solutions and opportunities for coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

International cooperation is inevitable in marine and coastal habitats conservation. This cooperation exists in the Baltic Sea and the Black Sea in the form of the Helsinki Commission (HELCOM) for the Baltic Sea (since the 1970s) and the Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention; adopted in 1992, ratified in 1994). The Baltic Sea Action Plan (HELCOM, 2007) targets four fields: eutrophication, hazardous substances, maritime activities, and biodiversity. The countries around the Baltic have been working together for decades to reduce pollution and repair the damage done to the marine environment. A lot of useful work has been done, even though the analysis of the Action Plan (WWF Baltic Ecoregion Programme, 2013) showed delays in the implementation of actions and that cooperation between countries lacks an adequate mechanism. HELCOM (2009) specifies spatial planning as a practical means for policy integration in the coastal areas. In the Black Sea, the adoption of the Convention was followed by the establishment of the Black Sea Environment Programme in 1993, and the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea was adopted Bucharest in 1996 and amended in 2002.

The production of Red Lists could lead to more focused action for habitat protection and restoration. The Red List for the Baltic Sea (HELCOM, 2013) lists Estuaries (1130) as critically endangered (CR) and Coastal lagoons (1150) as endangered (EN). The Black Sea Red Data Book (http://www.grid.unep.ch/bsein/redbook/index.htm) does not contain habitats, but is focused on species.

4.3.8 Relevant cross-cutting issues

Site management planning taking into account interests and pressures from other sectors and policy fields, funding of management activities and the involvement of stakeholders are issues that can best be addressed in an integrated cross-cutting way (Figure 12). In particular, in the policy area, there is a clear need and opportunity to engage with and develop synergies with the Water Framework Directive, the Marine Strategy Framework Directive as well the Natura 2000 regulation and emerging policy on Marine Spatial Planning.

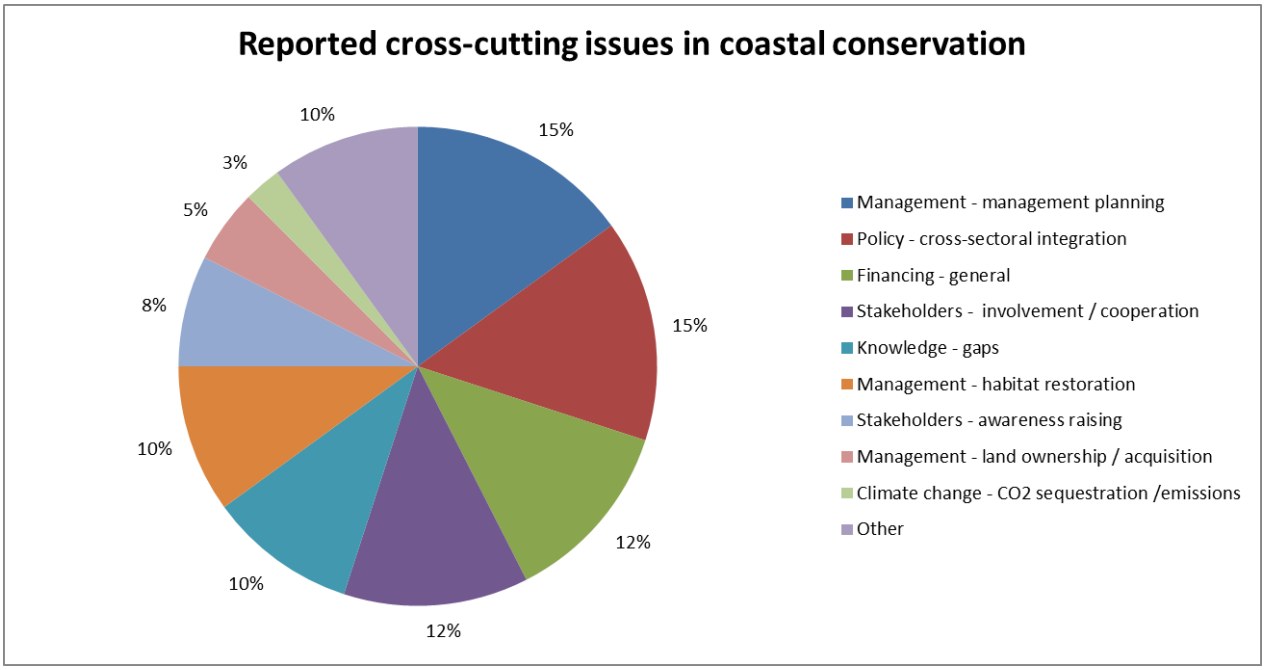


Figure 12 Results from Natura 2000 Biogeographical Process expert consultation: *Cross-cutting issues in coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Water quality is important not only for coastal habitats conservation, but also for the environment, and human health and well-being. Water quality can be improved through the introduction of clean technologies, the continued construction and modernisation of sewers, and the transition to farming methods that limit the run-off of biogenic substances into rivers. It is important to implement international obligations concerning the reduction of pollutants entering rivers from the sea (e.g. HELCOM, 2007) and the protection of catchment areas (e.g. the agreement between Germany, Czech Republic and Poland concerning the protection of the Oder River).

In the field of spatial planning and policy, all large investment projects in hydraulic engineering that affect coastal habitats, as well as investments in the watershed must be subject to an Environmental Impact Assessment.

Stakeholder involvement is important in all issues affecting the interests of various actors, and this is also true in such complex environments as the coastal zones.

It is also important that the activities included in the management plans consider the conservation status of habitats and species subject to conservation in the protected areas and Ramsar sites under the Habitats and Birds Directives.

4.3.9 Lessons learned / Examples of best practice / Successful and unsuccessful projects

Examples of good practice have generated a wide range of lessons to be applied and shared through the Process, in particular with respect to involving local communities, restoring hydrological conditions, and waste management (Figure 13). This section lists LIFE projects that have applied or tested different methods for improvement or restoration of the target coastal habitats and gained practical experience in the coastal habitats management that is useful and transferable to other sites and situations. The list includes some ongoing and recently started projects whose results should soon contribute to the management and conservation of their respective target habitats.

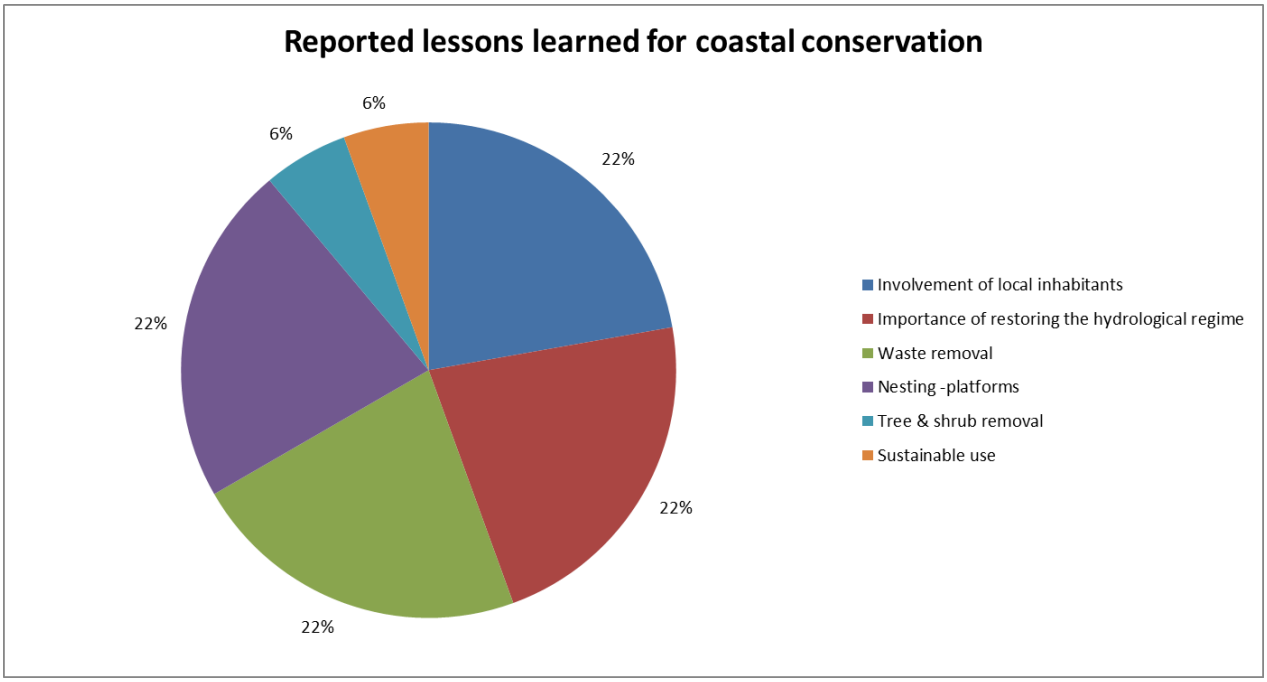


Figure 13 Results from Natura 2000 Biogeographical Process expert consultation: *Lessons learned for coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

1130 Estuaries

LIFE09 NAT/SE/000345 – 'GRACE – Grazing and restoration of archipelago and coastal environments'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3841 or http://www.graceprojektet.se/

- Restoration of coastal habitats by clearing of trees and bushes, burning of heaths, fencing, restoration of grazing.
- Production of management plans and restoration plans.
- Cooperation of four communes.

In addition, this habitat type is also addressed by LIFE09 NAT/SI/000376 – MANSALT, which mostly focuses on habitat 1330.

1150 Coastal lagoons

LIFE05 NAT/DE/000152 – BALTCOAST – Rehabilitation of the Baltic coastal lagoon habitat complex
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=2998 or http://www.life-baltcoast.eu/

- Restoration and management measures on a range of 34 Baltic coastal lagoons habitat complexes, located in Denmark, Germany, Sweden, Lithuania and Estonia.
- Restoration of the natural hydrology regime by blocking drainage trenches, removal of eutrophic mud and dense reed vegetation, clearing bushes and trees including alien invasive species such as *Rosa rugosa*, development of appropriate grazing regimes, reconnecting lagoons.
- Development of site management strategies respecting the socio-economic conditions, new grassland management rules and recommendations for dune management.
- International cooperation of experts and managers.

LIFE08 NAT/BG/000277 – 'LIFE FOR THE BOURGAS LAKE – Ensuring conservation of priority bird species and coastal habitats at the Bourgas Natura 2000 wetland sites'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3533 or http://burgaslakes.org/bg/

- Restoration of the lagoons by reed removal (cutting, burning), creating open water areas.
- Stakeholder and public involvement.

LIFE09 NAT/DK/000371 – 'CONNECT HABITATS – Restoring dry grasslands at Bøjden Nor with a positive influence on vulnerable coastal lagoon habitat status'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3837 or http://www.fuglevaernsfonden.dk/fuglevaernsfonden/projekter/life-bojden

- Restoration of water regime, wetland restoration, eutrophication reduction, establishment of buffer zones, interconnection of habitat fragments.
- Cooperation of public authorities and NGOs.

LIFE09 NAT/IT/000110 – 'Natura 2000 in the Po Delta – Conservation of habitats and species in the Natura 2000 sites in the Po Delta'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3878 or http://www.parchideltapo.it/life.natura2000.po.delta/

- Improvement of water circulation and eutrophication reduction.
- Restoration of coastal lagoons, salt meadows and salt steppes.

LIFE09 NAT/IT/000608 – 'Re.S.C.We. – Restoration of Sentina coastal wetlands'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3793 or http://www.life-rescwe.it/

- Recovery of a complex system of coastal wetlands.
- Bioengineering works aimed at the dune recovery, mainly: branch packs to facilitate the sandy stocks and to reduce the impact of erosion, the manual placement of dead trunks in order to favour the creation of microhabitats, the excavation of small ponds just behind the dune line.
- Restoration of the irrigation network, measures against invasive alien species.
- Cooperation with local stakeholders including tourist organisations, enhancement of site potential for tourists, improved environmental education.

This habitat type is also addressed by LIFE10 NAT/IT/000256 – MC-SALT, which mainly focuses on habitat 1330.

Ongoing and recently started LIFE projects
LIFE12 NAT/IT/001122 – 'LIFE VIMINE – An integrated approach to the sustainable conservation of intertidal salt marshes in the lagoon of Venice'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4555

- Integrated approach to the conservation of interior salt marshes, using low-impact soil bioengineering works and manual labour.
- Removal of accumulated waste from lagoon sites, measures against erosion.
- Participatory approach involving stakeholders in conservation works with aim of increasing environmental awareness and promoting sustainable local economic activities based on salt marsh services.

LIFE11 NAT/BG/000362 – 'Salt of Life – Urgent measures to restore and secure long-term preservation of the Atanasovsko Lake coastal lagoon'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4322 or http://www.saltoflife.biodiversity.bg/bg/

- Establishment of functional infrastructure for water management and the control of the coastal lagoon.
- Mitigation of the impact of direct and indirect threats.

LIFE12 NAT/IT/000331 – 'LIFE-SeResto – Habitat 1150* (Coastal lagoon) recovery by SEagrass RESTOration. A new strategic approach to meet HD & WFD objectives'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4838 or http://www.unive.it/nqcontent.cfm?a_id=1

- Restoration and consolidation of the habitat 1150 by transplanting submerged seagrasses.

LIFE13 NAT/IT/000115 – 'LIFE AGREE – coAstal laGoon long teRm managEmEnt'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5057 or http://www.provincia.fe.it/

- Adopting integrated management techniques that seek to use to positive effect the dynamism of the lagoon and its constant sedimentary deposit; improvement of the water circulation and the elimination of the eutrophication problems.
- Integrated management of the lagoon area, following an ecosystem and functional approach, in which both public authorities and private stakeholders are involved over the long term.

1210 Annual vegetation of drift lines

Ongoing and recently started LIFE projects
This habitat type is addressed by LIFE12 NAT/IT/001122 – 'LIFE VIMINE', which mainly focuses on habitat 1150.

1240 Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp.
No project.

1310 *Salicornia* and other annuals colonising mud and sand

LIFE09 NAT/SI/000376 – 'MANSALT – Man and Nature in Secovlje salt-pans'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3854 or http://www.kpss.si/

- Control of the water regime and hydraulic management in saline ecosystems based on a system of sea-defence walls, embankments and internal channels.
- Restoration of the embankments, habitat restoration, guidelines for conservation of target habitats.
- Good practice model as to the use of traditional methods in the reconstruction of the salina's ecosystems.

LIFE10 NAT/IT/000256 – 'MC-SALT – Environmental management and restoration of Mediterranean salt works and coastal lagoons'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4065 or http://www.mc-salt.eu/en/index.html

- Optimisation of water flow in the salt works by reconstructing sluices and drainage channels.
- Creation of a management model for salt meadows, enhancement of the tourist product and reduction of the impact of visitors.
- Conservation, including fire prevention and invasive plant removal, of a wide range of habitats, restoration and conservation of coastal lagoon habitat in Italy, France and Bulgaria.

This habitat type is also addressed by projects focusing mainly on habitats 1150 (LIFE05 NAT/DE/000152 – 'BALTCOAST'; LIFE09 NAT/IT/000110 – 'Natura 2000 in the Po Delta', LIFE09 NAT/IT/000608 – 'Re.S.C.We.').

Ongoing and recently started LIFE projects
This habitat type is also addressed by LIFE12 NAT/IT/001122 – 'LIFE VIMINE', which mainly focuses on habitat 1150.

1410 Mediterranean salt meadows (*Juncetalia maritimi*)
This habitat type is addressed by projects that mainly focuson habitats 1150 (LIFE09 NAT/IT/000110 – 'Natura 2000 in the Po Delta', LIFE09 NAT/IT/000608 – 'Re.S.C.We.') and 1330 (LIFE09 NAT/SI/000376 – 'MANSALT', LIFE10 NAT/IT/000256 – 'MC-SALT').

Ongoing and recently started LIFE projects
This habitat type is addressed also by the project LIFE12 NAT/IT/001122 – 'LIFE VIMINE', which mainly focuses on habitat 1150.

2110 Embryonic shifting dunes
No project.

2130* Fixed coastal dunes with herbaceous vegetation (grey dunes)

LIFE11 NAT/DK/000893 – 'LIFE LAESOE – LIFE LAESOE – Restoration of birdlife and natural habitats at Laesoe'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4301 or http://naturstyrelsen.dk/naturbeskyttelse/naturprojekter/life-laesoe-1

- Establishment of a sustainable grazing system targeting different coastal habitats, dunes, wetlands and grasslands.

LIFE08 NAT/DK/000464 – 'DRY GRASSLAND – Dry grassland in Denmark – Restoration and conservation'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3551 or http://naturstyrelsen.dk/siden-kunne-ikke-findes-paa-nstdk/?query=default

- Methods of controlling the invasive alien species *Rosa rugosa*.

This habitat type is also addressed by LIFE05 NAT/DE/000152 – 'BALTCOAST', which mainly focuses on habitat 1150.

Ongoing and recently started LIFE projects
LIFE11 NAT/SE/000849 – 'SandLIFE – Restoration of habitats on sandy soils in southern Sweden'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4314 or http://sandlife.se/?page_id=785

- Restoration work: woodland clearance, creation of bare sand areas, management of encroachment, removal of the invasive Japanese rose (*Rosa rugosa*), management of heather.

- Guidelines for restoration of a range of habitats on sandy soil, specific conservation recommendations.

LIFE12 NAT/DK/000803 – 'LIFE WETHAB – Restoration of wet habitats in the Jerup Beach Ridge Plain'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4617 or http://naturstyrelsen.dk/naturbeskyttelse/naturprojekter/life-raabjerg-mose/

- Restoration of the largest dune and mire habitats in Denmark: improving hydrology regime, clearing woody species, mulching in preparation for grazing and mowing, increased or improved grazing and mowing, control of invasive alien species.
- Working with a large number of private landowners, combining LIFE and Rural Development Programme support.

This habitat type is also addressed by LIFE13 NAT/DK/001357 – 'REWETDUNE-LIFE', which mainly focuses on habitat 2190.

2190 Humid dune slacks

Ongoing and recently started LIFE projects
LIFE13 NAT/DK/001357 – 'REWETDUNE-LIFE – Restoration of wetlands in dune habitats'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4910 or http://naturstyrelsen.dk/

- Restoration of natural hydrological conditions (closure of ditches).
- Mapping and subsequent clearing of invasive plant species *Rosa rugosa* and *Heracleum mantegazzianum.*
- Controlled mosaic burning and the establishment of grazing.

This habitat type is also addressed by projects that mainly focus on habitat 2130 (LIFE11 NAT/SE/000849 – 'SandLIFE', LIFE12 NAT/DK/000803 – 'LIFE WETHAB').

4.3.10 Opportunities for joint action

Opportunities for joint action in the context of the Natura 2000 Biogeographical Process to address some of the pressures, issues and barriers described in this chapter should focus on the exchange of best practice, transboundary cooperation with respect to an intersectoral and integrated approach to habitat management (Figure 14).

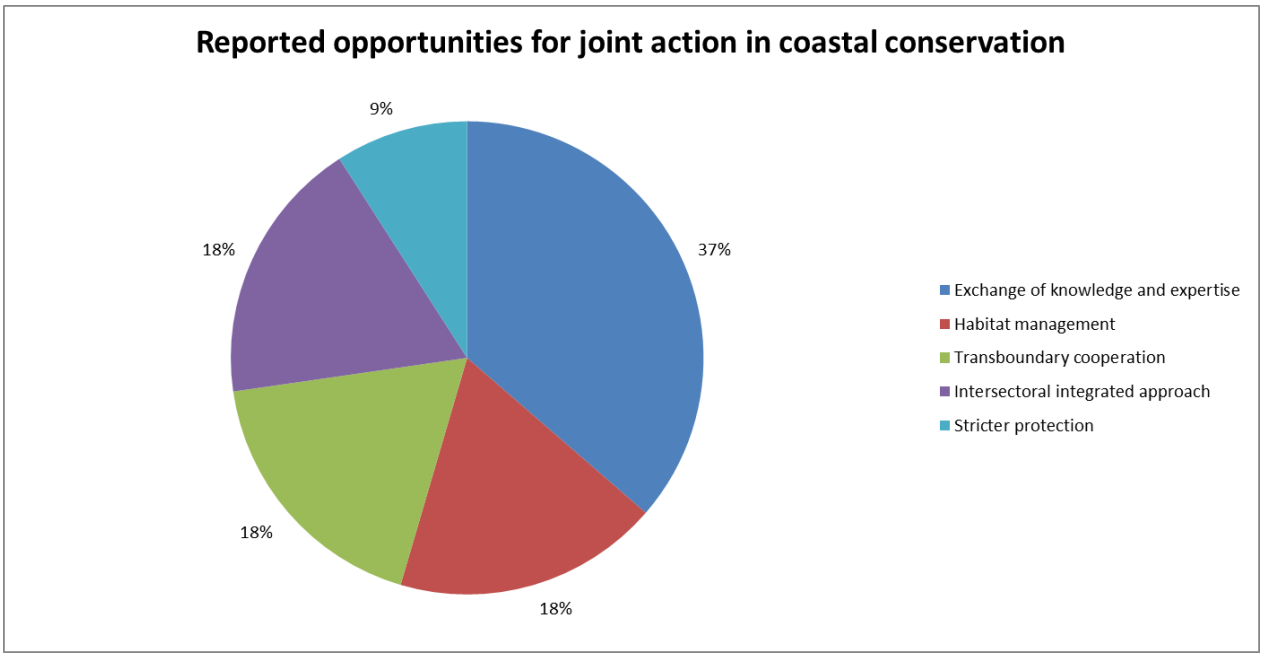
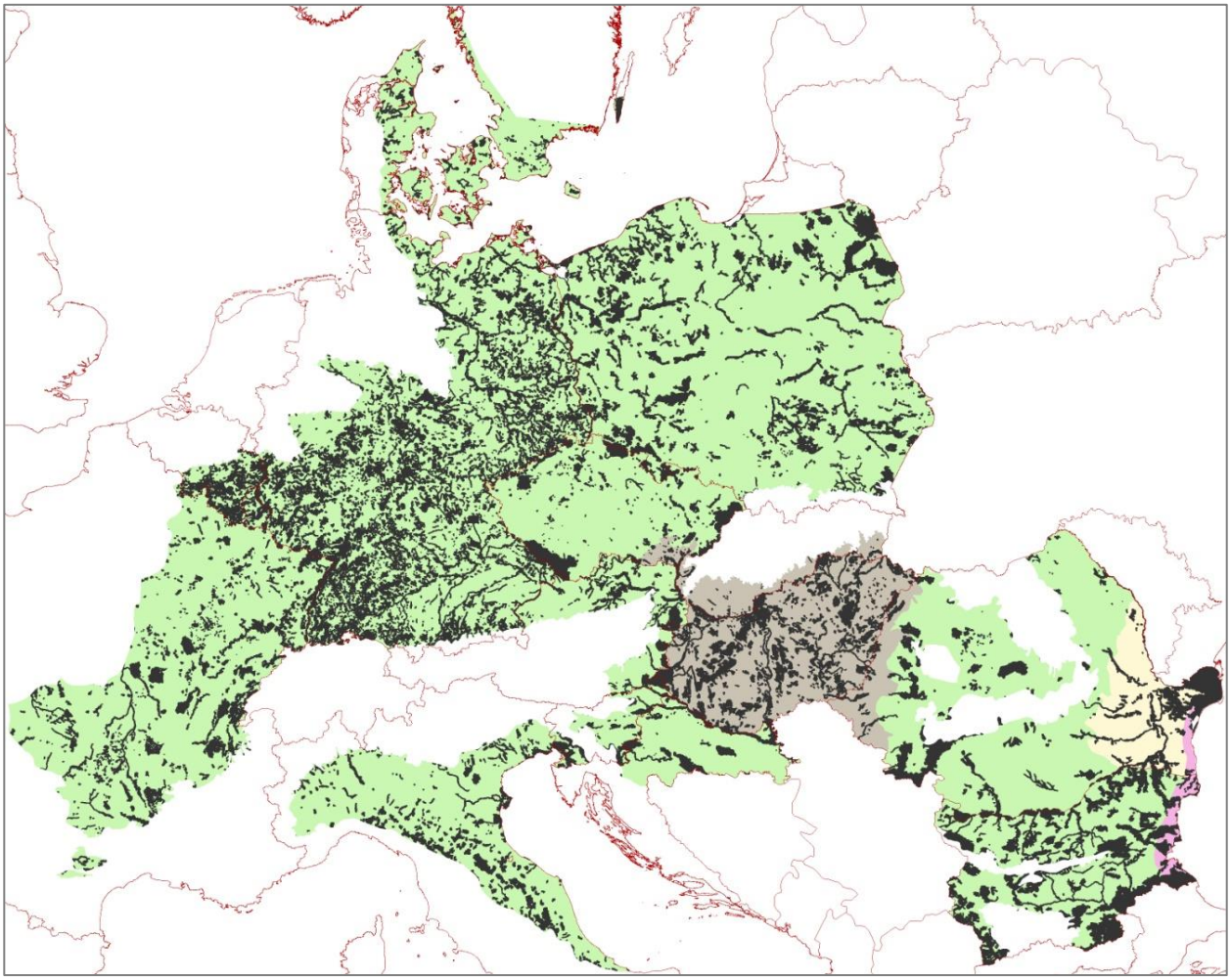


Figure 14 Results from Natura 2000 Biogeographical Process expert consultation: *Potential areas for joint action for the conservation of coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

4.4 Grasslands

4.4.1 Summary description

Almost all European grasslands have been more or less modified by human activity and have to a major extent been created and maintained by agricultural activities. In fact, one of the most remarkable aspects of nature in Europe is that a considerable part of it is closely linked to farming. Focusing again on European grasslands, these are maintained through farmers' grazing and/or mowing regimes. Hence, although their plant communities may be natural, they could be defined mainly as 'semi-natural grasslands'. In addition, some more natural 'permanent grasslands' also occur in Europe. For the Continental, Pannonian, Black Sea and Steppic biogeographical regions, 18 grassland habitat types were selected (Table 10).



Map 3 Natura 2000 sites containing grassland habitats selected for priority consideration in the Natura 2000 Biogeographical Process

For each of these habitat types the annexes provide data on the Sites of Community Importance (SCI) and the habitat area of grassland habitat types in individual Member States.

Table 10 Grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

Habitats Directive code and name of Grassland habitats selected for priority consideration
1340 - Inland salt meadows
1530 - Pannonic salt steppes and salt marshes
2330 - Inland dunes with open *Corynephorus* and *Agrostis* grasslands
2340 - Pannonic inland dunes
6110 - Rupicolous calcareous or basophilic grasslands of the *Alysso-Sedion albi*
6120 - Xeric sand calcareous grasslands
6210 - Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)
6230 - Species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)
6240 - Sub-Pannonic steppic grasslands
6250 - Pannonic loess steppic grasslands
6260 - Pannonic sand steppes
62C0 - Ponto-Sarmatic steppes
6410 - *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
6420 - Mediterranean tall humid grasslands of the *Molinio-Holoschoenion*
6430 - Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
6440 - Alluvial meadows of river valleys of the *Cnidion dubii*
6510 - Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*)
6520 - Mountain hay meadows

Based on Article 17 reporting by the Member States for the period 2002–2006 (Figure 15), the overall conservation status of the 18 grassland habitat types included was: unfavourable–bad (46 % of cases), unfavourable–inadequate (20 % of cases), or not assessed (28 % of cases).

For the period 2007–2012, much more data was available and all habitats were assessed. The number of habitats assessed to be unfavourable–bad (40 %) was similar to the previous reporting period. However, the number of habitats assessed to be unfavourable–inadequate increased (43 %). This should not necessarily be considered as an overall decrease in conservation status, as in the previous reporting period (2002–2006) many habitats were not assessed. Indeed, for the period 2002–2006 only 2 % of habitats were assessed to be in favourable conservation status; this increased to 16 % in the period 2007–2012 . Overall, grassland habitats' score is unfavourable for both reporting periods. However, current data also shows that close to 1 in 5 sites is in a favourable conservation status.

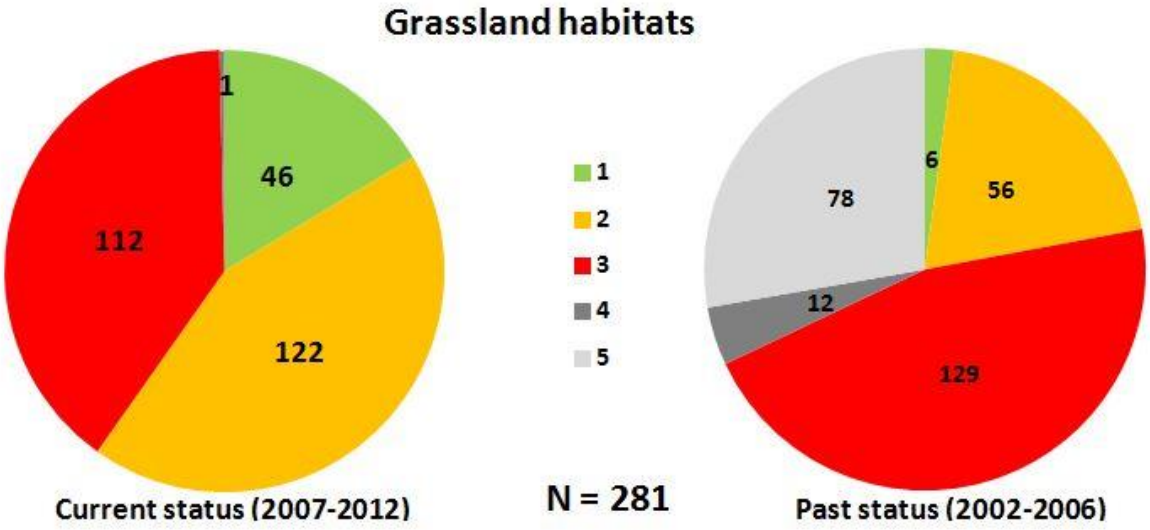


Figure 15 Current and past conservation status of grassland habitats based on Article 17 reporting. Numbers represent individual country/biogeographical region assessments (only habitats selected for priority consideration are included); N is the total number of assessments in each period. 1 = FV: favourable; 2 = U1: unfavourable–inadequate; 3 = U2: unfavourable–bad; 4 = XX: unknown; 5 = N/A: not assessed

4.4.2 Issues - pressures - threats

Agricultural pressures (in particular land-use intensification, inappropriate mowing and grazing, nutrient inputs by fertilisation), natural processes (such as biocenotic evolution in abandoned areas), invasive species and natural system modifications (in particular to the hydrology) are reported by the experts as the main pressures on grasslands (Figure 16 and Table 11). Between 1990 and 2003, the total area of grasslands in the EU fell by an average of 13 %, with increases in only a few areas. Overall, this has led to severe fragmentation of the habitat and a drop in various species that depend on it (by as much as 20–50 %). One of the main pressures for grasslands is change in land use, specifically urban sprawl, road building, and mining and quarrying activities. The timing of these changes varies widely. In some areas it has been going on for a very long time. For example, by the 19th century, heavy industries were omnipresent in key areas such as the Ruhrgebiet and the Black Triangle between Germany, Poland and the Czech Republic. In other areas the expansion of settlements, industry and infrastructure is much more recent and the increase has mainly occurred in recent decades.

Other major pressures faced by grasslands include increased nitrogen availability, caused by atmospheric deposition, and climate change (including droughts, extreme temperatures and floods). Tourism, including damage caused by cars, quads and motocross motorcycles (especially in Poland), can also be a pressure on the health of remaining grassland habitats. For example, high-altitude mountain areas are attractive tourist destinations. However, the development of tourism infrastructure may lead to the total destruction of the habitat or can strongly influence its structure and species composition (e.g. weed invasion on disturbed patches). Related pressures occurring in Poland are illegal collection of wild plants, especially common in the case of orchid species, and littering. In Bulgaria, poaching and illegal fishing add to direct anthropogenic disturbances.

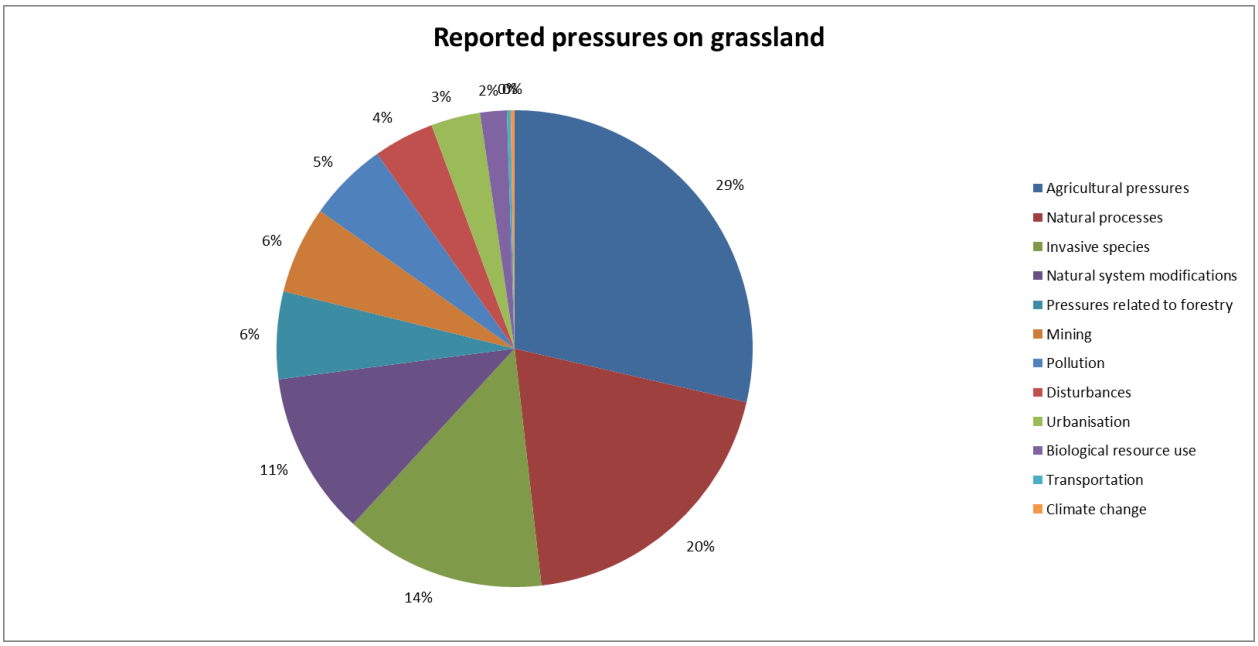


Figure 16 Results from Natura 2000 Biogeographical Process expert consultation: *Pressures on grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

However, increased tourist interest in biodiversity-valuable grasslands can be a sign of rising awareness of nature conservation. For example, the Kiskunság National Park in Hungary is an area with well-preserved sand steppes on sand dunes. It is a region of outstanding natural beauty which, combined with traditional shepherding, horse-drawn carriages and horse shows, makes the area very attractive for tourists.

Table 11 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 level 1 pressures for grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Pressure	% responses
K02 - Biocenotic evolution, succession	18
I01 - Invasive non-native species	11
J02 - Human induced changes in hydraulic conditions	11
A02 - Modification of cultivation practices	9
A04 - Grazing	8
A08 - Fertilisation	4
A01 - Cultivation	4
A03 - Mowing / cutting of grassland	4
B01 - Forest planting on open ground	4
H04 - Air pollution, airborne pollutants	4

To maintain grasslands high in biodiversity value, intermediate intensity of grazing is needed. However, grazing nowadays is either too intensive or otherwise very limited or completely abandoned. Where grazing is too intensive, this usually coincides with overall intensified agricultural activities (including ploughing, tilling and reseeding) and with the use of pesticides, herbicides and fertilisers. In Poland, conversion of grasslands to arable land is further destroying the habitat. While this is occurring across the entire region, there still are many areas with traditional small-scale mixed farming, especially in the east. Sometimes the inappropriate use of grazing animal types is an issue. For instance, many sheep have been replaced by grazing cows, which negatively affects floristic diversity. Where grazing is very limited or has even ceased, this leads to natural succession, afforestation and the disappearance of grassland habitat types. This happens in areas where people abandon rural lifestyles and move to cities or other countries in search of jobs. For example, a survey of Estonia in 2000 found that 25 % of arable land and as much as 56 % of permanent grasslands had been abandoned. Furthermore, in some instances, afforestation is deliberate, with rapidly growing wood species such as poplar, or even invasive non-native species such as *Robinia pseudoacacia*.

Additional pressures for the Continental, Pannonian and Steppic biogeographical regions are drainage, eutrophication, acidification and salinisation. For example, large areas of marshy meadows in the Hungarian region of Kiskunság have been destroyed by drainage and channel construction. Although many marshy meadows are now protected, they are continuing to dry out. As a further example, the relatively dry climate of the central and eastern areas of the Great Hungarian Plain has led to the construction of large-scale irrigation systems, mostly in the Tisza River basin (Hungary). This irrigation has caused salinisation and alkalisation on more than 20 % of the area. In Romania, irrigation has increased since 1965 and is used on more than 20 % of agricultural land. About 200,000 ha have been salinised, which represents around 6 % of total irrigated land. Salinisation is reversible but reclamation of saline and alkaline soils is expensive and requires complex amelioration techniques. In addition to agricultural pollution, eutrophication and salinisation, industrial and urban pollution also constitutes a significant threat in Bulgaria.

Based on the data from Member States' Article 17 reports, abandonment of pastoral systems was seen as the most relevant cause of unfavourable conservation status. Further causes of poor grassland quality are (in order of prevalence of reported Article 17 threat categories) modification of cultivation practices, fertilisation, unsustainable grazing practices, cultivation, drainage, burning and stock feeding.

4.4.3 Main conservation requirements

Reported conservation requirements by the consulted experts (Figure 17) show that, overall, grassland conservation requires much site-based management (such as mowing). However, habitat features, conservation values and context (history and development) of the various grasslands will vary among types and across the biogeographical regions covered here. In essence, grassland management objectives will vary from site to site, and different goals may be set for different areas within individual sites. Factors to be considered are:

- the type of grassland as influenced by underlying geology and soil type (acid/neutral/calcareous);
- the type of grassland community (sward type);

- the topography and terrain of the land;
- the surface water movement and drainage pattern;
- the management of the grassland site in the past (fertiliser applications, past tillage), and the proximity of adjoining features such as arable land, urban areas, road run-off, etc.

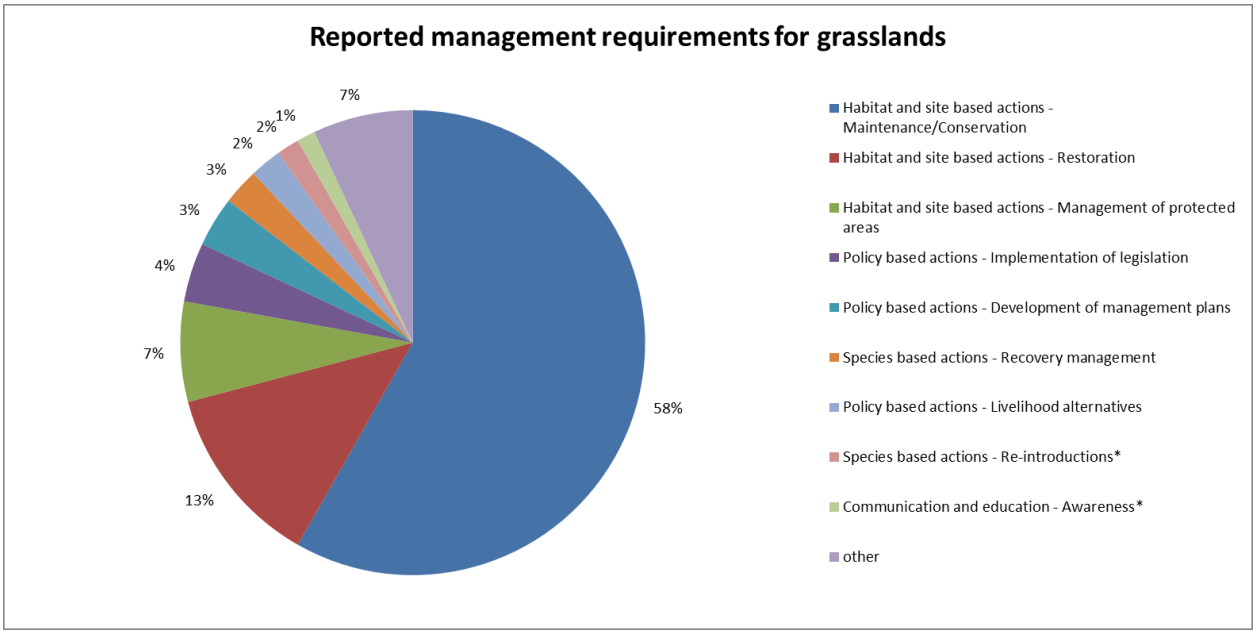


Figure 17 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation requirements for grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

When considering the conservation requirements and when planning the management of a specific grassland habitat, four of the main general aspects that can be taken into account are:

1. It is very important that management is based on a knowledge of ecology. Plan site management carefully and consider the needs and requirements of key species. Set site-specific objectives and targets with reference to the conservation status of these species.
2. Today's conservation values are often the result of the land-use and grazing regimes of the past. Therefore, it is important to consider the local or regional land-use and livestock husbandry traditions, practices and techniques. However, historical management practices can be improved by applying current knowledge and experience about the specific grassland habitat type and what is needed to reach favourable conservation status.
3. The objective of grassland conservation management should be to provide variety in structure and composition, on both a macro and micro scale. Thus, favouring different structural elements to form a mosaic of longer and shorter grass, of shrubby vegetation and small bare areas that will benefit different forms of wildlife. Insects, for instance, need open areas alternating with scrub areas, on a scale of one square metre, while birds or mammals need more extended areas, on

the scale of one hectare. The desirable mosaic of structures for a particular grassland site will depend on the particular nature conservation objectives.

4. One of the main problems in extensification of formerly intensively used agricultural lands is that the initial conditions are typically too productive to enable the development of species-rich communities. Excessive loads of nitrogen and phosphorus resulting from fertilisation lead to a vegetation dominated by few species. This is exacerbated by current levels of atmospheric nitrogen deposition. Hence, a reduction in nutrient levels is a prerequisite for the enhancement and restoration of biodiversity.

4.4.4 Management and conservation measures

Management measures for grassland habitat types largely focus on site-based actions (Figure 18) and include diversifying grassland structure and increasing plant species richness; removing/halting scrub invasion and limiting the establishment of undesirable robust competitive grasses and herbs, and retaining some areas of unmanaged grassland. Before making decisions on how to manage a grassland, it is necessary to define specific objectives for the area. These will vary from site to site, and different goals may be set for different areas within individual sites. A balanced approach is needed to maintain the main plant communities, along with the main features of importance to animals, such as areas of bare soil, scattered bushes and scrub margins. In addition, it is sensible to review these objectives from time to time to take into account newly acquired knowledge about the site and the changing status of grassland types and species elsewhere.

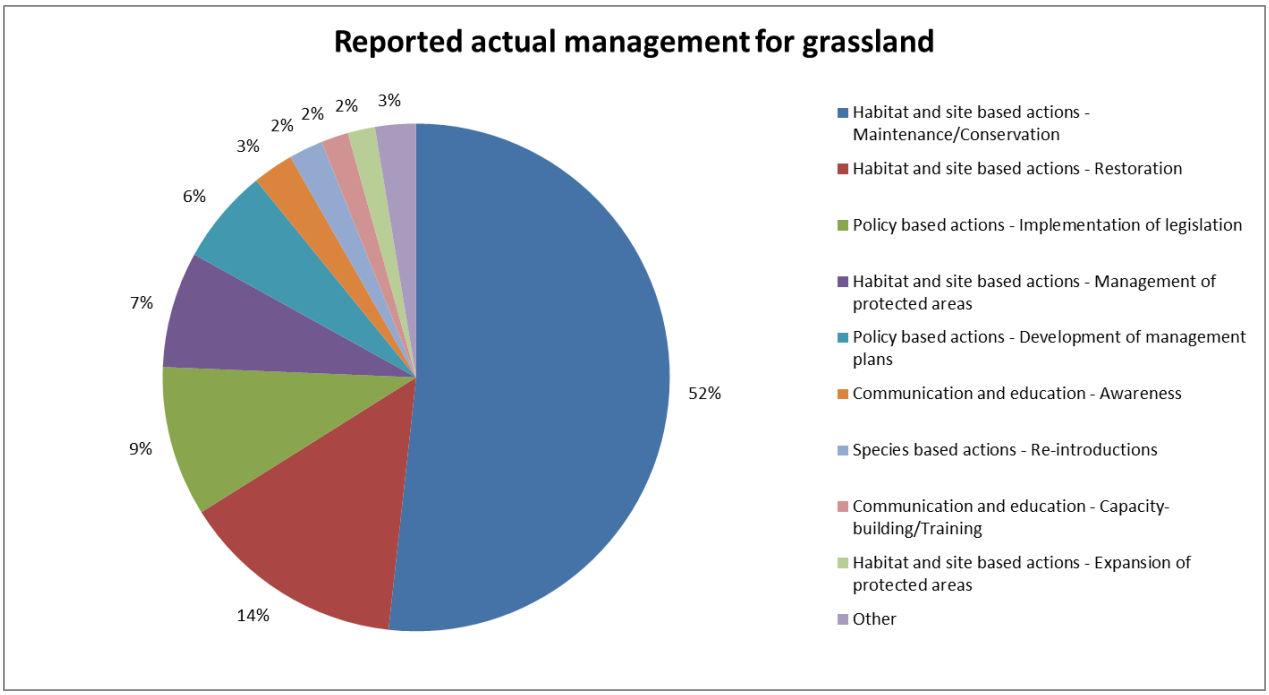


Figure 18 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation measures for grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

As regards management needs, there is general agreement that traditional ways of management should be encouraged. For example, the Hungarian Puszta has been traditionally grazed with indigenous breeds of cattle, horses and sheep, resulting in optimal maintenance of the vegetation and providing good conditions for associated species. It is also necessary to identify and restore abandoned habitats, remove non-native species and enlarge managed areas. Indeed, habitat restoration, the removal of bushes and trees overgrowing grasslands, and halting the afforestation of grasslands are necessary management measures in response to the widespread problem of grassland abandonment. Attention should also be paid to the improvement of connectivity between grasslands, as well as to other habitats, allowing species to move around. Restoration of the optimal water regime constitutes a vital element of grassland habitat restoration.

Traditional management largely consists of grazing, mowing or a combination of the two. When applying grazing or mowing regimes, a number of factors need to be taken into account. For grazing, this includes stock type, stocking rates, grazing periods and grazing system. Balance is needed to prevent natural succession on the one hand, and eutrophication as a result of overgrazing on the other. For mowing, factors to consider are timing, frequency and patchwork of the mowing regime. The end result should be the promotion of habitat heterogeneities by variable grazing pressure and grazing cycles over different parts of the habitat (rotation of mowing and grazing) and clearing of shrub. As it might be difficult to sustain farming systems that are economically less competitive and socially less viable, grazing and browsing by semi-wild herbivores may provide a solution, certainly in large nature reserves. Alternatively, mulching is another management practice which complies with the rules of good agricultural practices (GAP). Controlled burning is an infrequent and controversial management measure as it may lead to changes in species composition.

Several methods are used to restore habitats degraded by secondary succession. Turf stripping is used mostly in cases where the upper horizons of the soil are suffering from eutrophication. An oligotrophic habitat, such as *Nardus* grasslands, may be restored by removing nutrients from the upper soil layer. If the area is not heavily overgrown, the biomass can be cut or chopped with a flail or rotary mower. This is not feasible in more degraded areas, where a cultivator has to be used. Manual cutting by brush cutter is also a suitable, but costly, method. Cutting scrub is always an effective measure, but only if it is followed by regular management. If it is not possible to ensure frequent mowing or grazing after restoration, it is better to not restore, because scrub encroachment may be even more vigorous after cutting. Indeed, restoration requires a delicate balance, because overgrazing may eventually be as problematic as undergrazing, in view of maintaining diversity. For example, undergrazing has led to the invasion of scrub in the prairies.

Management can also be focused on specific valuable animal species. For example, appropriate management for the butterfly *Coenonympha oedippus*, which is dependent on the 6210 habitat, should include extensive grassland management with rotational mowing. Dense habitat networks and areas of suitable habitat with minimum levels of management should be maintained evenly in order to support metapopulations of this butterfly. Bushes and reeds should be removed every few years, as intrusion changes the microhabitat structure and destroys the habitat.

Pannonic sand steppes could be maintained without management. However, this is only possible if the ecological conditions and uncontrolled wind erosion, which allowed shifting dunes and their mosaic of

open communities to exist in the first place, are allowed to be present. Because most of the dune systems were stabilised in recent times, management is needed to maintain sand steppes and their associated species richness, otherwise natural succession will lead to the formation of scrub and woodland.

A monitoring programme should be established in order to evaluate the results of management initiatives. Generally, the monitoring system and the parameters to be monitored should be simple. To illustrate, for monitoring in the context of the Puszta, one could consider:

- targeting bird species: for example, rangers could carry out annual censuses, e.g. by using a standardised approach;
- monitoring vegetation and flora: to evaluate the impact of a grazing regime and/or different management techniques; monitor grazing animals: herd size and number of days spent grazing on different parts of the Puszta could be recorded in order to get an indication of the Puszta's actual grazing capacity.

4.4.5 Species-specific measures

With the exception of Inland salt meadows (1340*), all grassland habitats selected for priority consideration were considered to be in need of species-specific measures.

The creation of nesting platforms for aquatic birds and control of their mammalian predators are important in Pannonic salt steppes and salt marshes (1530). Special protection of *Lacerta agilis* and *Bufo calamita* (maintaining shallow waters and sand piles) is needed on Inland dunes with open *Corynephorus* and *Agrostis* grasslands (2330). Xeric and calcareous grasslands (6120) should be mowed in accordance with the requirements of *Gentianella bohemica* and orchid species.

Several species measures were mentioned for Semi-natural dry grasslands and scrubland facies on calcareous substrates *(Festuco-Brometalia)* (6210): sustaining the water regime and refraining from fertiliser use for orchid species, maintaining open sunlit spaces for *Pulsatilla* and *Coronella austriaca* and preserving *Sedum* species on open mountaintops with adapted grazing regimes for *Parnassius apollo*.

Rotational burning management and population reinforcement is necessary for *Arnica montana* in Species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) (6230).

In the case of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410), adjustment of mowing timing for butterflies (*Phengaris nausithous*, *Phengaris teleius*, *Lycaena dispar*, *Euphydryas aurinia*), *Crex crex* and orchids (*Sanguissorba*, *Gentiana*, *Eriophorum*) was considered of vital importance.

Furthermore, maintaining habitat connectivity and preventing drainage are also crucial. Grazing on abandoned meadows and water courses was deemed important for *Lycaena dispar* and *Lycaena helle* in Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430). In the case of Alluvial meadows of river valleys of the *Cnidion dubii* (6440), mowing needs to be adjusted to the needs of *Iris siberica*. Finally, on Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)

(6510), cutting regimes must be adjusted to *Phengaris nausithous*, *Maculinea* species, *Saxicola rubetra*, *Lanius collurio* and *Crex crex*.

4.4.6 Bottlenecks - Problems

The main bottleneck reported by the consulted experts is the lack of constructive engagement with the stakeholders (in particular landowners and land users such as farmers), especially with respect to financial issues related to the need to adopt labour-intensive practices that decrease the farm revenue (Figure 19 and Table 12). A general problem in the conservation and preservation of grassland habitat types is associated with changes in farming practices. Land abandonment on the one hand and farming intensification on the other hand can be seen as land-use polarisation. Thus, the main question is howto provide technical and economic support for the required pastoral practices in view of today's social and economic conditions. Unfortunately, management that is appropriate from the conservation point of view is currently unprofitable and thus requires additional funding.

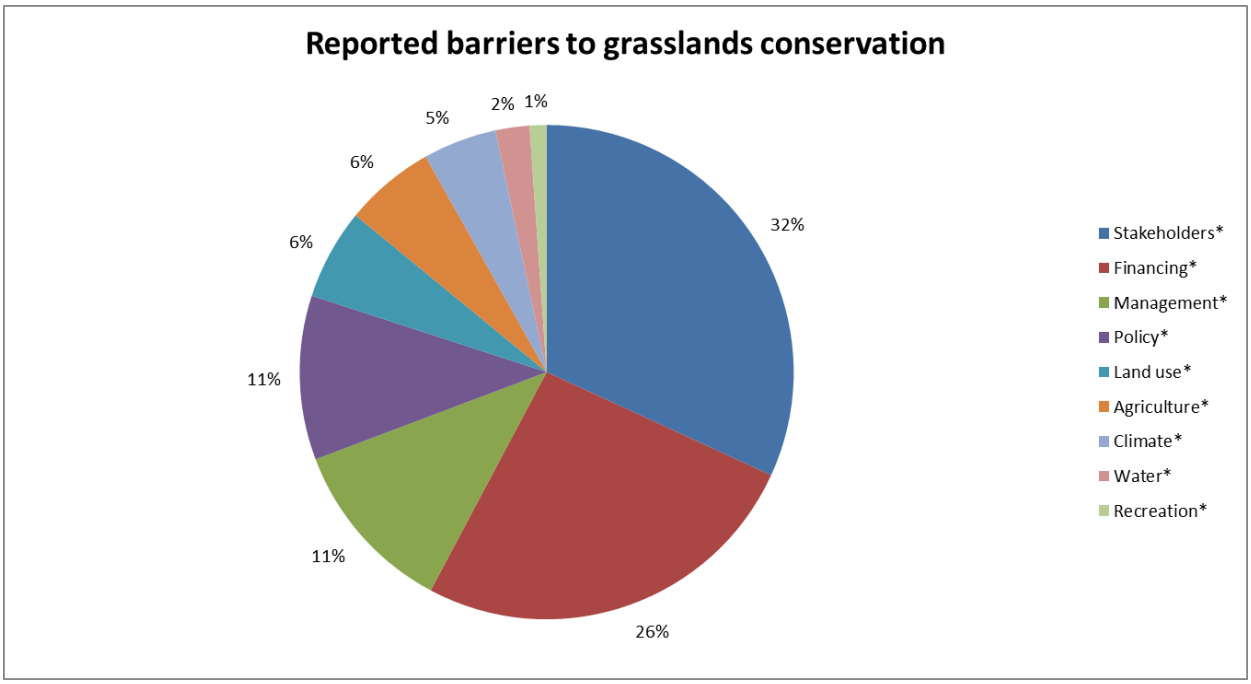


Figure 19 Results from Natura 2000 Biogeographical Process expert consultation: *General conservation barriers for grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Technical aspects should be interpreted as any possible lack of information that can prevent the achievement of grassland favourable conservation status. This may include lack of information on the location of remaining grasslands (sometimes an issue in Eastern Europe) or on the status of the various plants and animals that inhabit these grasslands. Information is equally lacking on the processes and

functioning of nature, which is needed to enable appropriate management decisions to be taken. This may include lack of knowledge of the reference values for evaluating favourable conservation status. Considering how important grazing is in the context of grassland management, data is needed regarding optimal intensity and duration of grazing, the best period for grazing (for example, not in early spring) and on grazing regimes, among others. With respect to climate change, lack of information may hinder understanding of whether this is a threat or an opportunity. Access to information is also a challenge; it is not always available to those who need it. For example, it should be ensured that information and knowledge reach farmers or administrations in charge of appropriate assessment. However, information alone can be seen as insufficient. A participatory approach and stakeholder involvement are needed to achieve effective, positive cooperation between landowners and other stakeholders. Building on scientific knowledge, management planning is an important tool to ensure continuity and coherence in habitat management as well as to gain public and stakeholder support.

Table 12 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 specific conservation barriers for grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Barriers and bottlenecks	**% responses**
Financing - Lack of funds for conservation (and complicatedness / difficult access)	15
Financing - Lack of forgone income compensation (or subsidies)	11
Stakeholders - Lack of awareness / negative attitude	10
Policy - Incorrect policy (and / or law)	9
Stakeholders - Lack of knowledge / competence / data	9
Stakeholders - Lack of cooperation	7
Agriculture - Intensification	5
Climate - Change	5
Stakeholders - Lack of skills	4
Management - Succession	3

As socio-economic conditions and rural life have changed so substantially, successful management is not possible without considering the financial aspect. One option is to show farmers that it is possible to live a good life in balance with nature. This can be done by showing them how to diversify activities so that income is generated through tourism as well as agriculture. In addition, subsidiary programmes and funding schemes will be needed to support restoration and maintenance of the various grassland habitat types. Agri-environmental schemes can probably play a dominant role. These schemes should be effective, targeted, and motivating (adequate payments per hectare) and provide long-term stability for farmers.

It is important to align various EU and national policies to avoid contradictions (such as the Renewable Energy Act in Germany). Similarly, the Common Agricultural Policy has to be fully in line with the recommendations of the Habitats Directive regarding permanent grasslands. Protected area designation has to take into account management needs into account.For example, grasslands requiring active management should not be declared an IUCN category II protected area, as has been done in Krkonose Mountains in the Czech Republic.

Additionally, in some areas the presence of obsolete warfare materials, which are very expensive to remove, prevents conservation management.

4.4.7 Solutions and opportunities

The success of management models for Natura 2000 habitats, especially grasslands, requires the involvement and agreement of many stakeholders: landowners, users, inhabitants of nearby villages, hunters, livestock owners, public administrations, environmental associations, NGOs, and many others (see Figure 20). This is why land management agreements have proved to be a suitable tool to achieve success in many European countries, as well as in Canada, the United States of America, Costa Rica and others. Most European countries draft official agreements, usually including management plans and budgets for every management unit. It is important that such an agreement uses a bottom-up approach in order to connect with people in the field directly, not only via their stakeholder representatives. This approach may be more time consuming, but it allows local managers to be heard and motivated. As an example, the LandLife project (http://www.landstewardship.eu) aims to communicate the value of land stewardship as an effective and successful tool for nature and biodiversity conservation, including the management of Natura 2000 sites.

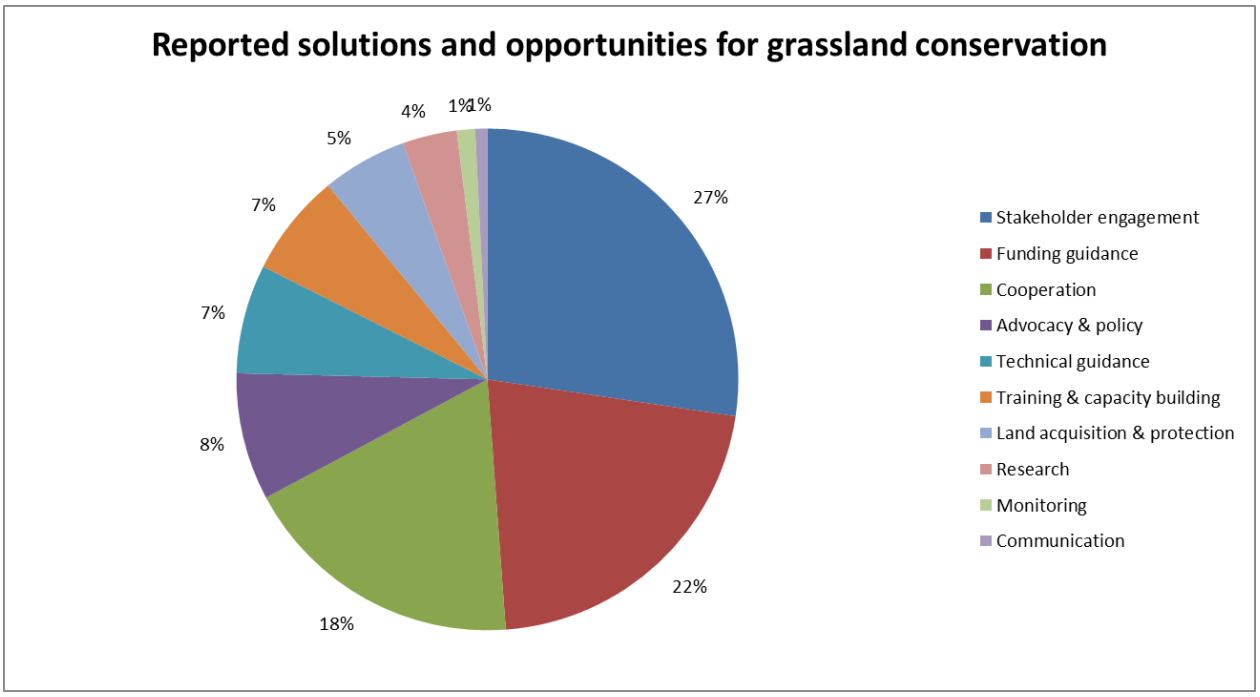


Figure 20 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation solutions and opportunities for grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

For the successful management of Natura 2000 habitats, four aspects require particular attention: (1) awareness raising and communication, (2) cooperation and stakeholder engagement, (3) finances for grasslands, and (4) better policies and legislation.

Awareness raising and communication

The elaboration of easily accessible documents for grassland owners and managers would provide a valuable resource. For example, advice could be given about good practices, dos and don'ts for the sustainable management of grassland habitat types. Although not in the geographical scope of the present seminar, a UK booklet on maintaining Worcestershire's grassland heritage illustrates how such advice could be covered in a guide: http://www.worcswildlifetrust.co.uk/sites/default/files/grasslands_-_a_landowners_guide_2_0.pdf

Cooperation and stakeholder engagement

The importance of involving stakeholders in the management of protected areas is clear, and the arguments most often cited for doing so are:

- Involving stakeholders in the management process respects their landowner and citizen rights and recognises their vital role in the management of Natura 2000 areas.
- Increasing social acceptance and public support for the management of the site. In many Natura 2000 sites habitat management is undertaken by private owners, NGOs and other non-state organisations. Effective and efficient management requires the support of local stakeholders.
- Sharing of knowledge and understanding. All stakeholders have unique perspectives as to what the problem is and what constitutes a good solution. In developing management plans, it is important to involve all key players in order to ensure that the best solutions are found and a consensus built. An important aspect of stakeholder involvement is encouraging people to work together, as part of a common effort that is driven by commonly agreed objectives. This is especially the case if sites are owned by various private owners or organisations, who are then forced to work jointly on management issues.

However, involving stakeholders in the management of sites requires investments of time and resources and can increase the complexity of the process of management planning. It also requires a long-term commitment from the various parties and might not always lead to the expected results.

In short, one of the major requirements is to keep farmers farming at low intensity. In fact, there is a need to create a multifunctional agriculture in which farmers function simultaneously as conservationists and sustainers of the cultivated landscape.

The principle of farmers taking care of the habitat can be applied in many cases. However, if the area is of no interest to farmers, or the habitat is threatened by different economic activities, land acquisition by governments may be a relevant means of ensuring its proper management.

Financing grasslands

From an economic point of view, to keep farmers farming at low intensity calls for mechanisms to improve the income from low-intensity farming, such as nature-based tourism, and the branding of products and services. Furthermore, this requires a shift from protecting nature against humans to having humans and nature work together. The challenge is to strike a balance between agriculture that is biodiversity-friendly yet not unprofitable. In this context, reference can be made to the report produced

by the European Forum on Nature Conservation and Pastoralism (EFNCP) and the WWF Danube-Carpathian Programme (WWFDCP): http://www.efncp.org/download/Mehedinti_HNVFreport_Final.pdf. As part of this project, the socio-economic needs of local farmers and policy improvements were identified. In this way, the project linked the concept of high nature value farming to the reality of farming and considered the practicalities of implementing EU commitments on identifying and supporting high nature value farming in different local situations. Additional funding for research into management options and their impacts has also been indicated as desirable.

A Member State example of the financing of Natura 2000 grassland management is the Austrian agricultural-environmental programme. The following aspects have been included in its goals:

- The promotion of environmentally friendly agriculture and pasture farming of low intensity.
- The preservation of traditional and especially valuable agriculturally used cultivated landscapes.
- The conservation of landscape.
- Fostering the inclusion of environmental planning in agricultural practice.
- Payment for the realisation of national and societal agricultural and environmental policies, such as payment for ecosystem services.
- The use of contractual nature conservation and measures to protect waterways, soil, and groundwater.

The *Financing Natura 2000 Guidance Handbook 2014–2020* should be consulted to determine whether management measures for a specific site are eligible for support from various EU funds. The following EU funds might primarily be of interest:

- The Financial Instrument for the Environment (LIFE+), which is the EU's financial tool supporting environmental and nature conservation projects.
- The European Fund for Rural Development (EARDF). This programme has might cover several management activities that are relevant to grassland habitat types. LEADER projects may be designed to include management of sites in the Natura 2000 network.
- The European Regional Development Fund (ERDF), Cohesion Fund, and Interreg. These funds might be relevant in individual cases, although activities related to Natura 2000 sites need to be integrated into a broader development context. For ERDF, they should also be related to productive investments (e.g. infrastructure). Different geographical levels are defined, all of which have specific rules, eligibility criteria and objectives.
- The Common Agricultural Policy (CAP) is one of the most important potential sources of EU funding for the management of farmland on Natura 2000 sites. The two Pillars of the CAP have common objectives, but differ in terms of financing, functioning and structure. Pillar 1 provides direct payments to farmers (and funds other measures such as market intervention and export refunds). Pillar 2 offers a wide range of measures to support farmers and other land managers and rural communities, implemented through multiannual Rural Development Programmes (RDP) prepared by national or regional administrations.

- The European Social Fund (ESF) can support capacity building aimed at the creation of new job opportunities related to Natura 2000 and small businesses.

Managing semi-natural grasslands offers good possibilities for the development of organic farming. In recent years, farmers in several European regions have shown interest in the grazing of beef cattle and sheep, enabling the traditional management of the landscapes and the production of organic meat. For example, the Rhön Biosphere Reserve in Germany used LIFE funds to promote sheep meat from the Natura 2000 grasslands as a nature-friendly product through the cooperative Natur- und Lebensraum Rhön e.V. A typical shepherd on one of the restored sites was, by 2002, selling 70 % of his annual lamb surplus direct to local restaurants and hotels at good prices. Local hotels and restaurants in the network committed themselves to use only Rhön sheep products on their menus and to promote the consumption of these dishes as a way to preserve the landscape the visitors have come to enjoy.

Ecotourism is one of the possible solutions to find an alternative 'output' for semi-natural grasslands by providing aesthetically pleasing traditional landscapes or maintaining bird habitats. For example, botanical excursions are offered in Kazakhstan, and scientific excursions are open for exclusive tourism in the USA.

Better policies and legislation

The remuneration of farmers for the environmental services they provide should be done in a transparent way. As regions of the EU with the greatest biodiversity are generally farmed the least intensively, they should therefore receive preferential Community support.

4.4.8 Relevant cross-cutting issues

The problem of changing farming practices shows a clear need to engage with the agricultural sector and to seek funding opportunities within the Common Agricultural Policy (CAP), agri-environmental subsidies and rural development funding (Figure 21). At the EU level, the CAP is the most relevant policy framework with regard to the conservation of high nature value farmland (much of which constitutes grassland habitats described here). In more urbanised areas, green infrastructure might be a useful hook to attract funding which could be used to support the management and restoration of grassland habitats.

Furthermore, spatial planning is a key sector in achieving the balance between protecting valuable habitats and finding space for controlled development and urbanisation.

Other cross-cutting issues emerging from the above include the need for:

- awareness raising and stakeholder involvement;
- increased capacity for the planning and implementation of proper management measures;
- policy coordination between different sectors (especially agriculture and water management).

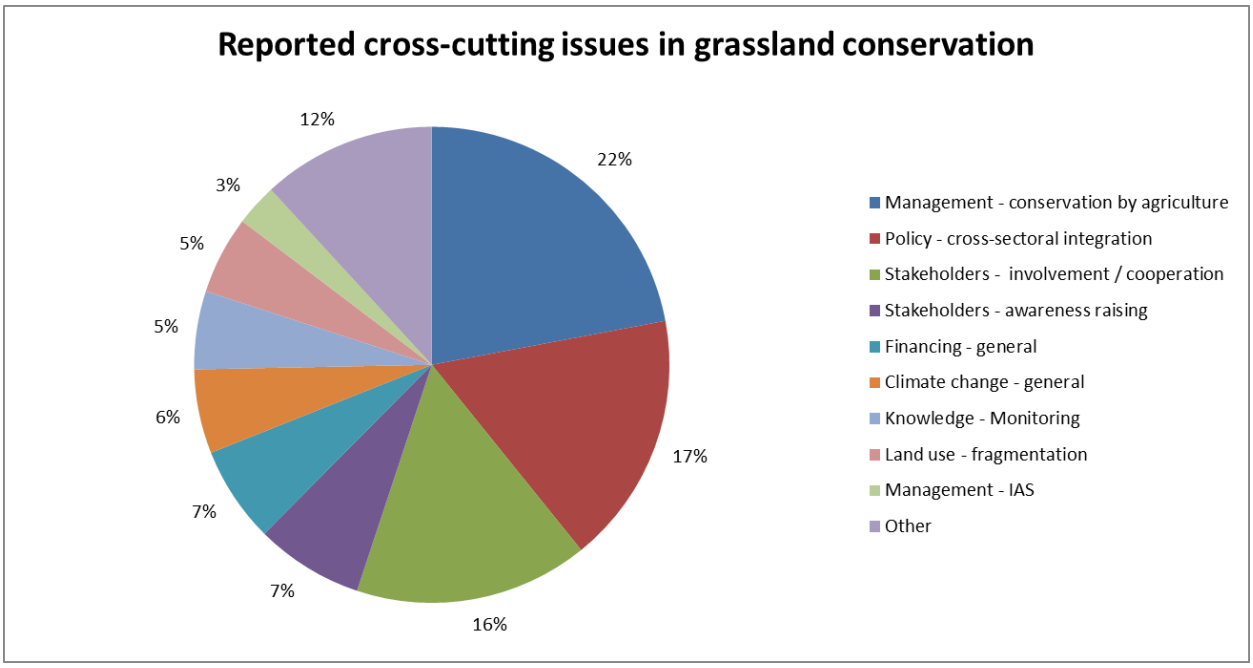


Figure 21 Results from Natura 2000 Biogeographical Process expert consultation: *Cross-cutting issues in grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

4.4.9 Lessons learned / Examples of best practice / Successful and unsuccessful projects

In recent years, knowledge about site-based actions, such as appropriate grazing and mowing regimes and scrub removal has improved, and more effective and constructive involvement of the local communities has been achieved (Figure 22). From 1999 to 2006, the European LIFE Programme co-funded more than 45 projects directly targeting grassland habitats. The financed actions varied considerably and provide a good overview of activities that were considered necessary to achieve successful conservation and management of Natura 2000 grasslands. In general, the funded projects included:

- preparatory actions (surveys, mapping, management techniques) to further increase the knowledge of grasslands and to improve conservation measures;
- land or rights acquisition;
- direct conservation actions which often concern steps taken to re-establish traditional farming activities;
- monitoring of long-term impacts;
- networking with farmers and rural organisations to develop management and conservation plans with local support;
- actions to raise awareness of grasslands among local stakeholders (farmers, environment agents, etc.), schools and the general public.

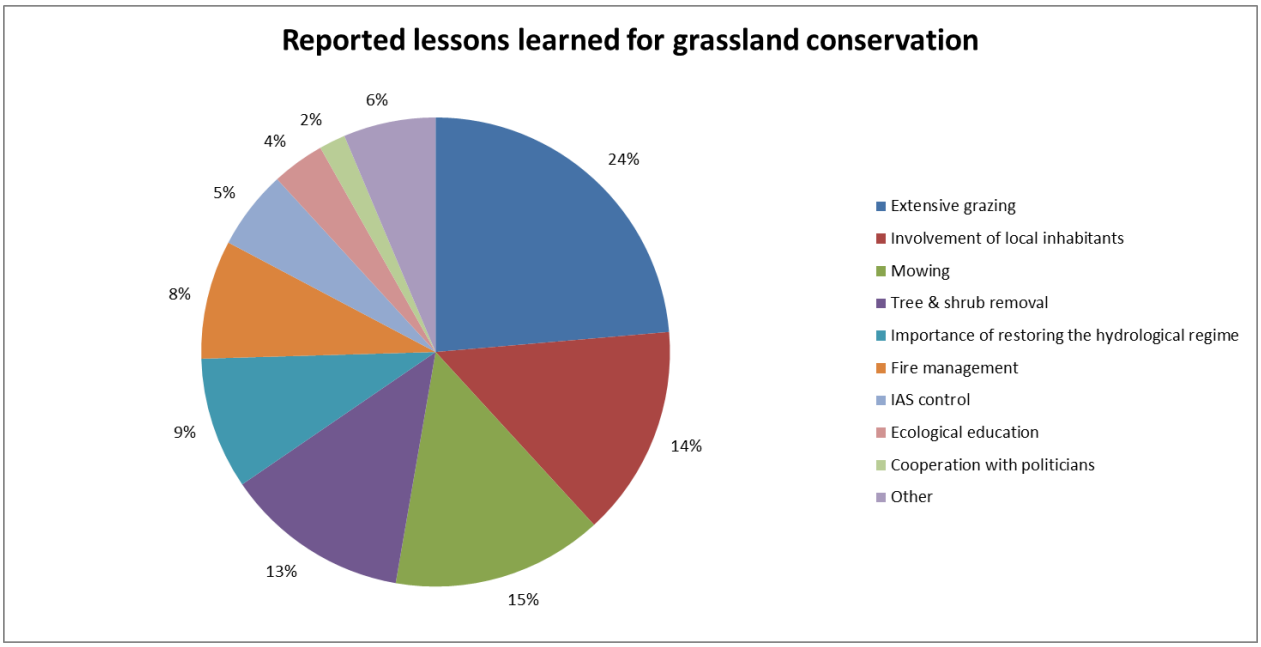


Figure 22 Results from Natura 2000 Biogeographical Process expert consultation: *Lessons learned for grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Below we provide ten examples of relevant grassland management LIFE projects undertaken in various Member States in recent decades.

1. The objective of the Austrian LIFE Nature project 'Pannonian Sand dunes' (LIFE98 NAT/A/5418) was the management of the last remaining dunes in Austria, which were 'constrained' by pines planted by the forestry administration during various reforestation campaigns, as well as by alien plants, such as *Ailanthus altissima* (Tree of heaven) and *Robinia pseudoacacia* (False acacia), which had invaded the dunes. National forestry laws were the main constraints to the project, forbidding the removal of exotic trees, especially those planted during the 20th century as part of reforestation programmes. Hungary faces a similar situation. The elimination of a forest (also when this is an alien tree plantation) requires the establishment of a new one of the same size in a different location, or the payment of large sums of money to the government, depending on the type of tree, even when the area is protected and state owned and the eradication is a part of a LIFE project.
2. Western Gutland is a crucial region for species-rich grasslands in Luxembourg and hosts many well-developed grasslands. However, they are threatened by the intensification of agricultural management and strong pressure from urbanisation. Such factors can cause habitat loss and increased uncertainty regarding the future condition of remaining grasslands. (Contractual conservation management agreements (biodiversity contracts) have been implemented, and many areas have been temporarily saved from intensification. Nevertheless, habitat loss continues and long-term solutions are needed. The LIFE13 NAT/LU/000068 project is an example of achieving Natura 2000 goals by both collaboration with farmers and the purchase and restoration of grasslands by authorities.

3. In the LIFE12 NAT/CZ/000629, the focus is on the preservation of species-rich *Nardus* grasslands in the Beskydy Mountains in the Czech Republic. Habitat 6230 in the Natura 2000 site is under threat, mainly due to eutrophication and the abandonment of traditional land management practices such as grazing and mowing. Eutrophication has led to an increase in productive grasses and a decline in the prevalence of plants that are typical for this habitat, while the cessation of traditional land management practices has led to a gradual succession to forest vegetation. Specific project aims include determining the optimal management for *Nardus* grasslands, informing and involving the owners of these grasslands (regarding threats and required management), and raising awareness and support among the general public. See also http://salamandr.info/projekty/zachrana-smilkovych-travniku-v-evl-beskydy/

4. The conservation of dry grasslands in central Hungary is the focus of LIFE12 NAT/HU/001028. These dry grasslands are generally in good conservation status with many protected species, but they are threatened by spontaneous reforestation, the spread of invasive species, and various harmful human activities. Land use related to dry grasslands has changed significantly in recent decades, as extensive livestock farming has declined sharply in Hungary, leading to the threatof spontaneous reforestation on many sites. Without urgent intervention, this process will result in radical shrinkage, or even the complete disappearance, of the dry grassland habitat. The spread of invasive species, mainly Black locust, Black pine and Common milkweed, is also a threat. For a number of economic and historical reasons, the use of grasslands in Hungary is often unfavourable to the maintenance of these habitats. Some of the project areas are affected by negative human impacts: illegal roads, urban waste disposal and illegal mining are three of the most frequent examples. The project therefore aims to eliminate shrubs and invasive species, purchase land to ensure adequate nature conservation management, and mitigate human-induced negative effects.

5. The target grassland habitat types of the Polish LIFE12 NAT/PL/000031 are inland dunes with open *Corynephorus* and *Agrostis* grasslands (2330) and xeric sand calcareous grasslands (6210). Conservation of both these sandy habitats in the Pustynia Błędowska Natura 2000 site (a former military area of Błędowska Desert) in southern Poland is poor. The project aims to restore the target sand habitats to their conservation status as recorded in 1958, after first checking that the site is safe from the possibility of unexploded ordnance, removing trees and scrub, and involving the military in developing good practices for the conservation of natural habitats within military zones. For further information, see http://rzilife-pustynia.pl/. See also LIFE09 NAT/PL/000259 'Active conservation of priority sand habitats complex (6120, 2330) in the Natura 2000 site Błędowska Desert'.

6. The meadow grassland habitat types 6410, 6430 and 6510 in Belgium's Wallonia region have been assessed as unfavourable under Article 17 of the EU Habitats Directive. Changing land-use patterns continue to present risks to the wildlife that depends on these agricultural landscapes. Wallonia's bocages are also considered under threat from changes in land use. Bocages comprise a patchwork of very small parcels of land that are separated by hedges and ditches. Such habitats provide important green infrastructure for biodiversity. The main objectives of LIFE11 NAT/BE/001059 are to recreate and restore substantial areas and an adequate bocage network that will ensure long-term conservation of characteristic habitats and associated species, and to raise public awareness about conservation of the natural heritage.

7. A project focusing on a specific species is LIFE11 NAT/IT/000213, whoseaim is the protection and species habitat conservation of the *Carabus olympiae* population in Valsessera (Italy). Olympia's Ground beetle (*Carabus olympiae*) is at risk of extinction. It is included in the EU Habitats Directive as a priority for conservation and is listed in the IUCN Red List as 'vulnerable'. The beetle is only found in two neighbouring localities in Sella dell'Alta Valle Sessera in the mountainous Piedmont region of northern Italy. The aims of the project are: (1) to reduce the risk of extinction of Olympia's Ground beetle through habitat restoration, (2) to preserve Olympia's Ground beetle and grassland areas with *Nardus stricta*, (3) to improve the coexistence of humans with the target species, (4) to set up a management model, including fundraising, to preserve and restore viable habitats for Olympia's Ground beetle, and (5) to restore rearing areas where *Nardus stricta* is particularly abundant. See http://www.lifecarabus.eu/index.php?lang=it for more information.

8. The Hungarian project LIFE10 NAT/HU/000018 targets restoration and conservation of Pannonic salt steppes and salt marshes (1530) at the Pásztói-legelő Natura 2000 site, focusing on the following plant species: Yellow star-thistle (*Centaurea solstitialis*), thistle (*Cirsium brachycephalum*), and Grass vetchling (*Lathyrus nissolia*), as well as the Large Copper butterfly (*Lycaena dispar*). The project also aims to establish a traditional and sustainable extensive grassland management system and a water management system, and to increase public awareness of the role of traditional landscape management in the conservation of biodiversity. A particular threat to the grassland habitat type 1530 at the Natura 2000 site is the increasing salinity due to a drainage system. For more information, see http://www.pasztolife.hu/index.php/hu/.

9. The project LIFE09 NAT/RO/000618 aims to improve the conservation status of two priority dry grassland habitats in the Sighisoara-Tarnava Mare SCI in Romania: semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) with important orchid sites (6210) and sub-Pannonic steppic grasslands (6240). The Sighisoara-Tarnava Mare Natura 2000 site covers 85,374 ha of one of the largest lowland areas of high nature value farmland in the EU. Following the collapse of the traditional rural economy, grazing was greatly reduced on an estimated 1,000 ha of these habitats, with the less accessible grassland abandoned completely. This has resulted in the spread of scrubland into these previously open areas. The LIFE project aims to establish conservation action plans for the two grassland habitat types, by a priority zonation in the area and the creation of micro-reserves in hotspots that include simple and practical management agreements with landowners. It is also foreseen to introduce payments for certain private owners where necessary. In short, the project will support local communities to continue or revert to traditional grassland management. Linked to this, Fundatia ADEPT[7] has been working for 10 years to protect the nature-rich, farmed landscapes of Transylvania, and to support the traditional farming communities which have created them over centuries and which maintain them today. A 10-year report on results achieved can be consulted at http://www.fundatia-adept.org/

10. The LIFE project 'Restoration of dry grassland in Denmark' (LIFE04 NAT/DK/000020) ran from 2004 to 2008, and resulted in the restoration of dry grassland through conversion of plantations

[7] Fundația ADEPT is an NGO that aims to protect Transylvania's unique farmed landscapes, their biodiversity, and the farming communities who live there.

and arable land, clearing of scrubland, and grazing. The LIFE08 NAT/DK/000464 project is continuing with the restoration and conservation of dry grassland in Denmark. The main objective is to improve the conservation status and to increase the dry grassland areas of semi-natural dry grassland and scrubland facies on calcareous substrates (*Festuco-Brometalia*), important orchid sites; and species-rich *Nardus* grassland, on silicious substrates in mountain areas (and submountain areas in Continental Europe). Furthermore, the project aims to evaluate the feasibility of different methods or combinations of methods in controlling the invasive alien species *Rosa rugosa*. The objective is to optimise efforts to control the distribution of the species, in order to obtain and maintain a favourable conservation status of dry coastal grassland habitats in Denmark.

In addition to examples related to management and the involvement of farmers (or, more broadly, stakeholders), other past activities can be equally inspiring in achieving sustainable conservation and management of Natura 2000 grasslands:

- The HNV meadow management scheme in Romania is an example of an agri-environment scheme designed to improve the conservation of Natura 2000 grasslands. The scheme includes requirements for the use of traditional manure, no use of chemical fertilisers, collection of mass cuttings within two weeks of mowing, and restrictions on grazing in flooded pastures. An additional payment is available for the 'maintenance of traditional practices' (involving a prescription to use manual mowing only). The scheme enables maintenance of the traditional landscape pattern of mosaic management of hay meadows, with a variety of mowing dates, which is ideal for enabling diverse animal and plant communities to thrive.
- An example of cooperation at the national level can be seen in the Netherlands (a country outside of the scope of the biogeographical regions covered by this study). Collective contracts were introduced for agri-environment applicants, with the purpose of improving communication between farmers and raising their environmental awareness. As a result, their capacity to deliver environmental benefits through shared best practice has been strengthened. This approach was also viewed as a more cost-effective means of delivering agri-environment objectives. These collective contracts resulted in multiple benefits for biodiversity, in particular for local species such as the hamster and meadow birds as well as for landscape features.
- Slovakia has mapped its semi-natural grassland habitat types at the national level and the resulting maps have been incorporated into the agricultural land parcel management system. Slovakia's grassland inventory is therefore not only one of the best developed in Europe, but also the best integrated into agri-environment support, though it needs to be updated. Mapping is used to target the national programme of agri-environmental measures for supporting extensive farming on semi-natural grasslands over the whole country. Emphasis was placed on areas recognised as having a minimum biodiversity value (high nature value), including Natura 2000 sites.
- Natura 2000 products and agro-tourism can be promoted through cooperation. An example is what happened in the Austrian Almo Genussregion. The Leader+ region Almenland Teichalm–Sommeralm in Styria produces excellent quality beef on 3,600 ha of alpine pastures. The Almo, the ox raised on these alpine pastures, is now a registered trademark and the product is certified.

LAG[8] promotes the Almo region as *GenussRegion* (region of enjoyment) for tourists, and quality restaurants and shops are offering the local Almo beef. Throughout the process, the key to success has been open communication with the local population and close collaboration between municipalities, farmers, tourist service providers, a regional slaughterhouse and the meat company. The beef is now also sold in about 250 outlets of a national supermarket chain.

Bad practices or lessons learned include failures in communication activities, lack of adequate research and lack of education structures in biodiversity and nature preservation, as well as high administration costs.

4.4.10 Opportunities for joint action

Knowledge transfer, best-practice sharing and transboundary cooperation have been emphasised as important tools for effective Natura 2000 management at the European scale (Figure 23).

Payments for Ecosystem Services (PES) schemes can provide an incentive for the conservation and restoration of farmland biodiversity and habitats in order to safeguard (or potentially increase) the provision of the ecosystem services they provide. Typical ecosystem services supported by PES schemes are groundwater quality, river water quality (restricting nutrient run-off and soil erosion), and carbon sequestration. PES schemes can operate between land managers or farmers and public organisations (such as municipal water companies) or private businesses (such as breweries), and may operate at the local, regional, river catchment or national scale. Successful schemes require transparency, reliability (e.g. of payments), acceptance of environmental stewardship values, trust, and strong commitment by all key stakeholders. In practice, PES schemes will only be able to halt degradation or loss of ecosystem services and biodiversity if they are embedded in a broader matrix of policy instruments that address the full range of ecosystem services from an area.

An interesting example of opportunities for joint action is LIFE10 NAT/SK/000080, a project which focuses not only on grasslands, but also on forests and wetlands by applying a transnational and trans-biogeographic approach (http://www.broz.sk/natura2000ba). The project focuses on grassland habitat types that are included in the biogeographical regions covered by this project (1340, 6110, 6240), as well as forest habitat types (9180, 91G0, 91H0), wetland habitat types (7230) and river and lake habitats (3260). Specifically, Bratislava capital region and the surrounding area are characterised by a high diversity of natural conditions supporting a large number of habitats and species of European importance. The cross-border region of Slovakia, Austria and Hungary, which includes valuable Natura 2000 sites, represents a strategically important region whose natural heritage should be preserved transnationally. Within the project site, the Pannonian and Alpine biogeographical regions melt together and there are important lothic and lenthic aquatic habitats as well as diverse man-made habitats and pristine natural forest. A total of 60 species listed in Annex II of the Habitats Directive occur in the project site – six species of plants and 54 species of fauna. These valuable habitats face threats from the abandonment of traditional land-use practices, and a high density of unregulated tourists and day trippers. The main objective of this transnational nature project is to establish a functional network of Natura 2000 areas in the trilateral border region close to Bratislava and to secure favourable

[8] Leader-Aktionsgruppe.

conservation status for the habitats of European interest found there (for details see www.danubeparks.org/files/877_Management_Plan_BAregion.pdf).

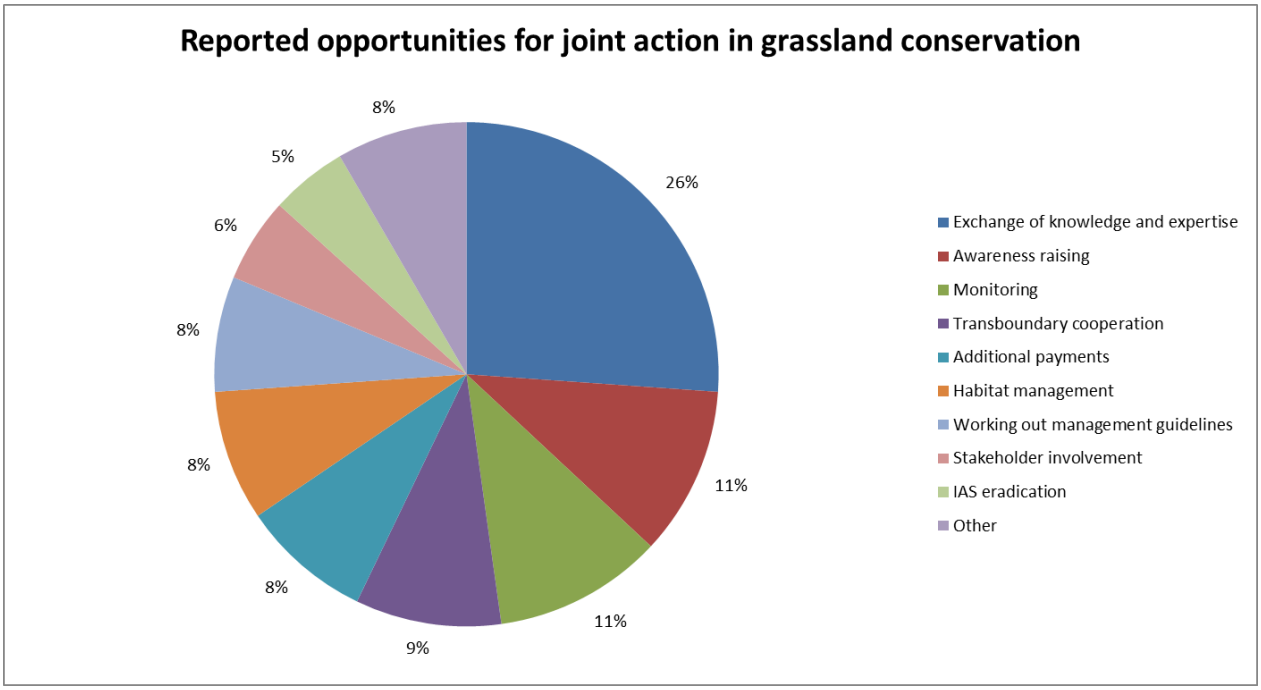
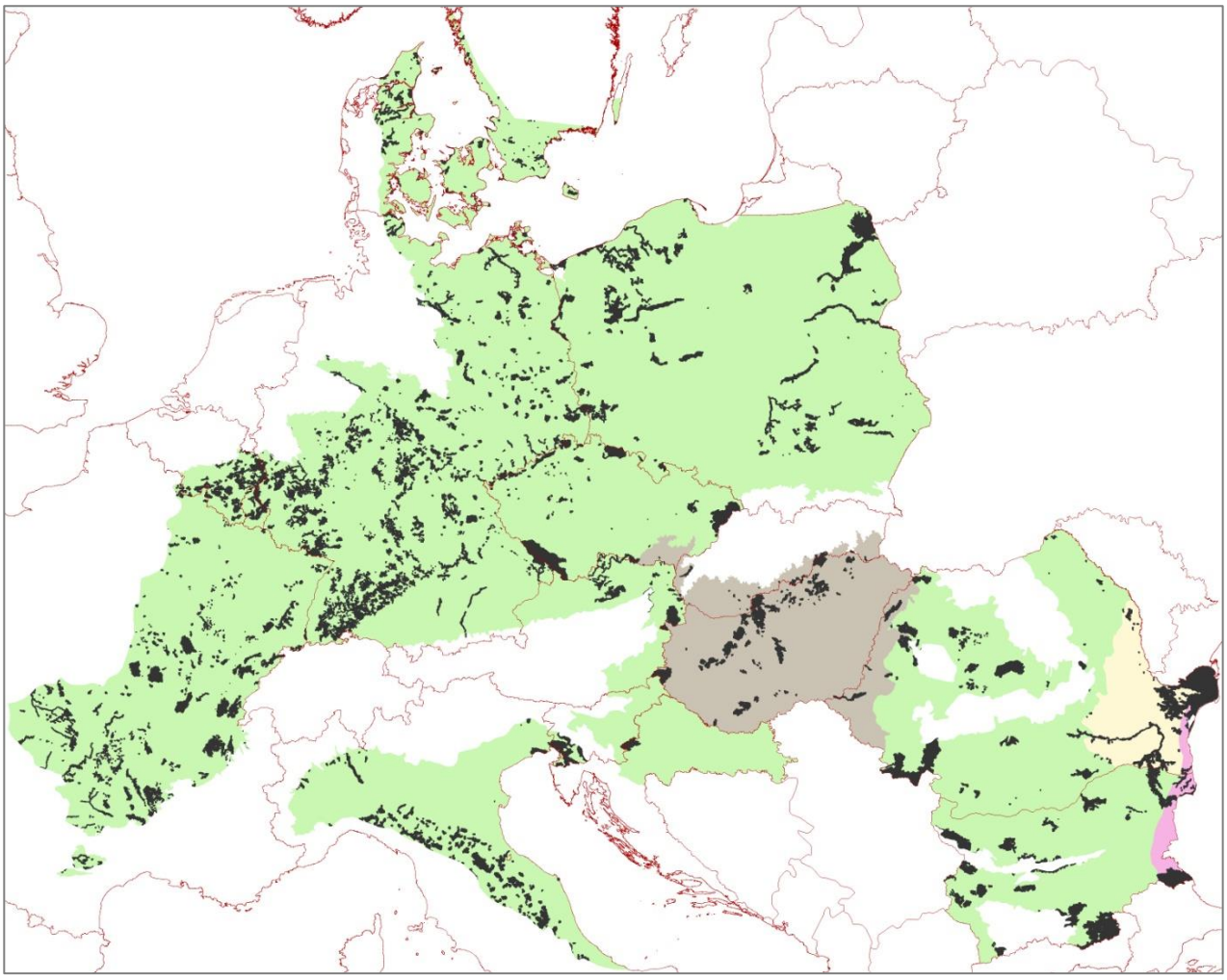


Figure 23 Results from Natura 2000 Biogeographical Process expert consultation: *Potential areas for joint action for the conservation of grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

4.5 Heaths and scrubs

4.5.1 Summary description

The heathland and scrub habitat group consists of four habitat types: 4030 - European dry heaths, 5130 - *Juniperus communis* formations on heaths and calcareous grasslands, 40A0 - Subcontinental peri-Pannonic scrub and 40C0 - Ponto-Sarmatic deciduous thickets. For each of these habitat types in the annexes, data is provided on the Sites of Community Importance (SCI) and the habitat area of heathland and scrub habitat types in the individual Member States.



Map 4 Natura 2000 sites containing heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

Table 13 The heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Seminar

Habitats Directive code and name of Heathland and scrub habitats selected for priority consideration
4030 - European dry heaths
40A0 - Subcontinental peri-Pannonic scrub
40C0 - Ponto-Sarmatic deciduous thickets
5130 - *Juniperus communis* formations on heaths or calcareous grasslands

Figure 24, based on Article 17 reporting by the Member States for the period 2002–2006, shows that the overall conservation status of the four heathland and scrub habitat types included could be seen as either unfavourable–bad (41 % of cases), unfavourable–inadequate (16 % of cases), or not assessed (27 % of cases). For the period 2007–2012 much more data was available and all habitats were assessed. The number of habitats assessed to be unfavourable–bad (25 %) was much reduced in comparison with the previous reporting period (2002–2006).

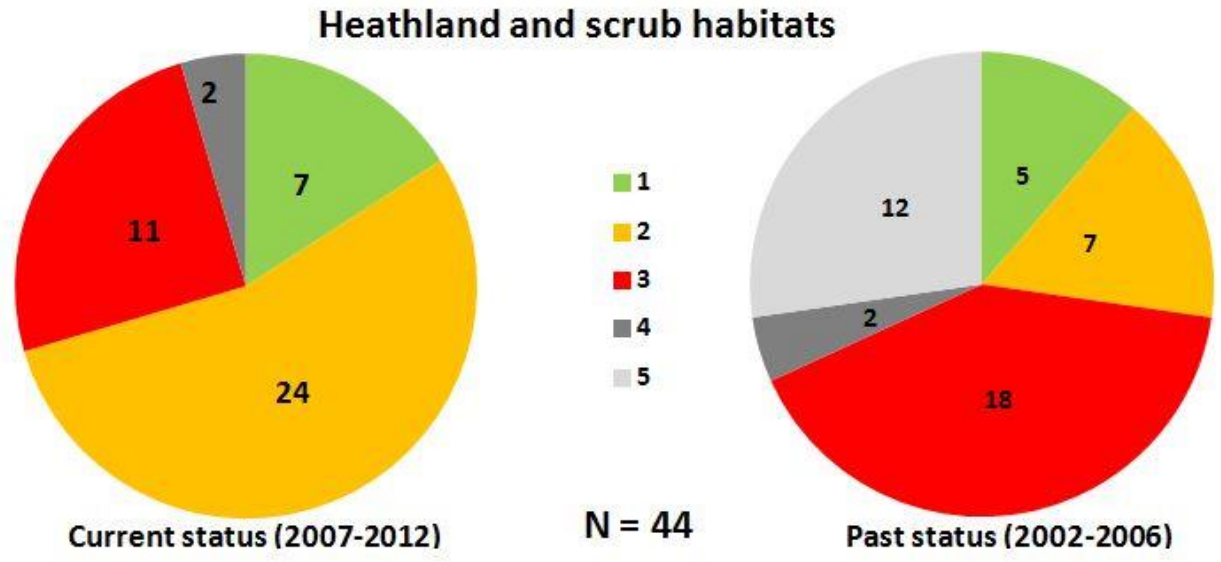


Figure 24 Current and past conservation status of heathland and scrub habitats based on Article 17 reporting. Numbers represent individual country/biogeographical region assessments (only habitats selected for priority consideration are included); N is the total number of assessments in each period. 1 = FV: favourable; 2 = U1: unfavourable–inadequate; 3 = U2: unfavourable–bad; 4 = XX: unknown; 5 = N/A: not assessed

However, the number of habitats assessed to be unfavourable–inadequate increased more than threefold (55 %). This should not necessarily be interpreted as an overall decrease in conservation status, provided that in the previous reporting period (2002–2006) many habitats were not assessed. For the period 2002–2006 only 11 % of habitats were assessed to be in favourable conservation status, a percentage that increased to 16 % for the period 2007–2012. The most significant change between the

two reporting periods is that the share of habitats in unfavourable–inadequate conservation status has considerably increased.

4.5.2 Issues - pressures - threats

Much of the Continental landscape has been significantly transformed through centuries of changing land uses. By the 19th century, heavy industries were omnipresent in key areas like the Ruhrgebiet or in the Black Triangle between Germany, Poland and the Czech Republic. Local human populations increased substantially as people moved into these areas looking for jobs. The impact on the environment was substantial. Large tracts of land were urbanised and transformed into industrial zones, while pollution began to cause major problems. Only a few habitats on poorer soils, such as heaths, escaped major transformation. These habitats were managed extensively, or not managed at all. Such was the case for the areas around Pomorania, Central Bulgaria and on the Massif Central in France.

However, this is not the case across the entire biogeographical region. Indeed, former widespread heathlands on sandy soil in the northern part of the Continental biogeographical region have to a large extent been cultivated or afforested. Here, many areas of heathland have been lost to housing, other urban development, artificial planting (mainly with coniferous trees, non-native species) or conversion to farmland (Figure 25). This also resulted in the knock-on effect of leaving some areas of surviving heathland in a highly fragmented and isolated state. Therefore, there is a growing concern that opportunities for heathland species to disperse between such sites and to recolonize sites that have been restored are inevitably very limited.

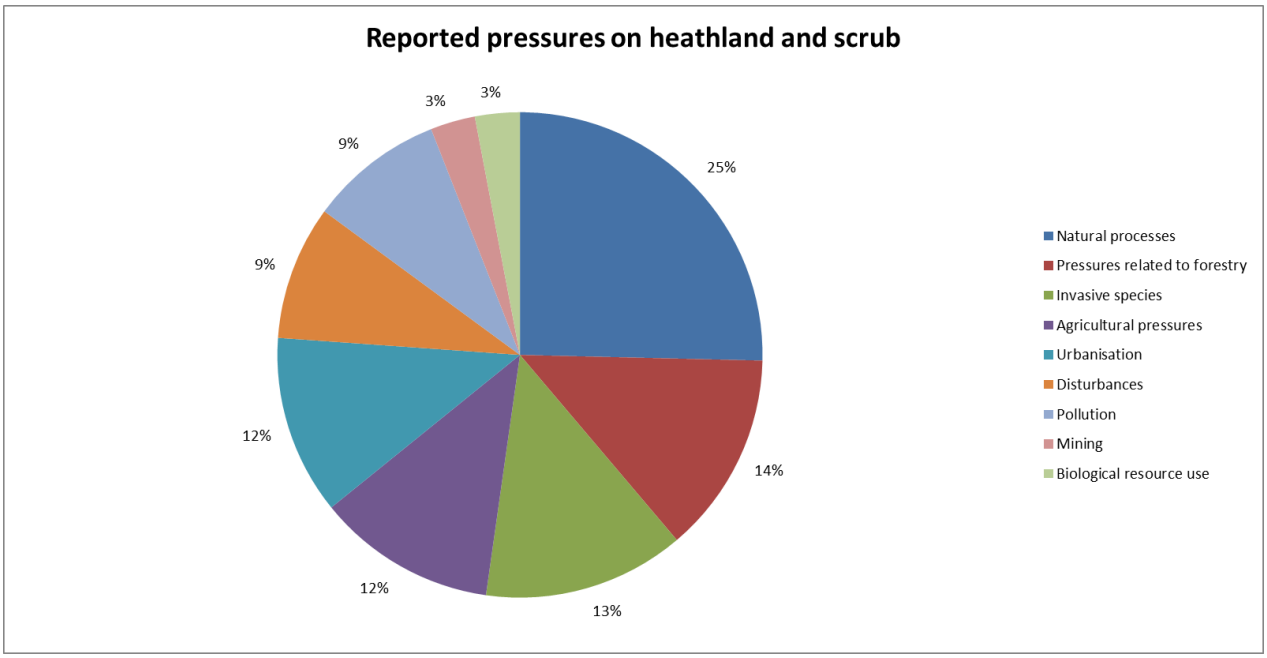


Figure 25 Results from Natura 2000 Biogeographical Process expert consultation: *Pressures on heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Further, heathland areas have been characterised and shaped by past human influence. Historically these habitats have provided permanent pasture for mixed farming systems. They provided not only grazing, but also fuel, livestock bedding, winter fodder, thatching and even road building material. The use of heathlands prevented the regeneration of the forest. The relationship of heathlands with human communities has since changed and a loss of pastoralism practices has led to an increasingly fragmented, urbanised, scrub-dominated habitat, especially in lowland areas. Recent disturbances to heathlands are air pollution and recreation. Air pollution can result in the deposition of unwanted nutrients onto heathlands, which can critically alter their acidity and overall nutrient status Nitrogen deposition may favour more competitive grass species by increasing nitrogen levels, thus leading to fundamental changes in plant community composition and potentially to increased pest outbreaks (Heather beetle) as a result of higher nitrogen concentration in plant tissues. Specifically, the decline of heathland quality in the later decades of the 20th century is usually attributed to increased soil nutrient status. This is due mainly to the abandonment of traditional management practices, resulting in a steady accumulation of nutrients in the system. In addition, heathland is a popular recreational resource. This can lead to excessive disturbance of wildlife, pollution through dog-fouling and littering, and damage through trampling and erosion. This type of pressure is greatly increased where heathland sites are located close to built-up areas.

Other human-influenced threats include motocross, motorcycles, quads, land abandonment (for decades), quarrying, and military activities on Natura 2000 sites.

Table 14 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 level 1 pressures for heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Pressure	***% responses***
K02 - Biocenotic evolution, succession	15
B01 - Forest planting on open ground	12
H04 - Air pollution, airborne pollutants	9
I01 - Invasive non-native species	9
E01 - Urbanised areas, human habitation	6
G05 - Other human intrusions and disturbances	6
A03 - Mowing / cutting of grassland	4
E04 - Structures, buildings in the landscape	4
I02 - Problematic native species	4
K03 - Interspecific faunal relations	4

As with grassland management, when grazing is applied, what is needed is an intermediate intensity of grazing. Overgrazing leads to the loss of dwarf shrubs, which are substituted by species that are more resistant to grazing. Eventually, this process enhances the expansion of grassland habitats. Undergrazing may cause a widespread degenerate phase, where gaps form in the canopy, allowing invasion by other species and eventual succession into woodland. The accumulation of woody material can also increase the risk of high-intensity, unplanned fires, particularly during summer months. Lack of mowing can result

in similar effects, although mowing techniques should be well analysed before being put into practice. Ecological succession as another pressure can also be mentioned here. Furthermore, invasive species such as *Pteridium aquilinum*, *Ulex gallii*, *Rhododendron ponticum* and *Gaultheria shallon, Prunus serotina, Heracleum sosnowskyi, Solidago gigantea/canadensis, Robinia pseudoacacia* can become dominant because of inappropriate management and can lead to the loss of dry heath communities. The development of problematic non-native species (*Sedum sp., Cotoneaster horizontalis, Mahonia aquifolium*) is also a threat. In addition, afforestation results in direct habitat loss and can also contribute to habitat fragmentation if poorly designed. Natural regeneration in and around existing tree plantations can also reduce the area of open habitat and lead to an increase in the predation rates of ground-nesting birds. On the other hand, there are difficulties for species such as *Juniperus communis* to regenerate.

For example, in the southern part of the Black Sea biogeographical region the main pressures on biodiversity and natural habitats come from the afforestation of dune ecosystems and heathlands for commercial timber production with alien *Pinus* species, combined with highway construction and urbanisation along the coast. Furthermore, in the peninsulas of the Istanbul province along the transition zone between this region and the Mediterranean, there are large stands of heathland, which are among the rarest habitat types in Europe. This unusual distribution pattern of heathlands results from the unique geographical location of the area, which is affected by both the Black Sea and Mediterranean climates. Ninety-five per cent of heathlands in this region have already been lost due to urbanisation and afforestation. The remaining 5 %, covering an area of more than 20,000 ha, still support substantial wildlife. Traditionally, Istanbul heathlands are used for bee farming and grazing. Heathers are also used for broom production, an important element of the rural economy in the Istanbul region.

Where Subcontinental peri-Pannonic scrub (40A0) borders arable land, threats include conversion to arable land, burning of stubble fields and inflow of nutrients from the arable fields. Indeed, a large part of this habitat has already been destroyed because of these threats. Other reported threats and pressures include inappropriate land management, abandonment of traditional grazing regimes, uncontrolled tourism and the harvesting of blooming lilac twigs for selling. Another threat for the 5130 habitat type is the removal of orchids, and sometimes other plant species, by plant collectors. Other threats here are ploughing and the creation of illegal waste dumps. Moreover, sometimes preference is given to temporary solutions, which makes it challenging to achieve conservation goals because management stops when the funds run out.

4.5.3 Main conservation requirements

Dry heathlands (4030) occur on poor soil and are man-made habitats that resulted from forest clearance. Traditional management has involved a complex interaction between grazing, arable cultivation and the use of turf and plant materials from the heaths, making these habitats cultural landscapes in addition to their status as biodiversity rich sites. In a few areas, the persistence of heathland still relies on these traditional techniques, but in most cases traditional forms of land use have vanished. Many protected heathlands are now isolated areas surrounded by intensively managed land. These isolated patches share two main challenges: reducing vegetation succession through site-based actions (Figure 26) and the maintenance of low concentrations of soil nutrients, against high background concentrations. Indeed, the use of artificial fertilisers on adjacent land may lead to pollution of groundwater and an increase in dominant grass species.

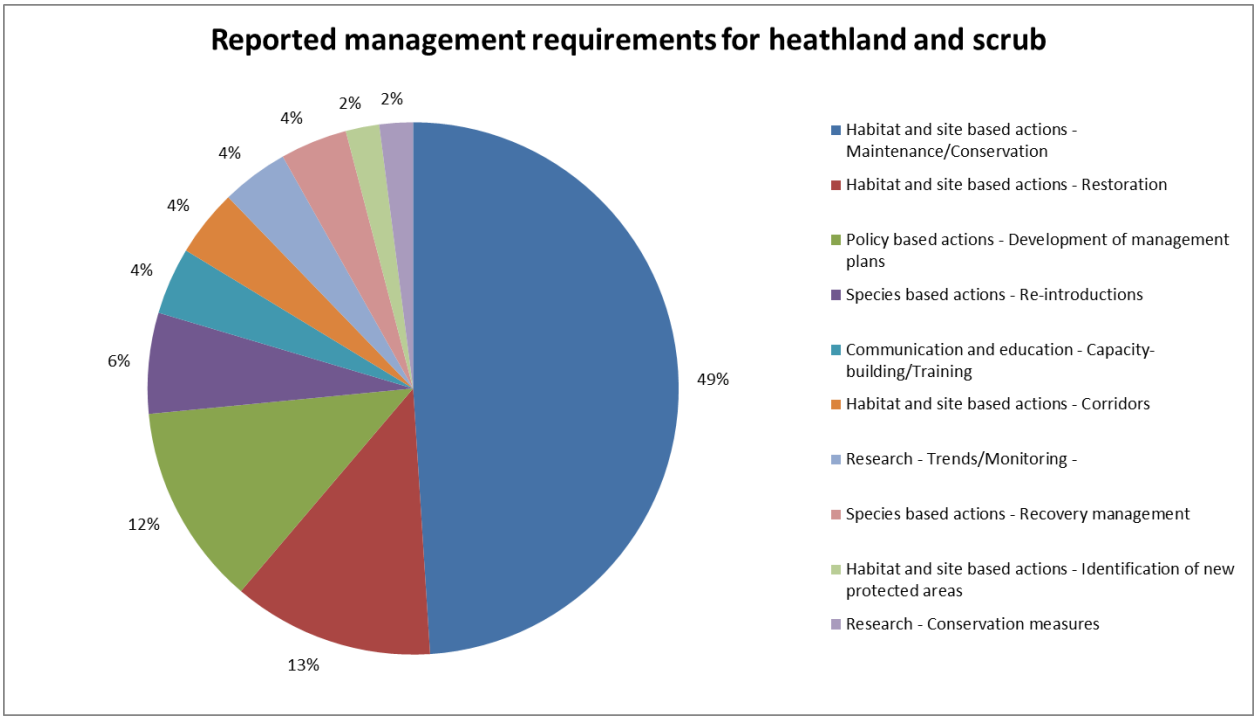


Figure 26 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation requirements for heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Where cultural landscapes remain, they should be sustained and encouraged because the landscape they produce has a high value for nature conservation. However, this may be difficult as the agricultural economy which lay behind them no longer exists. Two types of heathland can be distinguished. The first are relatively large areas surrounded by supporting land that can be managed as a unit and on which traditional practices can be reinstated. This will be possible in only a few places, unless these units of land can be restored through land acquisition by conservation bodies. The second type of heathland persists in isolated patches. Although based on traditional practices, management will remain intensive and, while conserving biodiversity, will not maintain the cultural landscape it used to be.

For conservation purposes, management requirements include the cutting of trees (also stump regrowth cutting) and shrubs, mowing and pasturage to prevent succession. As is the case for many habitat types, the removal of invasive plant species also requires considerable attention.

Additional conservation measures include monitoring and phytocoenological studies, sod removal, connectivity enhancement, reinforcement of declining populations/species (e.g. *Juniperus communis* in heathlands and *Arnica montana* in *Nardus* grasslands), restoration (e.g. by LIFE projects), efficient protection of habitats outside the Natura2000 network, and capacity building/training.

4.5.4 Management and conservation measures

Heathlands have high requirements in terms of active site-based actions (Figure 27). One of the main management measures for habitat type 4030 is grazing by sheep, used to limit successional change and

to stop woodland from colonising open areas. Nevertheless, culling of wild herbivore populations (e.g. deer) may be necessary in some areas to control grazing pressure. Controlled burning is used in a similar way to grazing, and regular controlled burning over small areas is generally recommended for dry heaths, provided it is coupled with effective post-burning monitoring. Cutting is another essential measure for the management of dry heaths, especially on lowland areas where it mimics traditional practices that previously helped to control invasive species such as *Ulex gallii*. As with controlled burning, cutting should be done over relatively small areas on a rotational basis. Likewise, scrub removal is essential on dry heaths where grazing or regular cutting has failed to prevent the establishment of tree species in open areas. This measure should be applied as part of a phased restoration programme where future management ensures that any recolonization is controlled through a sustainable (rotational) grazing management system. The active management of habitats should also include removal of invasive plant species. Where recreational activities take place, the impact of visitors on sensitive dry heath vegetation and associated ground-nesting birds during the breeding season should be managed. Specific management measures include diversification of the habitat structure for the Sand lizard in 2330 grasslands - 4030 heathlands and sod cutting (Lycopodiaceae for habitat 4030).

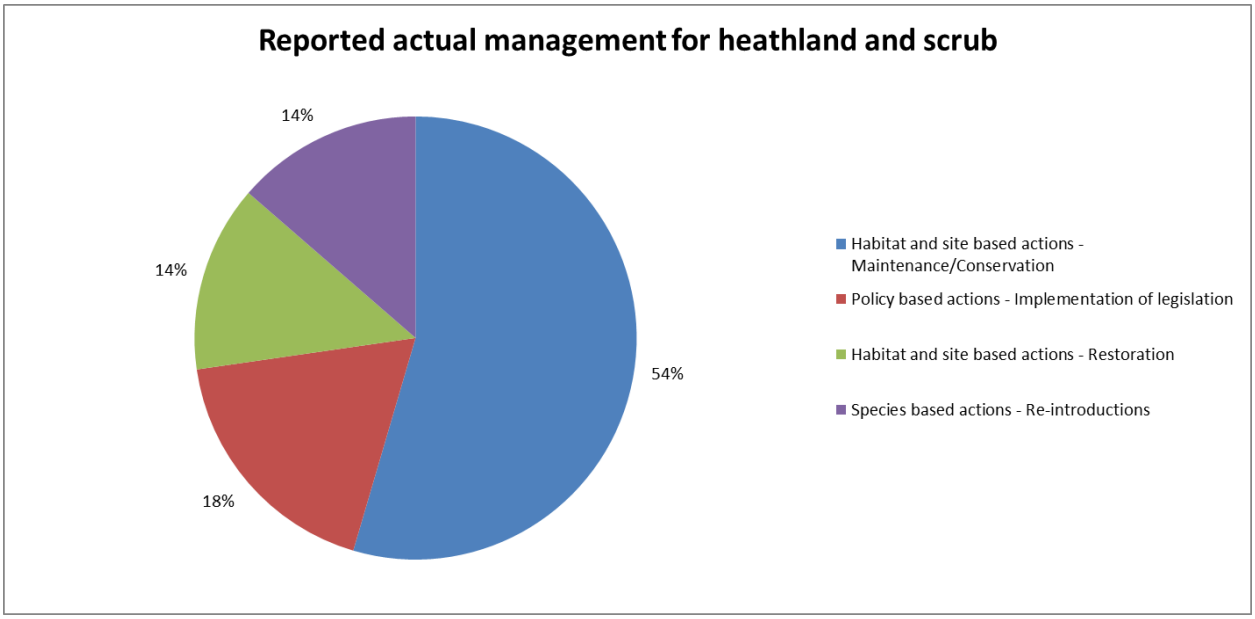


Figure 27 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation measures for heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

For habitat type 5130, the cutting of trees and shrubs, mowing and pasturage are management actions that can prevent succession. In addition, most areas need the removal of invasive alien species, while some areas also require the removal of garbage. Good results were achieved in Poland by cutting trees which had overgrown the habitat and by extensive grazing by sheep at low stocking rates from May to September each year.

4.5.5 Species-specific measures

For most of the heath and scrub habitats selected for priority consideration, experts did not indicate the need for site-specific protection measures. The only exception was European dry heaths (4030), where sod cutting was recommended for Lycopodiaceae. Burning through rotational management and reinforcement of *Arnica montana* populations were also measures endorsed by experts. Last but not least, diversification of habitat structure for *Lacerta agilis* was stressed as a species-specific requirement for European dry heaths (4030).

4.5.6 Bottlenecks - Problems

Lack of information on the location of the remaining habitats or the status of the plants and animals that inhabit these habitat types can be an issue in Central and Eastern European Member States. This may include the lack of knowledge of the reference values to be used when evaluating conservation status. Information is also lacking on the processes and functioning of nature to allow for appropriate designation of management plans. A challenge here is that information is not always available to those who need it the most. For example, information does not necessarily reach all stakeholders involved in habitat management, such as land owners, land managers and administrative entities.

For heathlands (4030) in Central Europe, adopting proper nature conservation management is impeded by poor knowledge of traditional management practices, because these heathlands were probably always restricted to small and more or less isolated areas. Furthermore, near the limits of its range, *Calluna* is less vigorous, possibly due to drought stress and the effects of lower temperatures. Therefore, not all of the above-mentioned conservation measures that are in use for heathland management in Western Europe may be ideal when applied to heathlands in Eastern European countries.

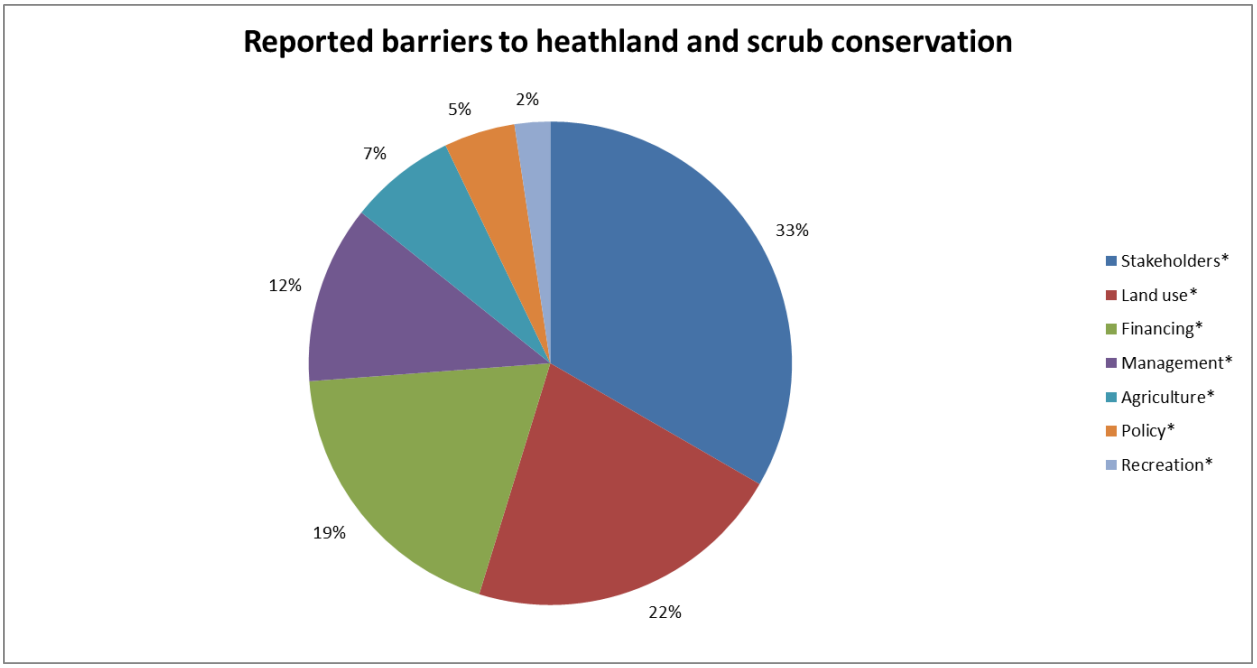


Figure 28 Results from Natura 2000 Biogeographical Process expert consultation: *General conservation barriers for heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

A general problem with the conservation and preservation of heathlands is associated with changes in land-use practices and the disappearance of traditional management systems (Figure 28 and Table 15). Indeed, in today's social and economic conditions, the required pastoral practices are no longer viable. Nevertheless, for the conservation or restoration of a favourable conservation status for habitat type 4030, human intervention is needed. Intensive land use does not seem to be suitable for restoring or enhancing characteristic biodiversity.

Table 15 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 specific conservation barriers for heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Barriers and bottlenecks	***% responses***
Financing - Lack of forgone income compensation (or subsidies)	10
Financing - Lack of funds for conservation (and complicatedness / difficult access)	10
Stakeholders - Lack of cooperation	10
Agriculture - Intensification	7
Land use - Air-borne pollution	7
Land use - Conversion	7
Management - IAS	7
Stakeholders - Lack of awareness / negative attitude	7
Stakeholders - Lack of skills	7
Land use - Military contamination	5

Several problems or bottlenecks can be highlighted for the management of heathland habitat areas. One of the frequent issues is the lack of management plans at an appropriate spatial scale. Ideally, this should be at landscape level, so that management of the heathland is considered in relation to surrounding woodlands and agriculture. Another related problem is the poor understanding of the relationship between conservation measures and biological outcomes at the individual site level. In particular, this is also the result of a lack of knowledge of habitat requirements and life histories of characteristic species, combined with the use of over-simplistic compliance monitoring and no clarity about key conservation objectives as well as future 'climate-proofing'.

In addition, the lack of appropriate training of advisers and scheme managers and the resulting gaps in skills and knowledge make the designation and implementation of appropriate management plans difficult. This is ultimately mirrored in conservation policies conflicting with conservation interest, and the reticence of stakeholders to implement measures that would normally benefit the habitat. For instance, in Poland it is difficult to agree on an 'open habitat' due to conflicts with forest and woodland conservation organisations and campaigners. Moreover, Polish environmental law prohibits vegetation burning, which is a valuable conservation measure for the heathland and scrub habitats. Likewise, lack of training and an adequate advisory system means that the policy framework does little to support a cross-sectoral management approach, and also makes it very difficult to implement cross-compliance measures.

Last but not least, there is limited financial support to encourage appropriate management, and regulations concerning funds are complicated and bureaucratic. A specific issue from Germany is related to contamination with dangerous military waste (ammunition and explosives), where management is very difficult and often strictly forbidden by legislation. The costs of removing warfare materials are also very high. Another challenge in Germany is that large parts of some protected sites (nature reserves) have been declared wilderness zones, and heathland management is forbidden by special conservation regulations.

4.5.7 Solutions and opportunities

The most frequently cited solutions by the experts consulted are effective stakeholder engagement, providing technical and funding guidance, and training and capacity building for better and economically viable habitat management (Figure 29). In particular, there is a need to shift from reactive to proactive interventions. A reactive approach may come too late, when it is no longer possible to recover a lost or damaged resource. Indeed, interventions should not be undertaken only because of mandatory requirements, but should be considered at an early stage in order to prevent damage or restore a natural resource in the most optimal way and with minimal financial burden. Therefore, from an economic point of view, proactive policies are appropriate for biodiversity conservation, because the cost-saving recovery/restoration minimises the risk of irreversible environmental damage. To halt the loss of, and where possible restore, habitat types 4030, 5130, 40A0 and 40C0, the primary target of management or conservation plans should be maintaining and increasing areas occupied by these habitat types, and improving their conservation status. Restoration measures are much needed and they should be part of a wider set of management tools to reduce habitat fragmentation.

- Preparing management plans in the near future
- *Scientific research works on positive and negative influences on the habitats*

Land acquisition practical communication and capacity-building for managers, owners and stakeholders.

Often, management actions try to recover or emulate traditional management, whereby impact on the composition, structure and function of the habitat type needs to be monitored and documented. Furthermore, measures need to be complemented by public awareness programmes to disseminate and share key benefits to society of valuable natural areas, such as ethnographic and cultural values or ecosystem services, thus highlighting the positive aspects of their conservation.

Specifically for habitat type 4030 there are a number of possible solutions that would significantly contribute to the achievement of a favourable conservation status. First, it is necessary to develop clear funding schemes with a full understanding of conservation needs supported by the evaluation of biological outcomes rather than just the delivery of management actions. It is agreed that more accessible funding should be allocated for eradication/control of invasive non-native species. The conservation goals/outcomes of such schemes should take into account the complexity and needs of whole assemblages rather than individual species. They should be managed by setting clearer duties for the responsible public bodies linked to the need to assist with the protection and conservation of dry heath sites. Equally, effective monitoring regimes that link habitat management to a range of biological outcomes will help in keeping track of progress and allow for a feedback loop among stakeholders. Education and training to raise awareness of the importance of heathland, as well as the particular

measures needed to conserve its full range of biodiversity, can also enhance stakeholder cooperation. Education, training and support for marketing products from pastoral systems are an example of how to attract and actively engage landowners and other stakeholders in the conservation process. Specific management requirements, such as removal of warfare materials, should be part of the policy framework and should be supported by funding schemes.

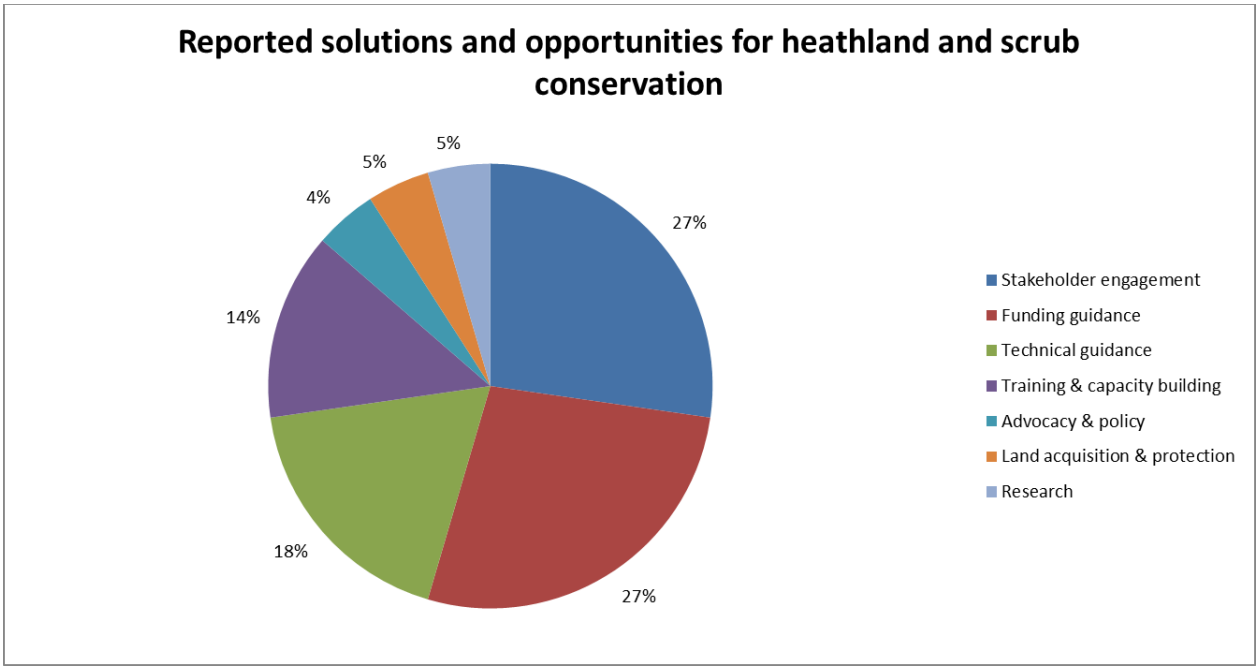


Figure 29 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation solutions and opportunities for heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

The *Financing Natura 2000 Guidance Handbook 2014–2020* can be consulted in order to identify whether management measures for a specific site are eligible for financial support from various EU funds. The following EU funds might be of interest:

- The Financial Instrument for the Environment (LIFE+), which is the EU's financial instrument supporting environmental and nature conservation projects.
- The European Regional Development Fund (ERDF), the Cohesion Fund, and Interreg. These funds might be relevant in individual cases, although activities related to Natura 2000 sites need to be integrated in a broader development context, and for the ERDF they must also be related to productive investments (e.g. infrastructure). Different geographical levels are defined, each of which has specific rules, eligibility criteria and objectives.
- The Common Agricultural Policy (CAP) represents one of the most important potential sources of EU funding for the management of farmland on Natura 2000 sites. The two Pillars of the CAP have common objectives, but differ in terms of financing, functioning and structure. Pillar 1 provides direct payments to farmers (and funds other measures such as market interventions and export refunds). Pillar 2 (European Agricultural Fund for Rural Development or EAFRD) offers

a wide range of measures to support farmers and other land managers and rural communities, implemented through multiannual Rural Development Programmes (RDP) prepared by national or regional administrations. This programme has the potential to cover several management activities that might be relevant for the habitat types covered here. LEADER projects could be designed to include management of sites in the Natura 2000 network.

- The European Social Fund (ESF) can support capacity building aimed at the creation of new job opportunities related to Natura 2000 and small businesses.

4.5.8 Relevant cross-cutting issues

Spatial planning is a key sector in achieving the balance between protecting valuable habitats and finding space for controlled development and urbanisation. For example, spatial planning should take into account that actions such as planting of new woodlands and forests, the location of renewable energy sites, etc. should be integrated with the requirements of heathland species. Additionally, spatial planning should ensure that areas of existing heathland outside Natura 2000 sites are not significantly affected by urban and transport infrastructure development, and that no barriers are created that prevent free movement of species on a landscape scale.

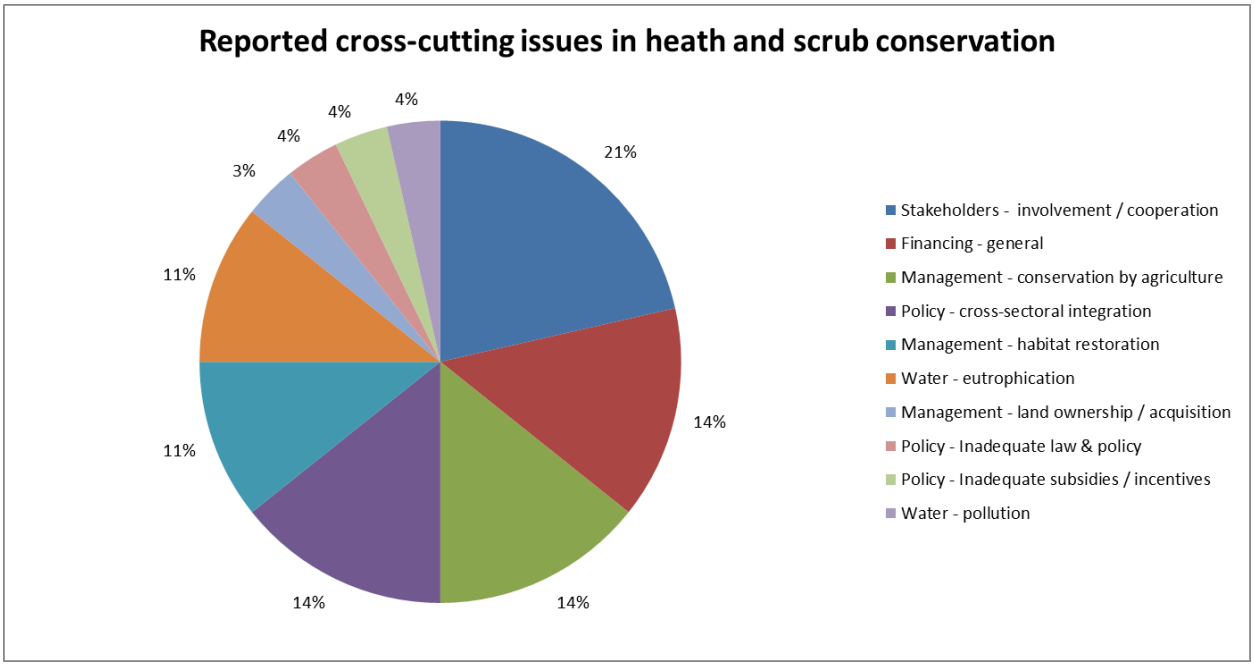


Figure 30 Results from Natura 2000 Biogeographical Process expert consultation: *Cross-cutting issues in heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Other cross-cutting issues include the need for awareness raising and stakeholder involvement (involvement in active protection, breeding animals and using them for grazing); increased capacity for the planning and implementation of proper management measures; policy coordination between

different sectors; more effective funding mechanisms, and integrating Natura 2000 in forestry practices for all related habitats (Figure 31).

4.5.9 Lessons learned / Examples of best practice / Successful and unsuccessful projects

This section provides an overview of projects (many of which are under the European LIFE programme) that focus on conservation and management to improve the favourable conservation status of European dry heaths (4030), *Juniperus communis* formations on heaths and calcareous grasslands (5130), Subcontinental peri-Pannonic scrub (40A0), and Ponto-Sarmatic deciduous thickets (40C0).

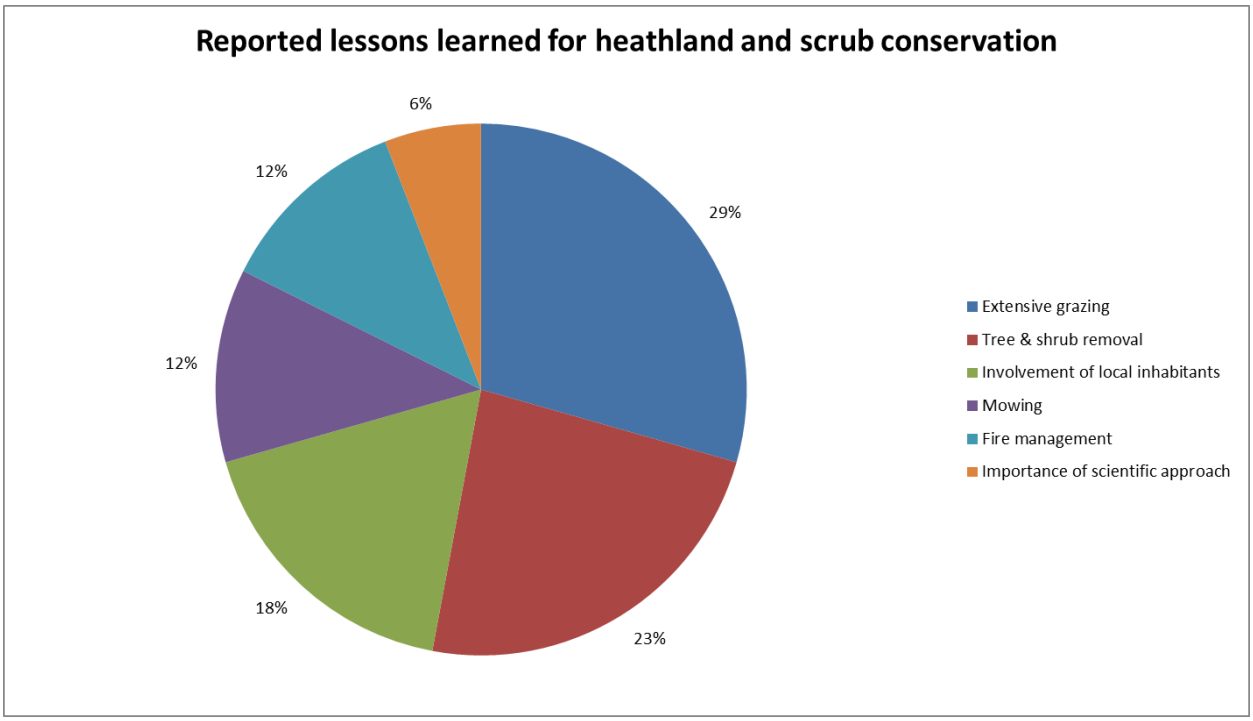


Figure 31 Results from Natura 2000 Biogeographical Process expert consultation: *Lessons learned for heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

The project LIFE09 NAT/DK/000370 targets the restoration of heaths and inland dunes in Denmark, including both European dry heaths and *Juniperus communis* formations on heaths or calcareous grasslands. Several factors adversely affect the conservation status of the heathland habitats. Air-borne fertilisation, atmospheric nitrogen deposition and the Heather beetle (*Lochmaea suturalis*) are responsible for the overgrowth of grasses at the expense of the characteristic heathland scrubs, resulting in a major loss of biodiversity in all of the targeted habitat types. Overgrowth with woody species is part of the natural succession of all of the habitats, but abandonment of pastoral systems has accelerated this process. The main objective of the project is to improve the conservation status and, if possible, increase the surface area of dry sand heaths with *Calluna* and *Genista* (2310), dry sand heaths with *Calluna* and *Empetrum nigrum* (2320), inland dunes with open *Corynephorus* and *Agrostis* grassland (2330), Northern

Atlantic wet heaths with *Erica tetralix* (4010), European dry heaths (4030) and *Juniperus communis* formations on heaths (5130).

Habitat types 4030 and 5130 are also among the target habitat types in project LIFE06 NAT/B/000091. The high Hautes-Fagnes plateau, in the north-east of the Ardennes (Belgium), consists of acidic and nutrient-poor soils developed on old sediments. It is a region of great ecological value. Heaths, fens and bogs are often in a degraded state, mainly as a result of drainage, widespread spruce plantation and the abandonment of traditional agricultural and pastoral use. The area also forms part of an international nature park that crosses into Germany, the Hautes-Fagnes–Eifel Nature Park. The main economic activities are forestry, tourism and hunting. Two-thirds of the land is publicly owned, local communities own nearly one-fifth, and only just over an eighth is privately owned. Planned actions included purchasing coniferous forest for habitat restoration, negotiating with forest owners to achieve nature conservation, restoration works such as deforestation and the introduction of extensive grazing to ensure the sustainable management of open landscapes. In Belgium the 4030 habitat of dry heathlands was restored with the help of LIFE projects. In particular, a Natura 2000 project was carried out in two military camps in Wallonia – at Lagland and Elsenborn – where significant areas of dry heathlands and *Nardus* grasslands still subsisted. Measures included felling trees, and removing scrubs and top soil. Some 28 ha of *Nardus* grassland and 200 ha of *Calluna* heathland have been restored. The project also aimed to initiate continuous management of the restored habitats by grazing (70 ha at Lagland) or controlled burning (752 ha at Elsenborn).

Other LIFE projects have restored dry heathlands, but to a lesser extent. At present one project (LIFE Herbages) aims to restore *Nardus* grasslands in south Wallonia. Sheep or cattle grazing is used to maintain the restored habitats, but locally mowing has been used when soil conditions are adequate.

Also in Belgium, around 400 ha of habitat 5130 of calcareous grasslands have been restored with the help of LIFE projects, but their post-LIFE management has proved challenging. Nearly all are managed by sheep, goat or donkey rotational grazing but some are mown (especially when orchids and rare species are present). Due to topographic features, low productivity of the sward and precautions required to preserve rare species, considerable funding is necessary. Occasional cutting of bushes seems sufficient in very dry grasslands but is very expensive.

The project LIFE99 NAT/IT/006229 is aimed at the conservation and management of Natura 2000 habitats and species in the Monte Labbro and Upper Albegna Valley (Italy). The main problems in the area are erosion of the *Festuco-Brometalia* habitat (see grasslands chapter), because of overgrazing and too much disturbance by tourists, the uncontrolled cutting back of forests in the ravines, interference with natural water courses, and the effect of poaching on wolf populations. The purchase of land and the elimination of exotic trees should guarantee the short- and long-term maintenance of *Juniperus communis* formations on heaths or calcareous grasslands.

In the project LIFE11 NAT/DE/000345 the overall objectives are to protect and improve the outstanding dry grasslands and cultural landscapes in the lower Franconian Muschelkalk limestone range along the Middle Main valley and the Fränkische Saale and Wern valleys in the counties of Bad Kissingen, Main-Spessart and Würzburg (Germany). In recent decades, the abandonment of traditional land-use practices on the steep slopes has led to a loss of the arid grassland sites, mainly through natural succession, and the subsequent loss of the valuable habitat types and associated species, especially birds. The project aims to improve habitat connectivity between the open grassland habitats and the adjacent lightly

wooded, thermophile forests, and to conserve biodiversity. One of the habitat types targeted by the project is *Juniperus communis* formations on heaths or calcareous grasslands. Another goal is to create a more coherent network of Natura 2000 sites in the region, by carrying out actions between as well as outside the borders of the project area. This will reduce the increasing isolation of the targeted habitat types. Intensive public dissemination activities will ensure the support of the different stakeholders (including winegrowers and viniculturists, farmers, foresters, and the tourism industry).

The isolated juniper heaths of eastern Eifel (Germany) are the remnants of a vast heath landscape that once covered a large part of the Eifel ranges. These heaths were the result of 'slash and burn' agricultural land use. This once widespread agricultural system was based on heathland grazing, interrupted by occasional heather burning and subsequent periods of arable land use. The Natura 2000 site Wacholderheiden der Osteifel encompasses 888 ha of the most valuable remnants of this landscape. The heaths in the area are threatened by overgrowth and reforestation. In recent years, local initiators have started removing trees and shrubs and have introduced grazing on some heaths in order to re-establish the typical heath landscape. The main objective of the project LIFE05 NAT/D/000055 (http://www.wacholderheiden.eu/) was to conserve and develop species-rich *Nardus* grasslands and heaths with *Juniperus communis* and *Cytisus scoparius*. It planned to re-establish permanent, extensive grazing regimes, and grazing plans have been worked out for various areas within the site with all the relevant stakeholders, including farmers, hunters and local authorities. It was thought that specific, planned interventions would provide the preconditions for financially viable grazing management, including the removal of trees, shrubs and topsoil, followed by the sowing of seeds of typical heathland species in the cleared areas. These preparatory actions were followed by sheep and goat grazing. Cattle and horse grazing was also tested and assessed on a few sites.

Volcanic rock combined with climatic factors and relief have created thermophilous habitats in the Lounské Středohoří hills of the Czech Republic. Thermophilous steppic grasslands are predominant here, dominated by *Stipa* grasses and rock outcrops with dry pioneer and grassland communities. In 1991, all sheep were removed from the site. An immediate consequence of this was the spread of shrubs and the accumulation of dead biomass, leading to significant changes in habitat structure and, subsequently, to a rapid decline of endangered species. The project LIFE09 NAT/CZ/000363 (http://www.ochranaprirody.cz/en/life/life-lounske-stredohori-steppes/) aims to contribute to the maintenance and restoration to favourable conservation status of the unique thermophilous habitats (including Subcontinental peri-Pannonic scrub) and species in the Lounské Středohoří hills.

Râpa Roşie nature reserve in Romania harbours Subcontinental peri-Pannonic scrub. A management plan has been developed for this Natura 2000 site, to combat the serious negative impact on biodiversity that could result from intensive anthropogenic activities such as spring and autumn fires, intensive grazing, climbing on the slopes, and unsustainable tourism. The main management recommendations that benefited the species and habitats include:

- A systematic evaluation of biodiversity, in order to increase the level and frequency of studies and investigations.
- Abolishing grazing rights, as they led to the destruction of crucial natural habitats and ecosystems.
- Awareness programmes for the citizens of Sebeş town and nearby villages, to inform them of the importance of biodiversity protection in Râpa Roşie. This also included the installation of

information panels and route direction displays, the implementation of a nature interpretation programme, and the establishment of a well-developed information system (reserve's perimeter, information panels, information leaflets, marked trails) for citizens and tourists.

- The involvement of local officials in the evaluation and planning of further common preservation activities.

The Bulgarian Rural Development Programme is an example of a less successful approach to Natura 2000 habitat management. This programme aimed to finance agri-environmental and Natura 2000 measures, butpoor implementation resulted in the subsidies contributing to the large-scale destruction of Natura 2000 habitats, including Subcontinental peri-Pannonic scrub and Ponto-Sarmatic deciduous thickets. In the last 50 years, a lot of arable land with low productivity has been abandoned and has turned into pastures or meadows, or become covered with bushes and trees. In the 1990s, most of these land types were incorrectly recorded as arable land in the new land property map. This was not a problem until Bulgaria's accession to the EU, when the Rural Development Programme started to subsidise well-managed agricultural land. Farmers started massive clearing of bushes and trees in order to obtain subsidies for pastures. The problem grew because different maps were used by different ministries. For example, the Ministry of Environment and Water, managing Natura 2000 sites, used the old land property map, so did not react to the destruction of the scrub habitats because they are recorded as arable land on the official maps. As a corrective measure, in 2011 the Ministry of Agriculture limited the requirements for the clearing of bushes and trees to 25 % of the territory of the land parcel in Natura 2000 sites.

4.5.10 Opportunities for joint action

Exchange of knowledge and expertise and transboundary cooperation seem to offer opportunities for joint action in support of heathland management and conservation (Figure 32). Such knowledge exchange could for example focus on Payments for Ecosystem Services (PES) schemes that can provide an incentive for the conservation and restoration of biodiversity and habitats in order to safeguard (or potentially increase) the provision of ecosystem services supplied by the heath and scrub habitats. Typical ecosystem services for which PES schemes are designed are groundwater quality, river water quality (restricting nutrient run-off and soil erosion) and carbon sequestration. PES schemes can operate between land managers or farmers and public organisations (such as municipal water companies) or private businesses (such as breweries), and may operate at the local, regional, river catchment or national scale. Successful schemes require transparency, reliability (e.g. of payments), acceptance of environmental stewardship values, trust, and strong commitment by all key stakeholders. In practice, PES schemes will only be able to halt degradation or loss of ecosystem services and biodiversity if they are embedded in a broader mix of policy instruments that address the full range of ecosystem services from an area.

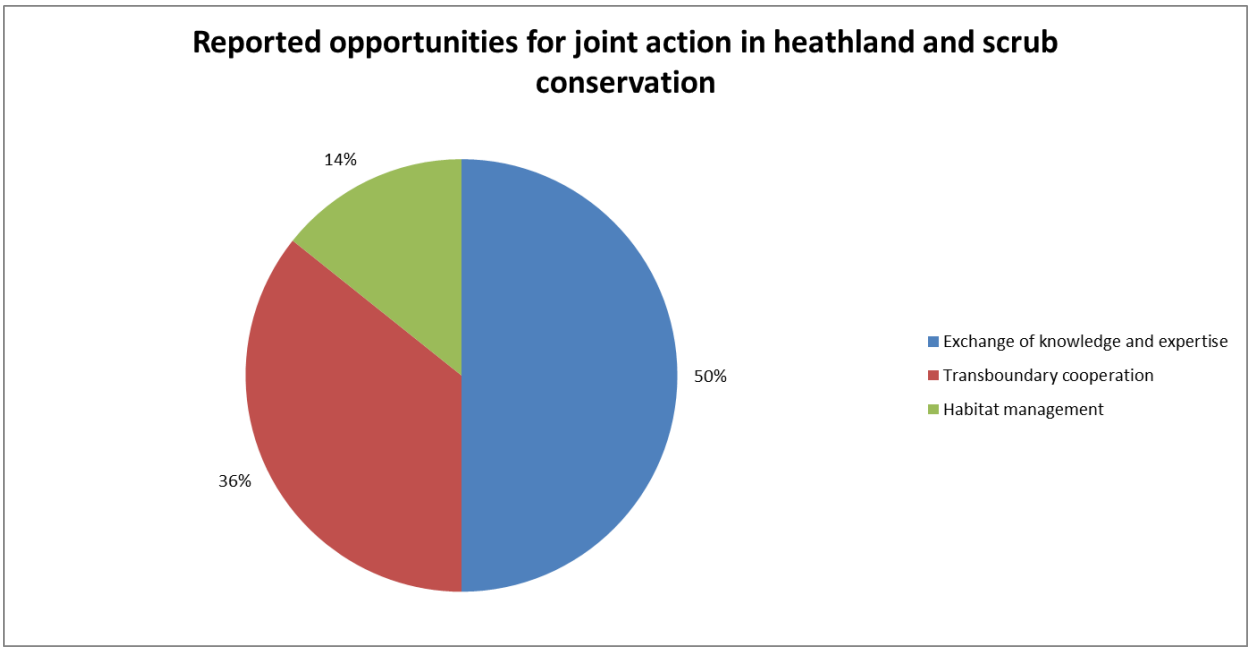


Figure 32 Results from Natura 2000 Biogeographical Process expert consultation: *Potential areas for joint action for the conservation of heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

4.7 Rivers and lakes

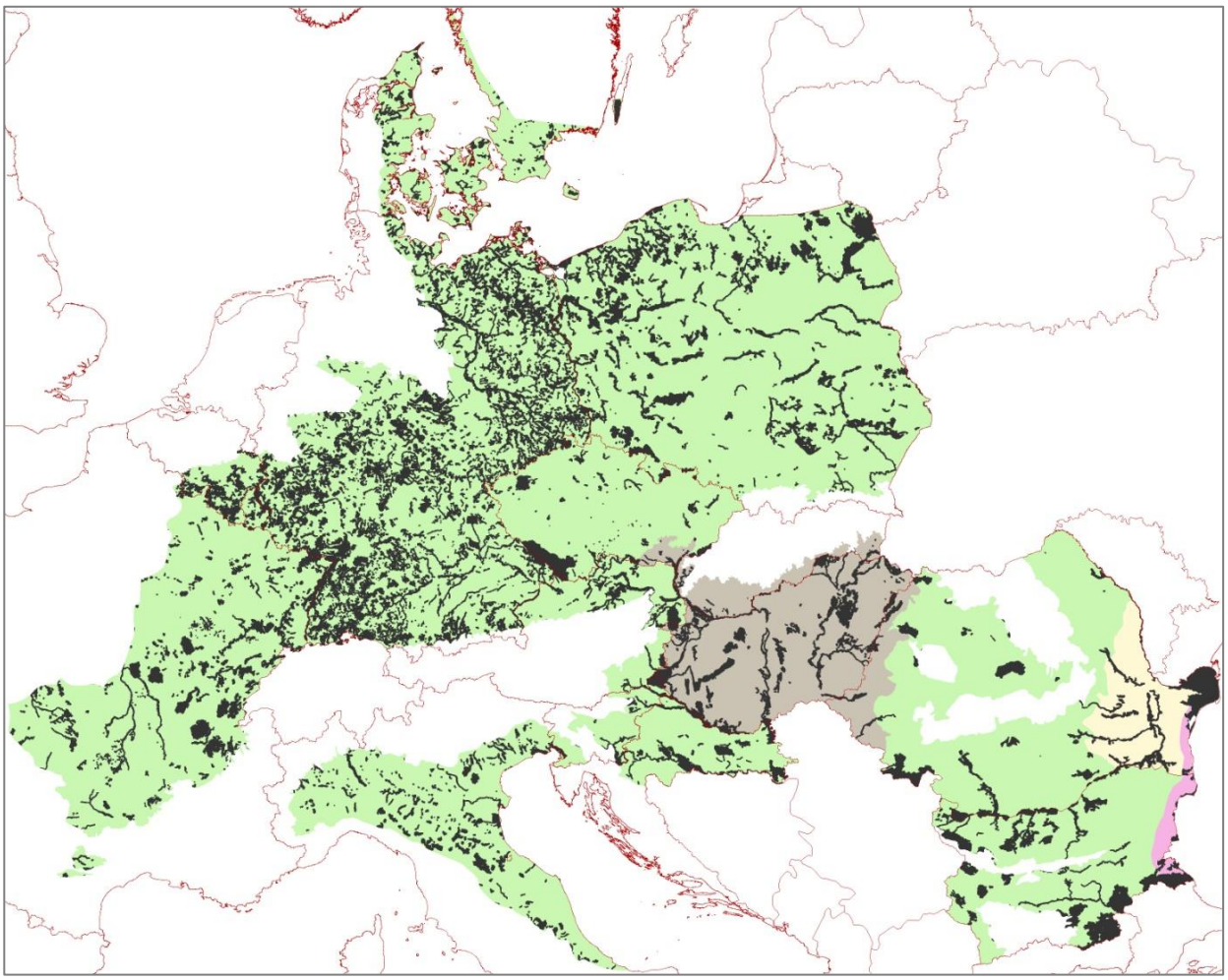
4.7.1 Summary description

Of the 16 river and lake habitats reported in the reference lists as being present in the Continental, Pannonian, Steppic and Black Sea biogeographical regions, six were selected for this Seminar. They can be divided into two groups. The first consists of four standing water habitat types: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (3130), Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (3140), Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (3150), and Natural dystrophic lakes and ponds (3160). In the second group are two habitat types of flowing waters: Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) and Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270).

Table 16 Grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

Habitats Directive code and name of River and lake habitats selected for priority consideration
3130 - Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*
3140 - Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
3150 - Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation
3160 - Natural dystrophic lakes and ponds
3260 - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
3270 - Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation

All six selected habitat types occur in the Continental, Pannonian and Steppic biogeographical regions; five habitat types are reported from the Black Sea region as habitat type 3160 is not present in this region. The best coastal habitat sites are protected in the Natura 2000 network, see Map 5.



Map 5 Natura 2000 sites containing river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

Based on Article 17 reporting by the Member States for the period 2007–2012, the conservation status of habitats of standing waters is mostly unfavourable–inadequate (3150, 3160 in the Continental region; 3140, 3150 in the Black Sea region; all habitat types in the Pannonian region), unfavourable–bad in the Continental region for 3130, 3140, and favourable in the Black Sea region for 3130. The habitats of running waters (3260, 3270) are unfavourable–inadequate in the Continental, Pannonian and Black Sea regions. The conservation status of both standing and running water habitats is favourable in the Steppic region, with the exception of habitat 3140, which is classified as unknown.

Compared with the period 2002–2006, at biogeographical level, for the most part no real change in conservation status was registered in both subgroups of habitats. When the status changed, it was mostly because of improved assessment methods. Genuine change was reported only by Belgium for the habitat 3160 (U2 → U1).

If we downscale the comparison to the summaries of Member States' assessments of individual habitats (Figure 4), we can see that the conservation status was considered unfavourable–inadequate in almost half of the assessments, unfavourable–bad in almost one-quarter, and favourable in one-quarter.

It is difficult to make comparisons with previous assessments as information for the period 2002–2006 does not include Romania and Bulgaria, which joined the EU in 2007 and so were not obliged to submit the report.

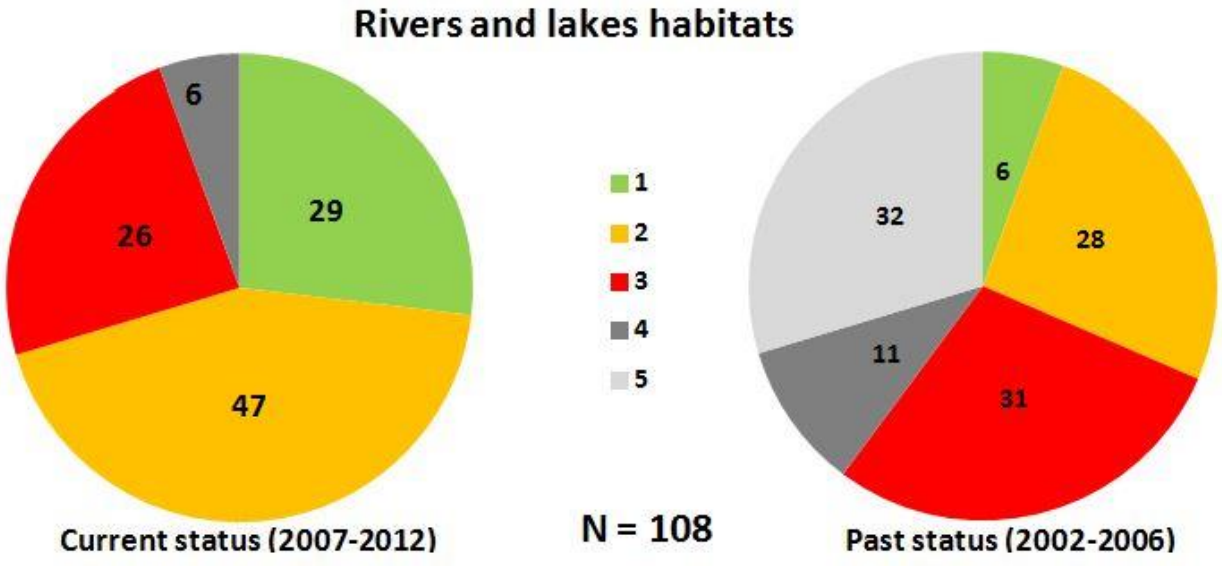


Figure 33 Current and past conservation status of river and lake habitats based on Article 17 reporting. Numbers represent individual country/biogeographical region assessments (only habitats selected for priority consideration are included); N is the total number of assessments in each period. 1 = FV: favourable; 2 = U1: unfavourable–inadequate; 3 = U2: unfavourable–bad; 4 = XX: unknown; 5 = N/A: not assessed

4.7.2 Issues - pressures - threats

According to experts the main factors causing decrease of freshwater habitat areas in all regions are water pollution and human-induced changes in hydrological conditions (Figure 34). Human-induced changes are the most frequently mentioned in the literature, and are caused by a broad range of activities, such as: modification of the structures of inland water courses; adjustments of natural river channels; construction of dykes, embankments or other anti-flood measures; land reclamation and drying out; lowering of the water level; increased agricultural, industrial and civil water extraction; canalisation and water deviation; draining; dredging; destruction of gravel banks and mud flats. Due to changes in the water system, these habitats become overgrown or are used as dumping grounds. The hydrological conditions of water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) are also disturbed by drainage, deepening, canalisation and faster discharge of water. Some rivers, such as the Rhine, have been transformed into major navigation routes, while others have been modified for hydroelectric power.

As mentioned above, pollution of groundwater and surface water is a very high threat. Soil pollution, dumping of old vehicles or dead animals may also contaminate water sources. Pollution is the reason that eutrophic lakes (3150) are uncommon in the EU. In addition, freshwater habitats are threatened by agricultural practices. The application of herbicides and fertilisers and intensive grazing can cause damage by over-enrichment with nutrients (eutrophication), resulting in hypertrophic conditions and reduction in species richness.

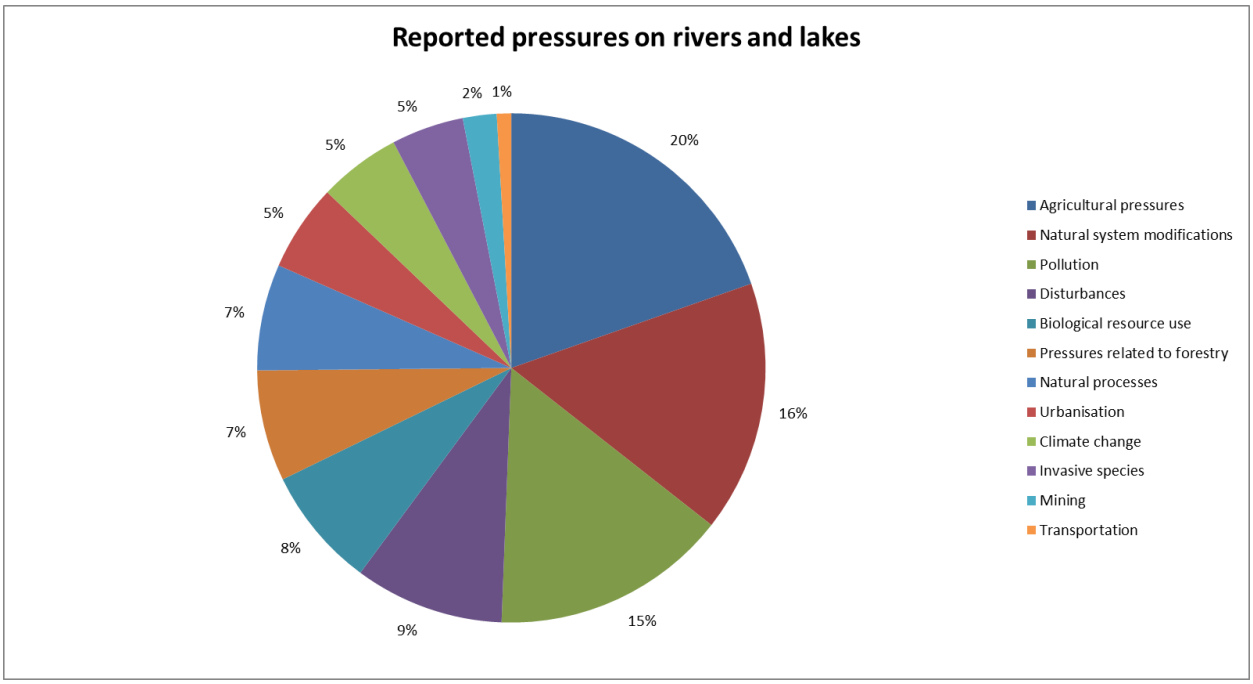


Figure 34 Results from Natura 2000 Biogeographical Process expert consultation: *Pressures on river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

A few literature sources consider the invasion of non-native species as a high pressure. Alien species have been introduced into ponds, brooks, lakes and other water surfaces. Indigenous species are now under threat as they have to compete for food and habitat with alien species. They shade the body of water and prevent the occurrence of natural bank vegetation. Moreover, they speed up soil erosion on bank slopes.

Table 17 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 level 1 pressures for river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Pressure	***% responses***
H01 - Pollution to surface waters (limnic & terrestrial, marine & brackish)	12
J02 - Human-induced changes in hydraulic conditions	12
K02 - Biocenotic evolution, succession	7
A07 - Use of biocides, hormones and chemicals	6
M01 - Changes in abiotic conditions	5
A08 - Fertilisation	5
G01 - Outdoor sports and leisure activities, recreational activities	5
F02 - Fishing and harvesting aquatic resources	4
I01 - Invasive non-native species	4
B02 - Forest and plantation management & use	4

Likewise, inappropriate use places a high pressure on continental freshwater habitats. Mechanical cleaning, gravel, peat and sand extraction contribute to the disturbance of these habitats. Applying excessive amounts of organic compounds in feed can badly affect the amount of nutrient in ponds and cause eutrophication. Some experts consider intensive fish farming as a very high threat for lakes and ponds in the Pannonian region. Rivers (3260, 3270) can be seriously threatened by shipping lanes, ports and marine constructions, some of which involve dredging or the removal of limnic sediments. Also, the intensive build-up of small to medium-sized hydroelectric power plants in many of the new Member States is a significant threat to the ecosystem balance and biodiversity of rivers.

According to available studies, issues of medium importance are: expansion of urban and industrial sites, abandonment of pastoral systems, lack of grazing, succession changes in abiotic conditions, erosion, and missing or wrongly directed conservation measures.

Other human-induced activities are of lower importance (leisure and recreational activities, oil and gas exploration, and other human intrusions and disturbances). Climate change or natural disturbances such as droughts or floods have only a minor impact on freshwater habitats, although in places like Bulgaria they play a more important role. Reforestation by spruce trees can also have a bad impact on water habitats. Besides the shading effect, their needle litter causes acidification, which only a few species can endure.

4.7.3 Main conservation requirements

The most important measure suggested by experts are site-based conservation actions, including restoration, and the implementation of legislation, which goes hand in hand with general communication, especially awareness raising among stakeholders (Figure 35).

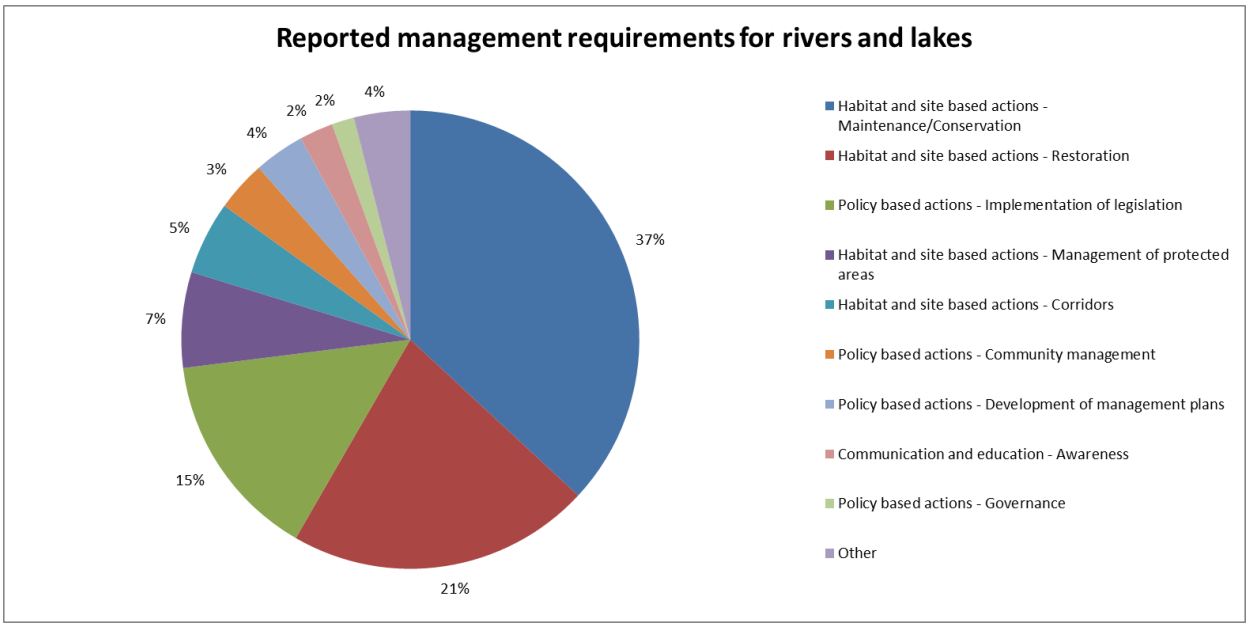


Figure 35 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation requirements for river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

The maintenance or restoration of natural hydrological conditions is considered a crucial conservation requirement for all habitats in this group. It is important to avoid heavy engineering works, serious technical interventions, water pumping, draining and deepening. Besides these measures, it is important to avoid the construction of dyke, canalisation, embankments or other anti-flood measures. Gravel, peat or sand extraction should be banned. Strict, standard measures to prevent groundwater and surface water pollution should be adopted. It is also important to prevent urbanisation along the banks of waterbodies and to control the number and movement of motor boats. The present invasive species should be manually cleared in order to prevent water pollution. After removal, control of invasive species is necessary. Appropriate management and use (fishing, recreation) is another issue needing special attention. As always, habitat- and site-based management is crucial.

Natural eutrophic lakes (3150) require maintenance of the natural water regime with periodic spring floods, low water level during the summer period and a slow water flow. Slow flow can be achieved by narrowing the stream at alternate points to reduce its flow. Some experts recommend the creation of buffer zones around oxbows, to minimise the impact of human activities. Some of these ponds also require active management, such as elutriating, deepening and cleaning of silt deposits, ground removal and removal of bank protection. In seriously damaged sites, restoration measures are recommended, including digging new peat holes to create water habitats, and dredging eutrophic peat lakes to improve water quality.

To maintain the oligo-mesotrophic water habitats (3130 and 3140), it is important that there is constant cold water flowing from springs and spring flooding of the area. The application of herbicides, pesticides and fertilisers should be banned and measures should be developed to preserve the upper soil layer on adjacent fields – the creation of buffer zones around oxbows is recommended. Cleaning of the water habitats is also highly recommended. The control measures for oligo-mesotrophic habitats with benthic vegetation of *Chara* spp. (3140) should first be aimed at preventing high nutrient loads (for habitat 3160 as well) and maintaining shallow waters. The growth of *Chara* can be enhanced through measures aiming to improve water transparency, such as active biological control or flushing, and selective mowing of water plants that grow higher than *Chara*. In this respect, maintenance of the typical management methods in fish ponds (with periodic water draining) and a reduction in the amount of organic compound used in feed are desirable. In addition, for habitat 3160, pools should be created on many sites because of the rarity of open water in these habitats. This will ensure a broad biodiversity spectrum and promote threatened species of invertebrates, amphibians and plants. Moreover, it is important to stop the spread of shrub and forest vegetation from neighbouring habitats and to remove *Molinia* sp.

In order to achieve favourable conservation status of the two river habitat types (3260 and 3270), the following management activities are recommended: a slow increase of water level in spring and slow decrease of water level in late summer without extreme fluctuation, reducing regulation of small streams, decrease of water eutrophication level and grazing of the banks.

The widespread creation of small waterbodies is a new idea in water management. This method works sustainably to treat problems at the source and acts to ameliorate both run-off quality and quantity. However, there is a limited appreciation of its wider potential.

Raising awareness among local communities and tourists is also an important management requirement, as it can prevent pollution from household and recreational activities. Modification of existing

hydroelectric power plants as well as prohibition or strict control of new power plants or weir units is required from relevant planning authorities to prevent breaking the ecosystem balance.

4.7.4 Management and conservation measures

The management practices applied in the selected freshwater habitats are quite diverse, but generally include a wide range of site based measures including habitat conservation and restoration (Figure 36). A key measure includes prohibiting project developments that negatively influence the water regime and can cause water pollution. Some other planning measures are used to regulate agricultural activities, urbanisation and tourism in the surrounding area. In many Member States, these measures go hand in hand with close environmental monitoring.

More specific measures include the use of heavy machinery for mechanical cleaning or extraction of material is often prohibited. Clearing of vegetation and mowing are used to control invasive species. Some measures are specific for Oligo to mesotrophic standing waters (3130), namely extensive management methods, limited fertilisation and leaving muddy sediments as seed banks. In some cases endangered species are cultivated.

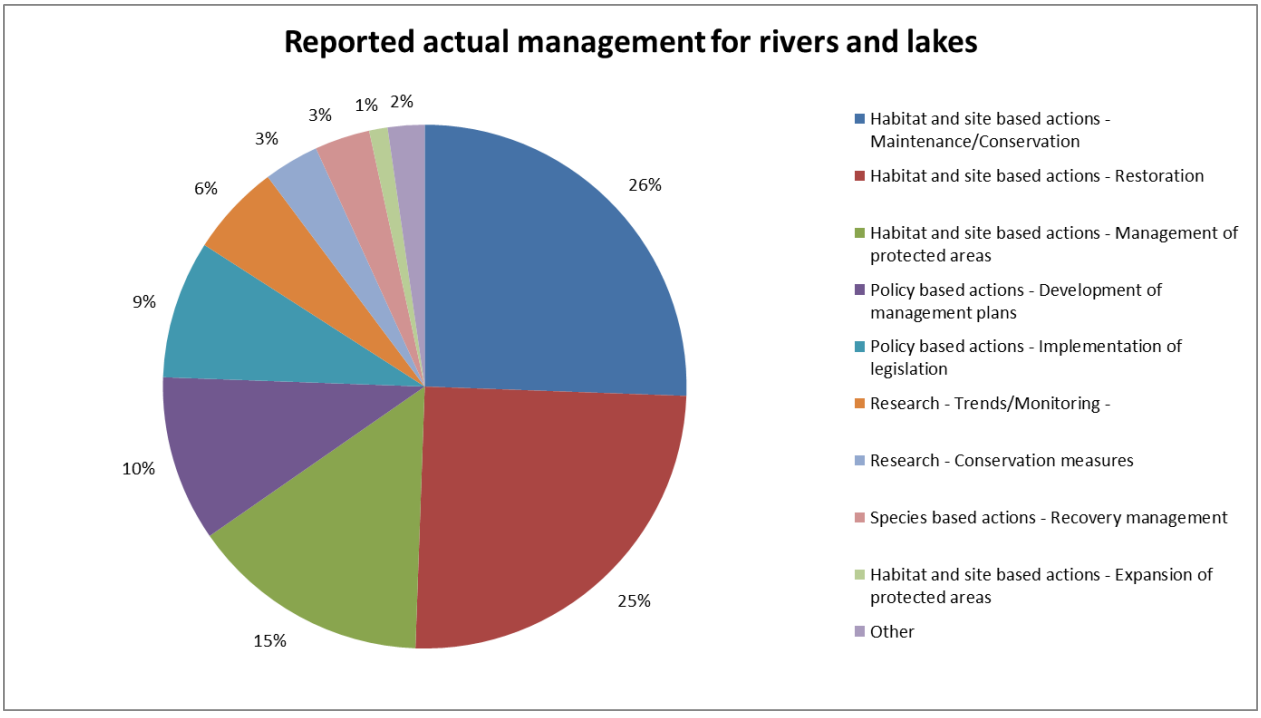


Figure 36 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation measures for river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

In Belgium, management plans are designed and implemented within the Water Framework Directive with the target of reaching good ecological status for all water courses by 2027 or high status for rivers where pearl mussel populations are present. In Poland, the acquisition of land for conservation purposes is an important management aspect due to the occurrence of numerous small privately-owned land

parcels, which makes the implementation of conservation plans challenging. Furthermore, there is legal protection against sewage disposal, although there are insufficient policy efforts to tackle nitrogen and phosphorus inputs from agriculture. In some parts of Poland, such as the Bory Tucholskie National Park, human impact is limited due to restrictions in the use of lakes or to specific requirements and limitations imposed on anglers. In the Bavarian region of Germany, on the other hand, agri-environment schemes are important policy tools that support conservation friendly fisheries. Management plans here also include establishing buffer zones by conservation of grasslands and changing arable land into grasslands along lakeshores and in the catchment areas of contributory water courses. On the other hand, insufficient funding through agri-environmental measures (AEM) and few or no Natura 2000 compensation schemes are seen as great challenges for conservation efforts.

4.7.5 Species-specific measures

Experts indicated the need for species-specific management measures for most of the rivers and lakes habitats. For instance, for *Ranunculion fluitantis* and *Calitrichio-Batrachion* vegetation of water courses of plain to montane levels (3260) it was found that reducing eutrophication, maintaining environmental flows and reaching good ecological status through the Water Framework Directive were necessary. Moreover, in some cases restoration measures are required for recovering specific ichtyofauna. Maintaining connectivity in order to ensure migration channels was considered necessary for both Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) and Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (3130). In addition, minimal water flow is required for some species such as *Austropotamobius*, which need deep, cold, well-oxygenated water.

Increasing the depth of the Dystrophic lakes or ponds habitats (3160) was highlighted as an appropriate measure for the protection of *Phonixus Percnurus*. For the same habitat, conservation of Black grouse (*Tetrao tetrix*) should be carried out by mowing and closing public access to areas used by the grouse during the breeding season. Similarly, matching mowing times with species-specific requirements was recommended for Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (3150), Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) and Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270), in particular for *Maculinea phengaris*, *Euphydryas aurinia*, *Lycaena dispar*, *Crex crex*, some orchid species, *Sanguissorba*, *Gentiana*, and *Eriophorum*. In general, for smaller lakes and ponds, a restricted number of fish or no fish at all is considered an adequate management practice for the protection of amphibians and dragonflies.

4.7.6 Bottlenecks - Problems

The main problems and barriers preventing implementation of the required management and measures are often related to stakeholder involvement, funding, policy (Figure 37).

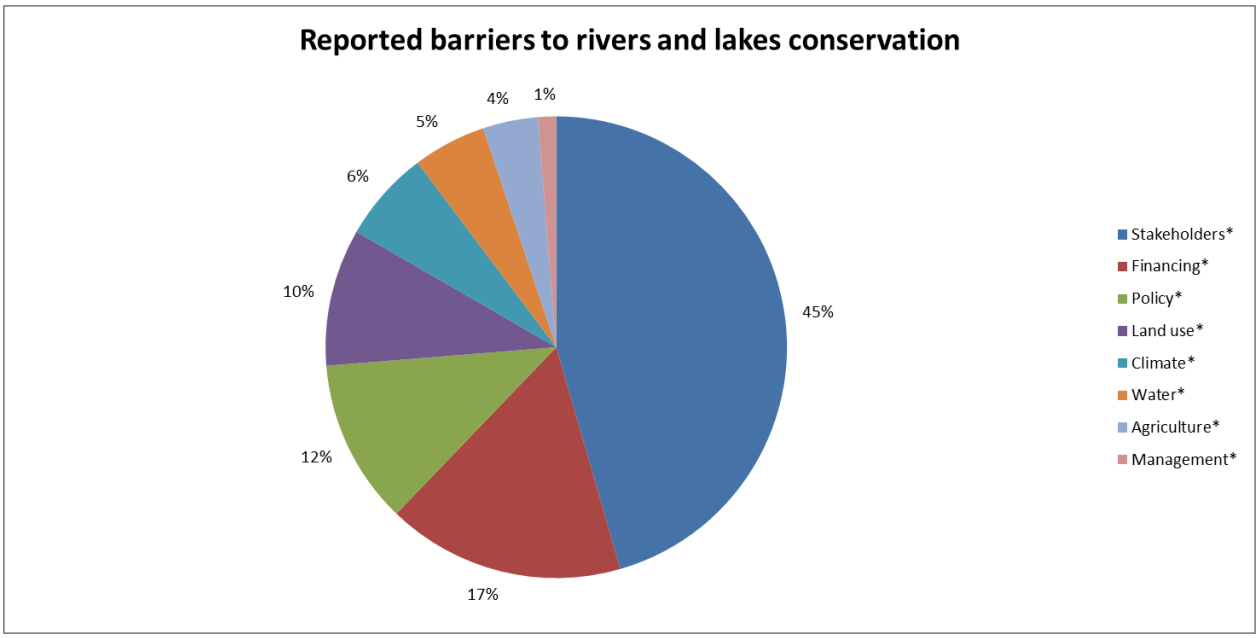


Figure 37 Results from Natura 2000 Biogeographical Process expert consultation: *General conservation barriers for river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Problems in the implementation of management requirements can be attributed to a missing or inadequate policy framework and a lack of legally enforced protection. The lack of sufficient funds is also closely related to these issues. Other obstacles referred to by experts were lack of approval from MPs during the project duration, failure of lobbying efforts, and owners' unwillingness to cooperate. Conflicting policies are also cause for poor conservation performance: in Poland, Bulgaria and Romania, for example, policy support for renewable energy has given great support to the development and rapid spread of small hydroelectric power plants, which in many cases disrupt the ecosystem balance and are not designed to offset their harmful impact on habitats and species.

Table 18 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 specific conservation barriers for river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Barriers and bottlenecks	***% responses***
Stakeholders - Lack of cooperation	19
Stakeholders - Lack of knowledge / competence / data	13
Financing - Lack of funds for conservation (and complicatedness / difficult access)	11
Policy - Incorrect policy (and or law)	8
Stakeholders - Lack of skills	7
Climate - Change	6
Financing - Lack of forgone income compensation (or subsidies)	6
Land use - Fragmentation	6
Stakeholders - Lack of awareness / negative attitude	6
Agriculture - Intensification	4

Some bottlenecks in the conservation of freshwater habitats can be found in awarness-raising and cooperation with stakeholders. In particular, lack of knowledge and interest are significant issues. For instance, lack of expertise and knowledge in terms of close-to-nature, ecosystem-based flood works makes stakeholders highly sceptical and disapproving of such soft engineering solutions; they favour traditional, concrete-based flood retention constructions. Also, lack of economic viability for many conservation schemes is a discouraging factor for landowners, who cannot quantify the benefits of habitat conservation. This becomes particularly important in places like Poland, where habitat sites are located on private property and are usually fragmented into numerous smaller parcels. Even in Natura 2000 sites, the long period of time required for the completion of management plans typical for many new Member States, makes implementation of conservation and restoration activities difficult.

4.7.7 Solutions and opportunities

The most important activities to resolve the problems mentioned above are awareness raising and education of the public, stakeholders and decision-makers (Figure 38). Training and awareness raising lead to the development of effective working relationships. Constructive dialogue with stakeholders can also be very helpful. The permanent exchange of knowledge and skills between scientists, site managers and land users could be useful for achieving the habitat management and conservation targets.

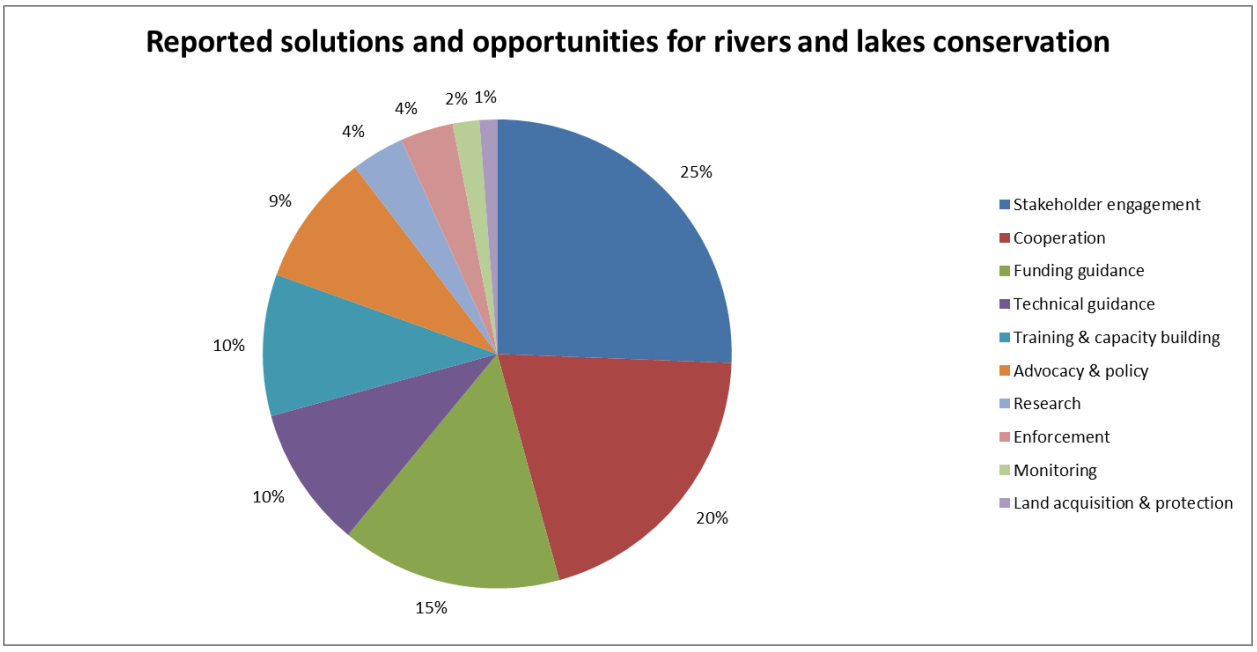


Figure 38 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation solutions and opportunities for river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Some solutions are policy-related, e.g. influencing policies to initiate the legislation measures that can contribute to the implementation of management requirements, conservation of habitats, and establishment of protected areas.

4.7.8 Relevant cross-cutting issues

Cross sectoral integration and a close cooperation with stakeholders are cross-cutting issues related to river and lake conservation and management (Figure 39). Water pollution and eutrophication are common pressures in all water and wetland habitats and tackling them requires very complex measures, sometimes at the local, but usually at the watershed, level. They are also linked to a wide range of human activities that need to be adapted, changed, relocated, restricted or prohibited. Thus, a considerable number of stakeholders are involved.

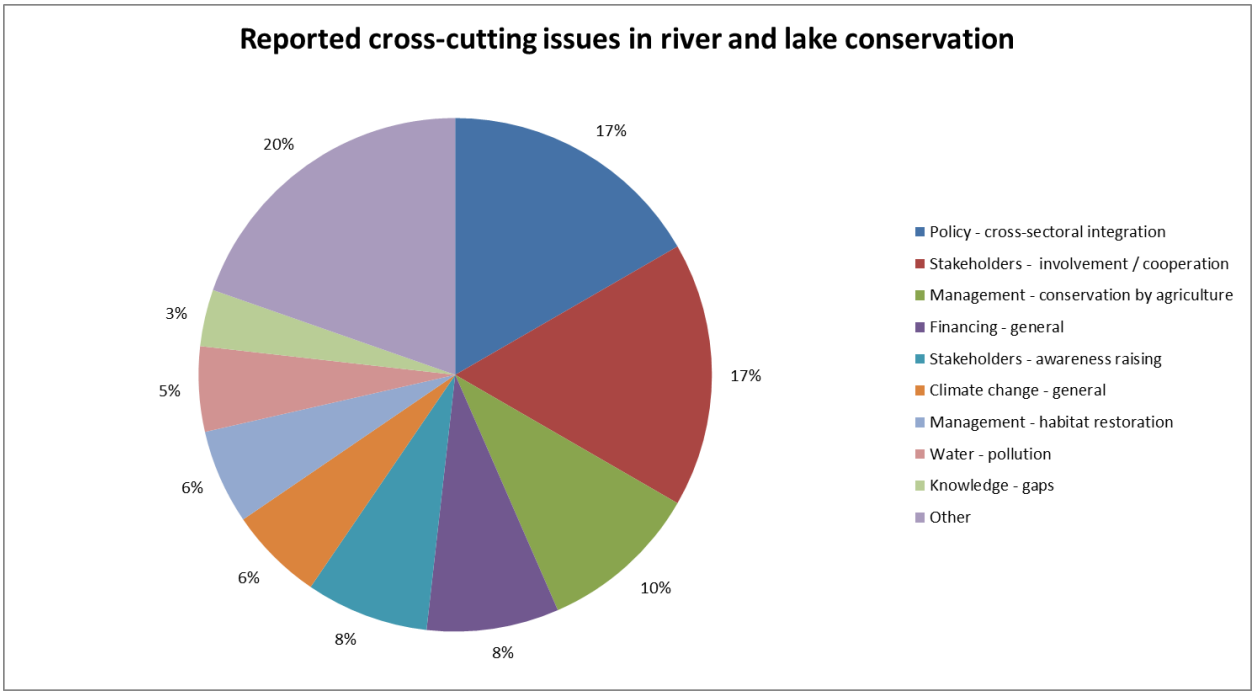


Figure 39 Results from Natura 2000 Biogeographical Process expert consultation: *Cross-cutting issues in river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

There are numerous synergies between the nature directives, the Common Agricultural Policy and the Water Framework Directive. These should be better analysed and integrated into policy, management plans and projects such as LIFE. For instance, the River Basin Management Plans (RBMP) should include maintenance and restoration activities, depending on the conservation status of habitats and species subject to conservation in the protected areas.

Awareness raising, cooperation, stakeholder involvement and a participatory approach are probably relevant to all nature conservation or environmental issues. When working with the management of habitats of European importance, it will be useful to discuss the most suitable ways to implement them at different levels, from biogeographical regions to local level. Stakeholders and landowners are crucial to the implementation of long-term sustainable habitat management. This should be a priority issue in the Continental, Pannonian, Black Sea and Steppic Seminar.

4.7.9 Lessons learned / Examples of best practice / Successful and unsuccessful projects

The practical examples of projects listed below can provide useful input to other sites with similar challenges. They show that current and past experience has generated many examples of good practice regarding the involvement of local communities, restoraing the hydrological regime and more specific benefits related to waste removal and appropriate mowing regimes (Figure 40).

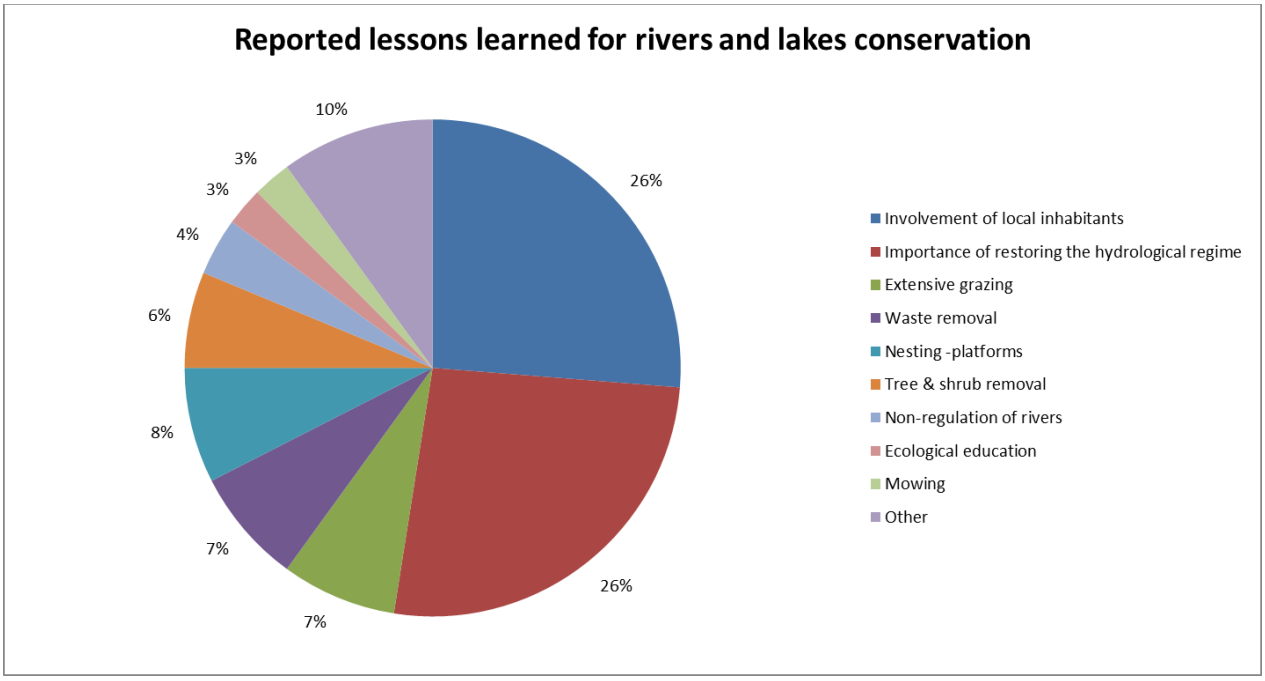


Figure 40 Results from Natura 2000 Biogeographical Process expert consultation: *Lessons learned for river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

3140 - Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Project LIFE09/NAT/PL/000258 – 'Restoration of hydrological system in the Middle Basin of the Biebrza Valley. Phase 1'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3862&docType=pdf

The aims of the project were to:

- stop degradation processes on hydrogenic habitats in the vicinity of the Rudzki Canal – Ełk River – Jegrznia River – Woźnawiejski Canal;
- improve habitat conditions for avifauna of non-forested ecosystems;
- purchase 19 ha of land.

'Preservation of alkaline fens in the upper Biebrza Valley in the vicinity of Szuszalewo village'

The aim of the project was to protect and preserve the most valuable habitats in Biebrza National Park, such as alkaline fens (7230). Most of the habitats are private property, so it was important to include the Szuszalewo village community in the project and to have their support. Project activities included scrub clearance in endangered habitats and the participation of private owners in agri-environmental programmes, which covered 103 ha of land. The project was carried out from 2009 to 2010 and was co-financed by the National Fund for Environmental Protection and Water Management, Dąbrowa Białostocka Commune and the Biebrza National Park.

Large-scale restoration programme in Wallonia

A large-scale restoration programme has been implemented in Wallonia in the framework of six LIFE-Nature projects in the Ardenne massif dedicated to the restoration of peaty habitats in the Ardenne high plateau: LIFE Saint-Hubert (2003–2007), LIFE Croix-Scaille (2006–2009), LIFE plateau des Tailles (2006–2010), LIFE Hautes-Fagnes (2007–2012), LIFE+ Lomme (2010–2014) and LIFE+ Ardenne liégeoise (2012–2018). These were financed and managed by the Walloon Government Service, except for LIFE Croix-Scaille, which was managed by a regional conservation organisation (Natagora).

This metaproject aims to restore the whole network of peaty habitats, such as active and degraded peat bogs, transition mires, acidic fens, bog woodlands, wet heathlands, and alluvial woodlands, from the south-west to the north-east of the Ardenne high plateau (http://biodiversite.wallonie.be/fr/meta-projet-life-de-restauration-des-tourbieres-de-haute-ardenne.html?IDC=5778). In the framework of these LIFE projects, all the restoration techniques successfully tested in the Hautes-Fagnes nature reserves have been applied on a large scale (Frankard, 2012). Globally, more than 4,000 ha have already been restored (and this should exceed 5,000 ha with the last project). The main activities are eliminating spruce plantations and drains, rotovating or scraping the invasive Purple moor grass, and restoring the water table level and natural hydrological structure on all sites. In each high plateau, site networks have been fully redesigned to ensure nature recolonization processes, species regional population dynamics and optimum restoration of ecosystem services provided by peat lands. (Plunus et al., 2014). Detailed biological monitoring programmes on vegetation, birds, dragonflies and butterflies already demonstrate a real, positive effect within each project and on the regional conservation status (Parkinson, 2008; Dufrêne et al., 2011).

Strict protection approach, Poland

The project was implemented for some of the lakes in the 3140 habitat of Drawa National Park. It prohibited any pressures, including fishing, recreational activities and forestry operations in the adjacent forests. The habitat has now achieved favourable conservation status and a fully maintained biodiversity.

Project LIFE06 NAT/D/000006 – 'Schwäbisches Donautal - Swabian Danube valley'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3112 or http://www.donautal-life-natur.de/

The project aimed to:

- create shallow water areas providing a positive impact on relevant bird species;
- implement measures to stabilise hydrology.

Project LIFE06 NAT/DK/000158 – 'REMAB - Restoration of meadow bird habitats'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3108&docType=pdf or http://www.skovognatur.dk/Naturprojekter/Projekter/Vestjylland/Engfugle/

The main aims of this project were to:

- improve the hydrological conditions;
- reduce eutrophication in order to improve water quality;
- raise awareness.

3150 - Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation

Project LIFE06 NAT/RO/000172 – 'RESTOREWETLANDS – Conservation, restoration and durable management in Small Island of Braila, Romania'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3110 or http://www.bmb.ro/

The main aims of this project were to:

- restore the natural hydrological regime;
- improve the hydrological conditions of lakes;
- raise public awareness.

Project LIFE06 NAT/SI/000069 – 'Cerknisko Jezero - Intermittent Cerknica Lake'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3154&docType=pdf or http://life.notranjski-park.si/

The main aims of this project were to:

- raise awareness;
- demonstrate new approaches to nature conservation in Slovenia;
- restore former riverbeds of natural streams.

Project LIFE08 NAT/D/000001 – 'Obermain - Upper Main valley'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.createPage&s_ref=LIFE08%20NAT/D/000001&area=1&yr=2008&n_proj_id=3520&cfid=95413&cftoken=b327c2d053659616-56009F32-06C6-1458-B9F83A7028F9C95A&mode=print&menu=false or http://life-oberes-maintal.de/

The project aimed to:

- shape shallow pooling areas with excavators;
- create depressions to store water during floods and heavy rain.

Project LIFE09 NAT/SI/000374 – 'WETMAN – Conservation and management of freshwater wetlands in Slovenia'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3832 or http://www.wetman.si/

The main outcomes of the project included:

- removal of overgrowth from around all ponds;
- enlargement of the water area, and creation of rugged, gentle banks and shallows;
- restricting fishing to a part of the ponds;

- deepening and establishing a new water area on 2.1 ha of lakes, removing 30,000 m^3 of material, which was used to rehabilitate the banks.

3260 - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Project LIFE06 NAT/D/000003 – 'Rohrhardsberg - Rohrhardsberg, Upper Elz and Wilde Gutach'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3130 or http://www.rohrhardsberg-life.de/

Successes from this project include:

- repression of shrubs and small trees through the introduction of grazing;
- restoration of peat bogs through the removal of spruce forest;
- active participation of the local population in Natura 2000 management.

Project LIFE06 NAT/F/000142 – 'Lauter-Donon – Protection of the forests of Basse Lauter and Vosges moyennes'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=%203136 or http://www.onf.fr/projets_europeens/sommaire/en_cours/llauter-donon/@@index.html

The main results of the project were:

- studies that contributed to the establishment of management plans;
- clearing of shrubs and trees;
- removal of invasive species;
- restoration of riverbanks;
- improvement of natural hydrological management.

Project LIFE06 NAT/IT/000060 – 'LIFE FRIULI FENS – Conservation and restoration of calcareous fens in Friuli'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3165 or http://www.lifefriulifens.it/

The main outcomes of the project were:

- removal of alien species;
- restoration of water habitats;
- raising public understanding of the importance of biodiversity in wet ecosystems.

Project LIFE06 NAT/RO/000177 – 'GREENDANUBE – Conservation and integrated management of Danube islands, Romania'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3111&docType=pdf or http://www.ostroaveledunarii.ro/

The project achieved:

- knowledge improvement;
- eradication of invasive species;
- increased awareness.

Project LIFE06 NAT/SI/000066 – 'BIOMURA – Conservation of biodiversity of the Mura River in Slovenia'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3153&docType=pdf or http://www.biomura.si/default.aspx

The main project outcomes were:

- re-establishment of the connectivity between the main river and side channels;
- removal of bank protection;
- cleaning of lakes overgrown with vegetation and sediment;
- opening of an information centre.

Project LIFE07 NAT/D/000214 – 'Bachtäler Arnsberger Wald – Rehabilitation of streams in the Arnsberger Wald'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.createPage&s_ref=LIFE07%20NAT/D/000214&area=1&yr=2007&n_proj_id=3378&cfid=95413&cftoken=b327c2d053659616-56009F32-06C6-1458-B9F83A7028F9C95A&mode=print&menu=false or http://www.life-bachtaeler.de/

The main outcome of this project was the restoration of small rivers.

Project LIFE07 NAT/DK/000100 – 'REFLOW - Re-establishing a natural water flow level in the river system "Mølleåen"'
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3352&docType=pdf

The main goals of this project were to restore and expand water courses.

Project LIFE08 NAT/D/000009 – 'Life+ Möhneaue–- Restoration and improvement of the SCI Möhne Oberlauf and the SCI Möhne Mittellauf'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3517 or http://www.moehne-life.de/

The project's aims were to:

- lengthen and widen the water course;
- enhance self-dynamic lateral morphodynamic processes (by dismantling riverbank protection);
- increase structural diversity (by introducing dead wood and creating rifle and pool structures).

Project LIFE08 NAT/D/000010 – 'Lippeaue – Improvement of the connection between the river and the floodplain within the pSCI Lippe floodplain between Hangfort and Hamm'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3522 or http://www.hamm.de/lifeplus-projekt.html

The project aimed to remove artificial bank dykes and stones from shorelines.

Project LIFE09 NAT/IT/000213 – 'SORBA – Restoration of bacchiglione springs and habitat of SPA IT3220013 and SCI IT3220040'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3791 or http://www.lifesorba.eu/it

The project's most significant outcomes were:

- returning the site to its original condition (with the reopening of the old spring-water channels and reforming of the original riverbed);
- selective cleaning of recesses and cavities, removal of debris and vegetation (dredging and excavation).

3270 - Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation

Project LIFE09 NAT/DE/000004 – 'Rheinauen bei Rastatt – Rhine wetlands near Rastatt'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3859&docType=pdf or http://www.rheinauen-rastatt.de/de/life

The main outcomes of the project were:

- restoration of muddy riverbanks and improvement of the river dynamics (3270);
- restoration of the habitat Water courses of plain to montane levels with aquatic vegetation (3260);
- long-term conservation of standing waters, classified as Natural eutrophic lakes (3150).

Project LIFE10 NAT/AT/000015 – 'Untere March-Auen – Restoration of the Lower Morava floodplains'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4070&docType=pdf or http://www.life-march.at/

The first results of this ongoing project include neophyte management in order to renaturalise the riverbank vegetation.

Project LIFE11 NAT/PL/000431 – 'Ostoja Wigierska – Endangered species and habitats protection of the Natura 2000 Ostoja Wigierska site'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4289 or http://www.life.wigry.win.pl/

The first results of this ongoing project include the removal of *Impatiens glandulifera*, and awareness raising.

Recently started LIFE projects that should contribute to the management and conservation of the target habitats in the future include LIFE11 NAT/DK/000893 – 'LIFE LAESOE – Restoration of birdlife and natural habitats at Laesoe', LIFE13 NAT/HU/000388 – 'LIFE Old-Drava transboundary cooperation for revitalisation of riverine habitat complex in Drava region within Natura 20 00 sites', LIFE13 NAT/PL/000018 – 'LIFENaturaSlowinskaPL – Conservation of selected habitats and species in Ostoja Słowińska PLH220023 and Pobrzeże Słowińskie PLB220003 Stage I', and LIFE13 NAT/PL/000050 – 'Renaturyzacja II_LIFE_PL – Restoration of hydrological system in the Middle Basin of the Biebrza Valley, Phase II'.

4.7.10 Opportunities for joint action

For a more effective and successful management and conservation of river and lake habitats, the experts consulted reported the exchange of knowledge and expertise, in particular in the fields of intersectoral and integrated approaches, stakeholder involvement, and cross border cooperation (Figure 41).

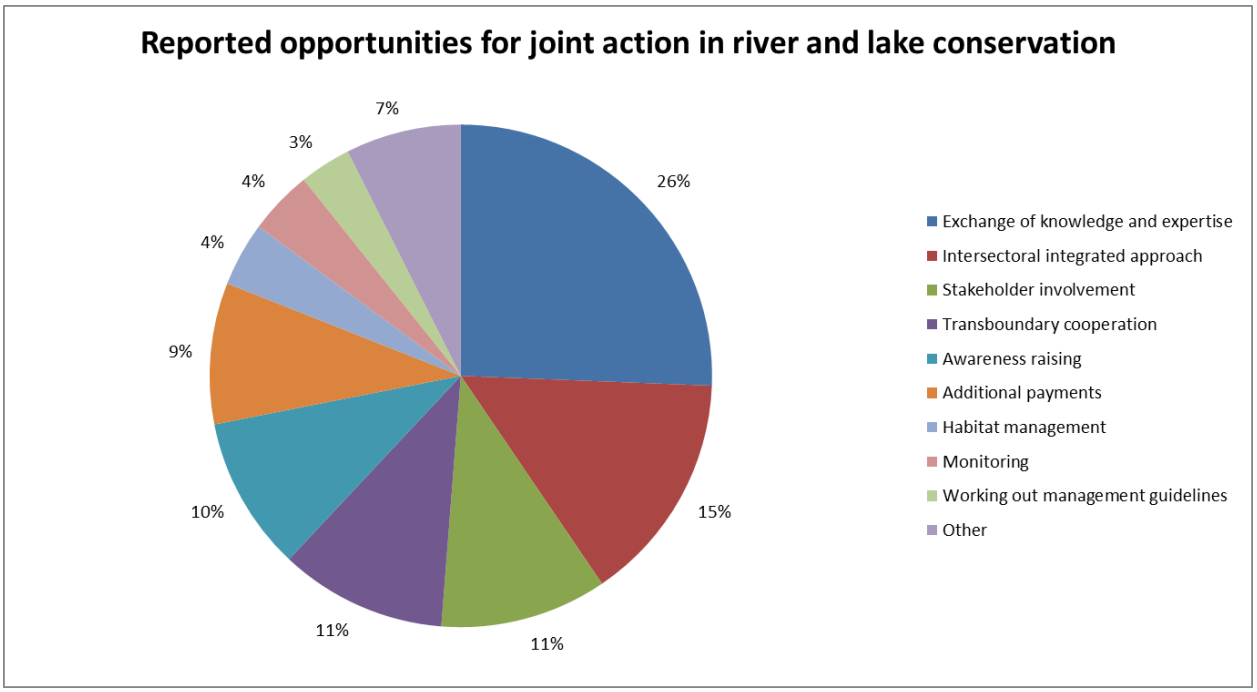


Figure 41 Results from Natura 2000 Biogeographical Process expert consultation: *Potential areas for joint action for the conservation of river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

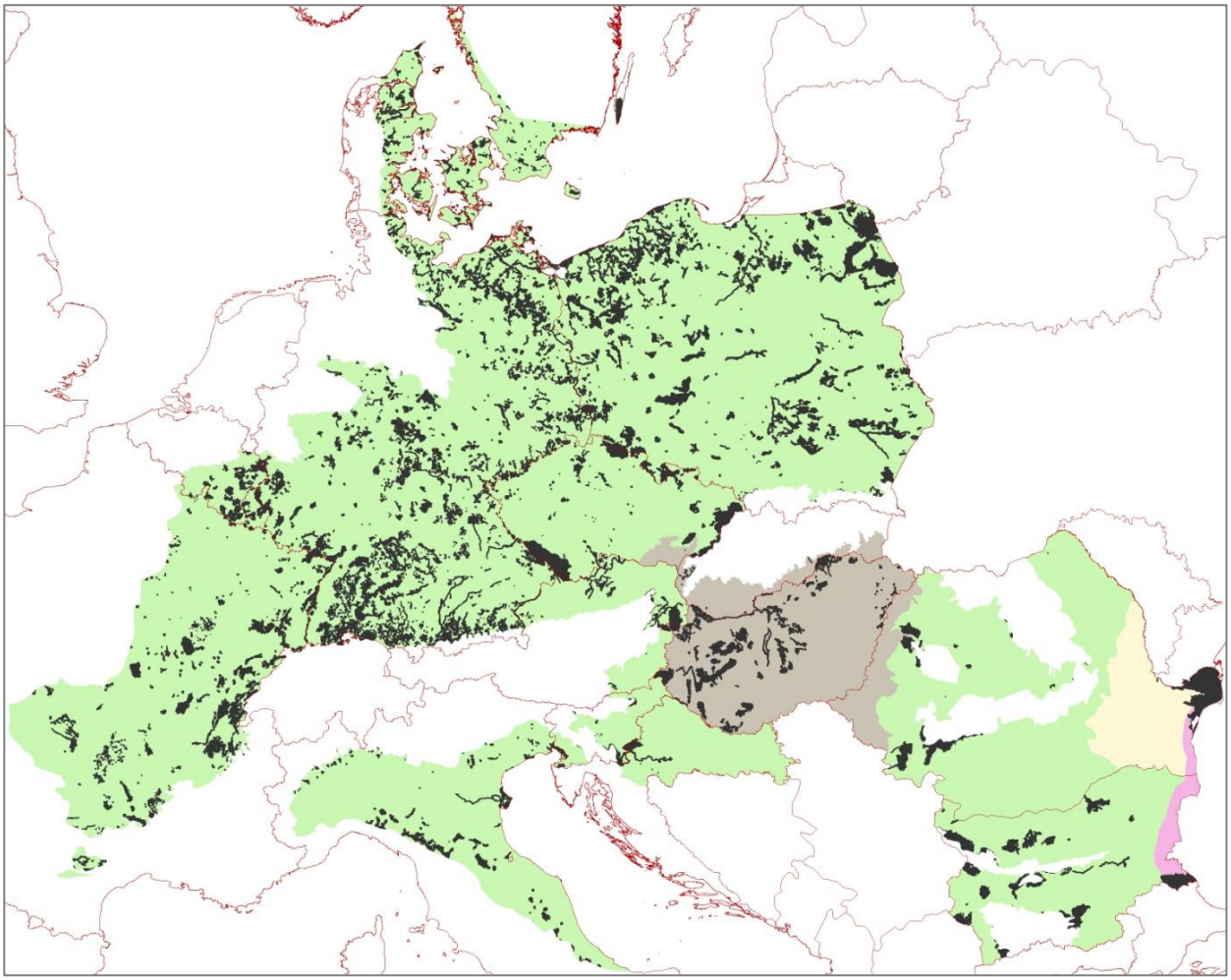
4.8 Wetlands

4.8.1 Summary description

The seven wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Natura 2000 Biogeographical Process are classified by the Habitats Directive into two subgroups (priority habitats are marked with an asterisk):

1. *Sphagnum* acid bog and transition mires: 7110* -Active raised bogs (–Continental, Pannonian), 7120 - Degraded raised bogs still capable of natural regeneration (Continental), 7140 - Transition mires and quaking bogs (–Continental, Pannonian) and 7150 - Depressions on peat substrates of the *Rhynchosporion* (Continental, Pannonian).
2. Calcareous fens: 7210*- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (–Continental, Steppic), 7220* - Petrifying springs with tufa formation (*Cratoneurion*) (– Continental, Pannonian, Black Sea) and 7230 - Alkaline fens (–Continental, Pannonian).

These habitat types are mostly present in the Continental and Pannonian biogeographical regions, while the Black Sea and Steppic regions are only represented by one wetland habitat each.



Map 6 Natura 2000 sites containing wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

Table 19 Wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

Habitats Directive code and name of Wetland habitats selected for priority consideration
7110 - Active raised bogs
7120 - Degraded raised bogs still capable of natural regeneration
7140 - Transition mires and quaking bogs
7150 - Depressions on peat substrates of the *Rhynchosporion*
7210 - Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae*
7220 - Petrifying springs with tufa formation (*Cratoneurion*)
7230 - Alkaline fens

According to the latest Article 17 report (for 2007–2012), the conservation status of almost all habitats in the subgroup *Sphagnum* acid bogs (in the Continental and Pannonian regions only) is unfavourable–bad, except for Transition mires and quaking bogs (7140), which are categorised as unfavourable–inadequate. Calcareous fens show an unfavourable status at the biogeographical level. Alkaline fens (7230) have an unfavourable–bad status for both reported regions (Continental and Pannonian), mainly due to their conservation situation in France, Denmark, Italy and Hungary. Likewise, petrifying springs (7220) are in an unfavourable–inadequate conservation state in all reported regions (Continental, Pannonian and Black Sea). As for the *Cladium mariscus* fens (7210), their status in the Continental region is also unfavourable–inadequate, mainly due to their conservation status in France and Germany, but also in Poland and Italy. The only favourable status at biogeographical level (still regarding this habitat) is reported from the Pannonian region, based on the situation in the only reporting country (Hungary). Since the only habitat in the Steppic region (7210 in Romania) was only recently added to the Reference list (it appears in the list of April 2014), it was not subject to reporting under Article 17 of the Habitats Directive. Information on its status was not found while reviewing the available literature.

Compared with the period 2002–2006, no real change in status was registered for the two subgroups of habitats at biogeographical level. When the status did change, it was mostly because of improved assessment methods. Only Belgium and Luxembourg (countries with a very low proportion of the habitat area that currently has an unfavourable–bad conservation status) reported genuine positive and negative changes for some parameters for habitat 7140. The period 2007–2012 is the first time that the Black Sea region has been reported (7220 habitat in Bulgaria). If we downscale the comparison to the summaries of Member States' assessments of individual habitats (Figure 42), we can see an increase in both categories of unfavourable status and a decrease of favourable status. But, as mentioned above, this is mainly due to improved methods and/or replacement of unknown or unavailable assessments.

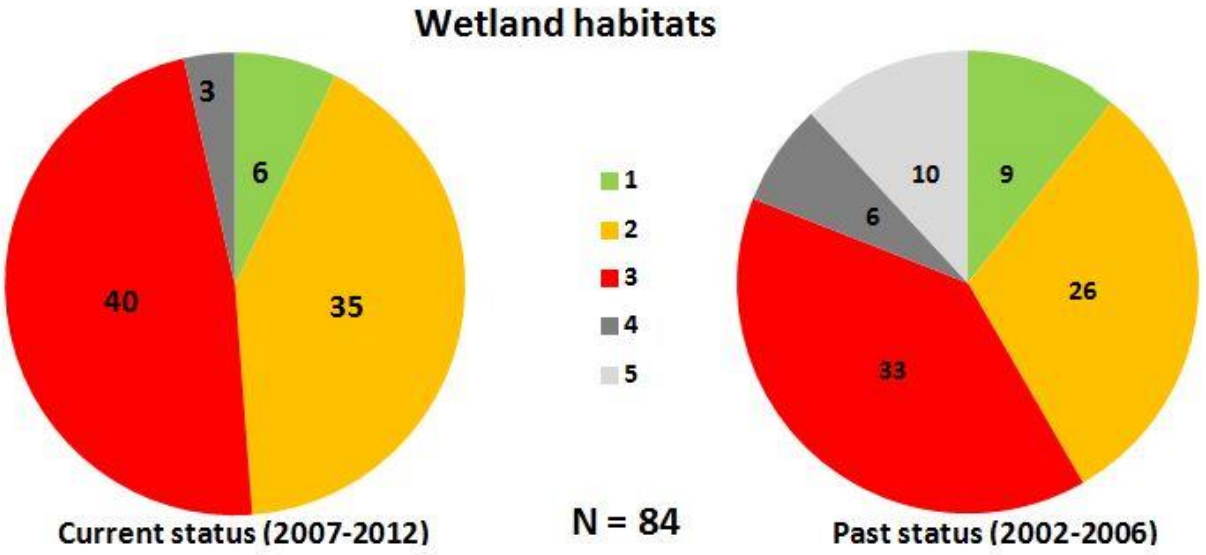


Figure 42 Current and past conservation status of wetland habitats based on Article 17 reporting. Numbers represent individual country/biogeographical region assessments (only habitats selected for priority consideration are included); N is the total number of assessments in each period. 1 = FV: favourable; 2 = U1: unfavourable–inadequate; 3 = U2: unfavourable–bad; 4 = XX: unknown; 5 = N/A: not assessed

4.8.2 Issues - pressures - threats

Wetland habitats depend on the water regime and quality. The main pressure on the habitat group comes from changes in the water regime caused by natural processes or human activities and pollution, mainly from agricultural areas (Figure 43).

Large-scale drainage of raised bogs began centuries ago in order to improve opportunities to extract peat and expand forest areas. First, girdling ditches were dug around them, and then the bog area was cut up by digging deep main ditches and branch networks of various side ditches. Stepwise changes in the mode and scope of use of raised bogs followed in the 20th century when the demand for peat extraction for fuel and horticultural use increased (Herbichowa et al., 2007). Degradation of these habitats is still taking place in the 21st century. It is estimated that if peat land deterioration continues and climate change increases, the last almost intact peat lands in the Belgian region of Wallonia will probably disappear within the next 20 to 50 years. In addition, the survival of the small population of Black grouse (*Tetrao tetrix*) remains compromised in spite of intensive management efforts (National Climate Commission, 2009). In the Jura Mountains of France, the growth or proliferation of common species such as Purple moor grass and birch is creating a vicious circle, because the strong evapotranspiration power of these species induces further lowering of the water table, accelerating the changes in the environment.

The most frequently reported pressures and high-level threats for active and degraded raised bogs (7110 and 7120) are human-induced changes in their hydraulic conditions (sometimes specified as land reclamation or water abstraction), succession of vegetation (sometimes direct forest planting) and air pollution (acid rain and nitrogen input). Drying-out due to climate change and peat extraction is reported as well. Medium-level threats include forest planting, peat extraction, invasive native species and water abstraction.

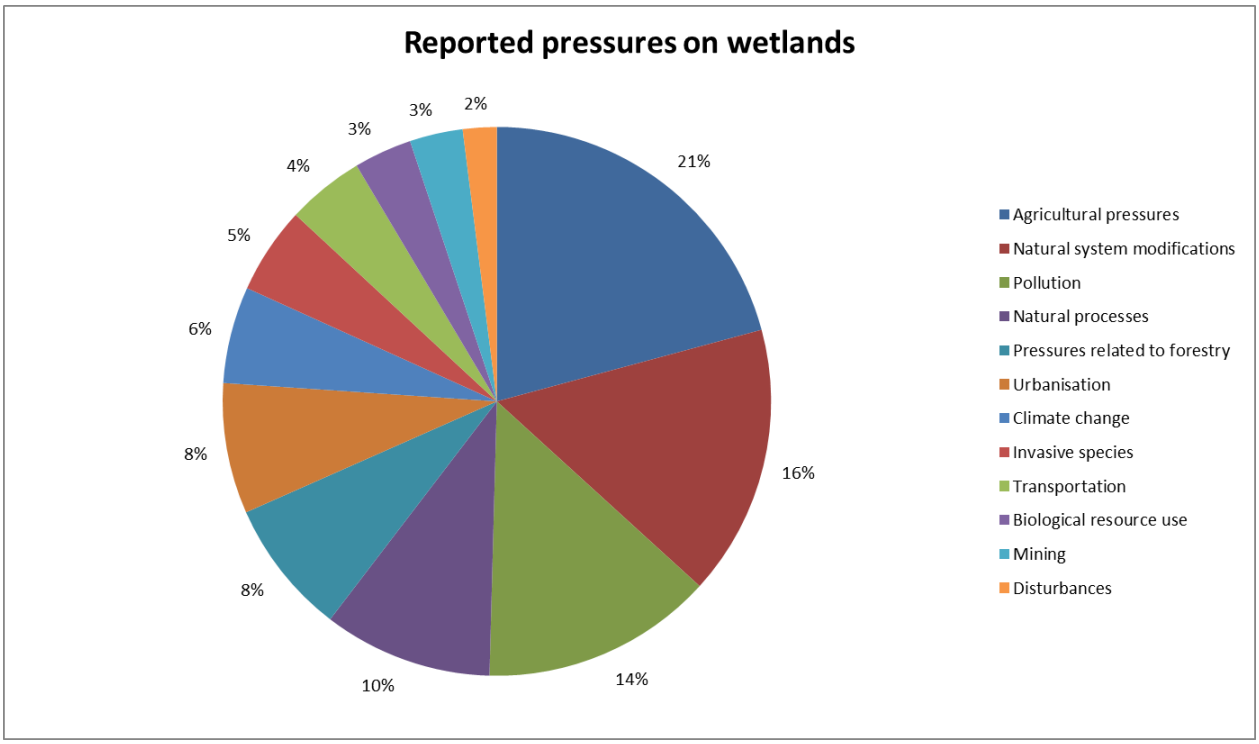


Figure 43 Results from Natura 2000 Biogeographical Process expert consultation: *Pressures on wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

The same high-intensity pressures and threats are reported for transition mires and quaking bogs (7140) and for depressions on peat substrates of the *Rhynchosporion* (7150). Moreover, lack or abandonment of mowing, and trampling by people or machines are mentioned. At medium level, grazing (sometimes intensive), fertilisation and pollution of surface waters, natural eutrophication and accumulation of organic material are pressing on these habitats.

Other pressures on bog and mire habitats reported in the literature include introduction of alien invasive species, illegal dumping, overgrazing, burning, forestry, direct loss of habitat to development, agricultural reclamation and increased pollution of water/reduction in water quality. De-icing salts are an additional problem for mires crossed by roads. In addition, poaching and disturbance of the avifauna and other animal groups is still a widespread phenomenon in countries like Bulgaria, despite recent efforts to control it.

For more than 200 years raised bogs (7110) have gradually been brought into forestry and peat exploitation or at least drained. The intake of water supplies near these habitats is particularly harmful, as it alters the water level. In this regard, it should be highlighted that a peat bog is always a potential reserve of fresh water. Human-induced changes also result from drainage, eutrophication due to air pollution, fertilising and liming of forests, forest works, use of heavy machinery and building of water reservoirs. Trampling increases the danger of surface erosion, and small bogs could also be damaged by game grazing and movement, especially if the game populations are large. The Degraded raised bogs still capable of natural regeneration (7120) are highly endangered because of past and current drainage, natural regeneration of raised bogs for forestry and peat excavation. The habitat is very sensitive to progressive lowering of the water level, afforestation, peat excavation, burning and trampling. Eutrophication from the air and climate change may be potential threats, but they are not sufficiently

recognized at present. The presence of non-native species such as *Vaccinium macrocarpon* is also an important pressure on raised bogs habitats.

Table 20 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 level 1 pressures for wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Pressure	***% responses***
J02 - Human-induced changes in hydraulic conditions	11
K02 - Biocenotic evolution, succession	9
H04 - Air pollution, airborne pollutants	7
A02 - Modification of cultivation practices	6
H01 - Pollution of surface waters (limnic & terrestrial, marine & brackish)	6
B01 - Forest planting on open ground	5
M01 - Changes in abiotic conditions	5
A08 - Fertilisation	5
I01 - Invasive non-native species	4
J03 - Other ecosystem modifications	3

The Transition mires and quaking bogs (7140) is a vulnerable habitat, sensitive to nutrient inputs, trampling and the intakes of water supplies made in the vicinity. The habitat is disappearing due to past and present drainage for forestry and grassland management, eutrophying wash-out in the agricultural landscape, local pollution from households, attempts to increase fertility of oligotrophic lakes for fish production, rubble and other waste near recreational areas. In Poland, the habitat is also subject to species composition change, as it can be overgrown by trees and bushes and locally encroached by expansive plants such as *Phragmites communis*, *Typha latifolia* and *Molinia caerulea*.Regulation of natural rivers is a continuous threat for this habitat in Poland, where legislation favours hard engineering solutions over flood protection. There is a similar threat in Bulgaria, even though most river corrections were carried out in the second half of the 20th century. The potential threat for mires comes from liming and fertilising of adjacent forests and areas planned for afforestation.

Depressions on peat substrates of the *Rhynchosporion* (7150) always form part of spatial complexes of raised bogs or wet heathlands, and are thus subject to the negative changes typical for those ecosystems. These environments are fragmentary, of limited size and, therefore, very vulnerable, unless they are able to occupy secondary spaces (for example, arising from previous excavations of peat).

The human-induced changes in hydraulic conditions of Calcareous fens (sometimes specified as drying-out, canalisation or water extraction) and succession of vegetation are the most frequent pressures and threats reported in common with previous habitat types. In addition, urbanisation and road construction (mechanical damage) are more specifically pressing on calcareous and alkaline fens (7210 and 7230); sand and gravel extraction and water pollution are pressures on petrifying springs (7220); and agricultural intensification (including grazing) as well as lack of or abandonment of mowing are pressures on alkaline fens habitats (7230). To a greater extent in Poland, mechanical damage of habitat 7220 has also been shown to result from the dumping of household waste or the accumulation of waste resulting

from recreational activities. Fertilisation (nitrogen input), the use of chemicals, related water and air pollution, invasive native and non-native species, forestry activities (planting among them), droughts and water abstraction are frequently reported as having a medium relevance level.

Areas with larger-scale occurrence of Calcareous fens have mostly been damaged in the past, especially by changes in the hydrological regime caused by meliorations, lowering of the water table, and shrub and tree encroachment. Lowering of the water table caused by drainage or water extraction is leading to extinction of the rich fen bryophytes and other plant species restricted to wet habitats. Unless drainage is followed by eutrophication, the habitat may remain species-rich but without the characteristic bryophytes. However, drainage of previously undrained peat soils is likely to induce acidification and internal eutrophication involving the release of SO4-S, NH4-N, Ca, Mg, NO3-N and soluble reactive P. Drainage also induces rapid mineralisation of the peat followed by mobilisation of nutrients and eutrophication. The effect of drainage on mire vegetation has been reported to be more drastic in minerotrophic than in ombrotrophic sites. External eutrophication is also a major threat to most natural, herb-dominated habitats, as the eutrophication by airborne or water-carried nutrients has a huge potential to change the composition and productivity of the vegetation. The cessation of traditional mowing management has been the main threat to fen biodiversity for many decades; shrubs and trees expand, and target plant and animal species decline. Expansion of trees and shrubs on open fens follows cessation of mowing practices that were common in fens (especially in Europe) until the second half of the 20th century.

The Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210) are a highly vulnerable habitat, as are all wetlands located in depressions, especially those in urbanised valley floors or floors dominated by intensive agriculture. The main cause of degradation is overgrowing by reed, shrubs and trees, but other pressures are important as well: withdrawal of *Cladium* vegetation in reaction to lowering of the water level or burning, degeneration (thinning out of sward, invasion of *Molinia caerulea* and *Calamagrostis epigeios,* invasion of synanthropic species*),* transformation of communities into moss/meadow vegetation, transformation of rushes into wet alder wood, and irregular mowing. For example, more than 800 ha of peaty areas once thrived in the Belgian Lorraine region, but today only small remainders (15 ha) of alkaline fens survive, often in a highly degraded state. Most of these alkaline fens were cut for hay in the former agropastoral economy. After haymaking gradually ceased, some of the fens became overgrown with *Phragmites australis*, *Carex* spp., *Salix* spp., *Betula* ssp. or *Alnus glutinosa* and have lost their biodiversity value as a result of lack of traditional management. They are also very scattered and very small in size, due to connectivity problems. Some of the typical species are now regionally extinct, while other species only occur in a few sites. At present, 14 of the 15 ha of the remaining alkaline fen areas are classified as nature reserves and are protected. Nevertheless, without appropriate restoration measures, these protected areas are still threatened by drying, tall-herb invasion, natural afforestation and lack of recurrent management measures. The populations of the typical species are also small and isolated, threatened by inbreeding depression.

For habitat 7220 Petrifying springs with tufa formation (*Cratoneurion*), the greatest risk is represented by wells and aquifer extractions, perhaps caused by excavations and new roads. The most common reasons for the habitat's degradation are the lack of management, eutrophication, extreme mechanic disturbances, ruderalisation, drainage and afforestation. The fen springs often require cutting in the late summer, otherwise the accumulation of dead matter becomes a problem. The insufficient export of nutrients is leading to succession of competitive grasses, herbs and later also shrubs. Eutrophication in

combination with disturbances could lead to increased abundance of ruderal species linked to grazing. Drainage represents the most serious pressure, especially because such changes to the water regimes are usually irreversible.

The Alkaline fens (7230) are extremely endangered due to general and wide-scale disturbance in water conditions that lead to irreversible change in the habitats. Drainage may alter the peat chemistry (for example lowered pH and leakage of cations) and biological attributes (invasion of dominant species) as a result of the combination of lowered water table and peat decomposition. These disturbances are often accompanied by other degradation mechanisms and succession to other types of natural or non-natural habitats. In situations where dynamic equilibrium is achieved by traditional management the major threat is abandonment of mowing. Intensive agriculture also brings pressures: excessive grazing trivializes the flora and facilitates introduction of species from adjacent habitats. Drainage for the improvement of pasture represents another risk. In an intensive agricultural landscape, chemical pollution leading to eutrophication is a serious threat. The combination of individual effects (e.g. drainage combined with eutrophication and the management change) increases the degree of degradation. Another serious threat is the widespread construction of fish ponds and other water reservoirs. New threats arise from large-scale development projects (large river regulation and canalisation projects; water reservoirs).

4.8.3 Main conservation requirements

The maintenance of a suitable hydrological regime in non-disturbed sites and its restoration in drained sites is the main conservation requirement for all wetland habitats. Because these habitats were mostly under strong pressures in the past, they usually need active management and restoration rather than passive conservation (Figure 44). In restoring raised bogs, it is crucial to achieve the optimal possible hydrology. The preparatory work should include hydrological and relief study, study of drainage plans, analysis of ownership, communication with the owners and stakeholders, biology and technological solutions. The level of the preparatory studies should be adapted to the topography and ownership situation of the project area. In the most complicated projects, it may be necessary to actually produce a hydrological model based on setting up sounding pipes and measuring the water level over a relatively prolonged period. Producing a model of this kind is quite costly and it usually requires external advice (Stenild et al., 2011). The first step in the restoration of the hydrological regime should be to stop the operation of drainage ditches. Also, the impact of changed hydrology should always be studied when the restoration works have been completed. Conservation requires measures to reduce nutrient input, and measures that allow better control of nutrient use, such as the creation of buffer zones on wetlands limits. With respect to the restoration of raised bogs, overgrowth is still the biggest land management challenge, in particular the elimination of birch and pine invasion.

There is an urgent need to protect remnants of raised bogs in the network of protected sites. Legal protection should be applied to all bogs retained in good condition, followed by promotion of spontaneous development and control of catchment management (especially forest management). Management plans should be developed. In Poland, a main requirement is the availability of land for habitat restoration. At present this is difficult because most bog sites are private property divided in numerous small parcels belonging to different owners.

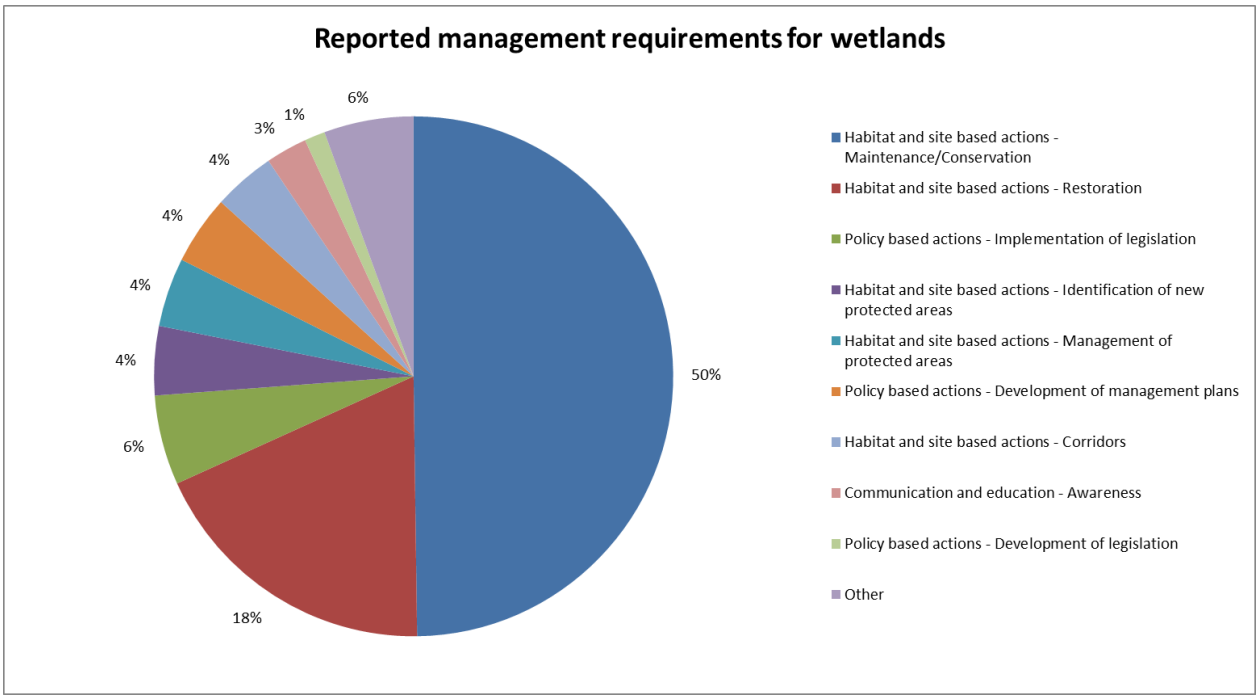


Figure 44 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation requirements for wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

The only way to preserve Degraded raised bogs still capable of natural regeneration (7120) is to restore them by raising the water level. This can be achieved by building dams across ditches and removing trees. In some cases, the implantation of peat-forming vegetation is needed. Activities should be preceded by assessment of water conditions to allow adequate planning for the number, location and density of dams.

The basic method of protecting the Transition mires and quaking bogs (7140) is by preserving natural water levels or, where lowered, raising them to their original level. A hydrological analysis of the whole wetland complex is therefore essential. Measures aimed at re-establishing optimal hydrological conditions, such as filling-in drainage ditches, and damming, should be introduced gradually in order to allow the system to adjust to the new conditions. Severely drained mires should be restored by blocking ditches on slopes and raising the 'erosion base'. For mires situated in agricultural landscape a belt several metres wide should be excluded from ploughing. In forested landscapes the clear cuts should be excluded in the vicinity of transition mires, and no branches should be dumped on the mire surface. Any pollution with rubble or waste as well as radical changes in land use (for example for fisheries) should be prohibited. These peaty areas are often located in close proximity to pastures. If cattle trampling is sporadic and occasional, it could be tolerated, but it would be better to avoid it if the site is located near the stables. Maintaining herbaceous communities to slow succession could be served by schemes focusing on mowing. On wet, sloping mires, methods to curb succession should be implemented by qualified personnel. Very large mire areas demand cross-sectoral, integrated management plans, which should include rational water management, agricultural activities, hunting, etc.

The challenge in conservation of the habitat type Depressions on peat substrates of the *Rhynchosporion* (7150) is to balance the disturbance regime necessary for this habitat with the rather more conservative needs of other habitats which will be present. Due to its transitory character, the maintenance of its

presence depends on optimal conditions at least somewhere on the same mire at any particular time. *Rhynchosporion* communities have strong requirements regarding water in terms of quality (oligotrophy, acidity) and quantity (constant humidity) and concerning the openness of the ecosystem (open and bare peat areas). Active management should aim at stabilising favourable water conditions (building of sluice gates, filling in draining ditches, piezometric monitoring, etc.), extensive grazing, and mowing and clearing of brushwood and invasive species in general. At the stand level, the habitat can be promoted by creating specific favourable conditions, e.g. by removing vegetation, litter and part of the soil surface from limited areas (Stallegger, 2008). Any activity that can promote eutrophication should be avoided. The general rules to protect sites from desiccation, eutrophication and chemical pollution have to be respected.

For the Calcareous fens, the main objective is to keep the hydrological regime at a favourable level. The water level should be stable, and a low trophic level has to be maintained. Extensive land use in the form of grazing and mowing, and the manual removal of trees and shrubs to keep the habitats open is suitable. If necessary, measures to control alien species should be applied. The habitat should be protected from the influence of directly adjacent agricultural land by creating buffer zones to reduce the influence of fertilisers, pesticides and herbicides. Depending on the impact factors, it is recommended to stop drainage and the extraction of water, to avoid eutrophication.

Protection methods for the habitat Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210) depend on the dynamic state of vegetation, which in turn results from stable or disturbed abiotic conditions. Under natural conditions, habitat management measures are not necessary. If the habitat is disturbed, active management is necessary. Most of the time, this translates into stabilising or raising the water level (e.g. by blocking drainage veins), or extensive use of the sites (by mowing and grazing) which prevents the succession towards shrub and forest communities. In the more advanced stages of succession, shrub and tree removal is inevitable. The protection methods have to be customised to the individual properties of sites.

In order to preserve the habitat 7220 Petrifying springs with tufa formation (*Cratoneurion*), which is usually of very limited expanse in the field, it is essential to preserve its surroundings and the entire hydrological system concerned. Some of the requirements here would be: to prepare guidelines for electricity line conservation/refurbishment; to reduce the spread of invasive non-native and expansive species; to remove the piping and makeshift flow-smoothing inlet structures; and to monitor the presence of wild boars and potential damage caused by them.

Since almost all Alkaline fens (7230) have been drained during the past few centuries and often changed into low-productivity meadows and pastures, they cannot be maintained without management practices such as mowing, moderate grazing and clearing of overgrowth (to prevent natural succession). On the contrary, because of these past modifications, there is a high demand for restoration of rich fens. Furthermore, it is often necessary to control ditching activities and the use of fertilisers in surrounding agricultural and forest land, and to restore the hydrological conditions and remove the top-soil layer (e.g. blocking or filling in the ditches)(Šefferová-Sanová et al., 2008). Preservation or restoration of hydrological conditions with simultaneous traditional management (mowing or light grazing) is favourable. Extensive mowing with manual equipment once every two to five years is desirable and in countries like Poland this could be achieved with the support of agri-environmental measures.

4.8.4 Management and conservation measures

The hydraulic regime of wetlands has been restored in numerous projects mostly by stopping the water outflow by constructing wooden or earth dams and by partially or totally filling the ditches (Figure 45). Changes in the hydraulic regime could affect the interests of local owners and stakeholders. Therefore, for the success of the project, it is important that there is a positive response, particularly from any private owners within the project area. The transplantation of peat mosses into peat post-excavation areas as well as to other sites systematically drained and/or afforested represents a promising restoration measure. Guidelines produced by projects for the restoration of wetlands and for raised bogs can be found in Stenild et al. (2011), Herbichowa et al. (2007), Pawlarczyk et al. (2005).

The reduction of the negative impact of nutrient enrichment and elimination of dry deposition of atmospheric nitrogen on trees and scrubs is done by the clearing of trees and scrubs, and especially the elimination of birch and pine invasion. Scrub encroachment is also controlled by grazing. Goats are very effective for this, especially in respect of birch and Purple moor grass (*Molinia caerulea*), which are the greatest problems when restoring former raised bog surfaces. Grazing can be used for both short-term clearance and subsequent periodic use, depending on the appearance of new birch seedlings. When establishing grazing immediately after clearance, the goats remove the regrowth of old and young stumps as well as any new seedlings. Grazing cannot be a long-term land management action for a raised bog; there needs to be both an implementation strategy and an 'exit strategy'. Sheep and cattle are currently being reintroduced on an experimental basis on some of the mountain pastures in Northern Velebit National Park, Croatia. On the other hand, ongoing research in Poland is looking into the influence of mechanical mowing on hydrogenic habitats.

The conservation of fens (minerotrophic peatlands) for biodiversity is to a large extent related to maintaining their open (treeless) character and undisturbed hydrological regimes. To combat unwanted succession, tracked mowers have been developed based on snow-grooming vehicles, and are being increasingly used in some European fen habitats. In Poland, their conservation is also linked to public acquisition of land, as the existence of a large number of small privately owned parcels is a great obstacle to the implementation of conservation measures.

The restoration of rich Alkaline fens (7230) depends on the severity of the damage, the time that has passed since drainage, the changes in chemical properties of the peat and the possibilities to re-introduce water. Experience shows that several rich fen bryophytes respond quickly to changes in water level whereas vascular plants do not. After rewetting, recovery towards the original rich fen vegetation is slow, as it is delayed by substrate degradation, dispersal limitation and the presence of dominant species. The eutrophicated and acidified surface peat may have to be removed from the site in order to facilitate successful establishment of locally extinct species, but it is also possible to add a small amount of lime to the peat surface to promote the establishment of brown moss establishment. Removal, perhaps repeated, of dominant species (trees, shrubs, *Molinia, Polytrichastrum, Sphagnum*) in combination with surface peat removal, liming and reintroduction of rich fen specialists may also be necessary, otherwise the substrate may once again degrade as an effect of invading dominants (Mälson et al., 2008). Judging from observations in Germany, one late mowing (August–September), by hand or brush cutter, is recommended. It seems to be sufficient to repeat the action every two years on wet sites and more frequently on less humid sites.

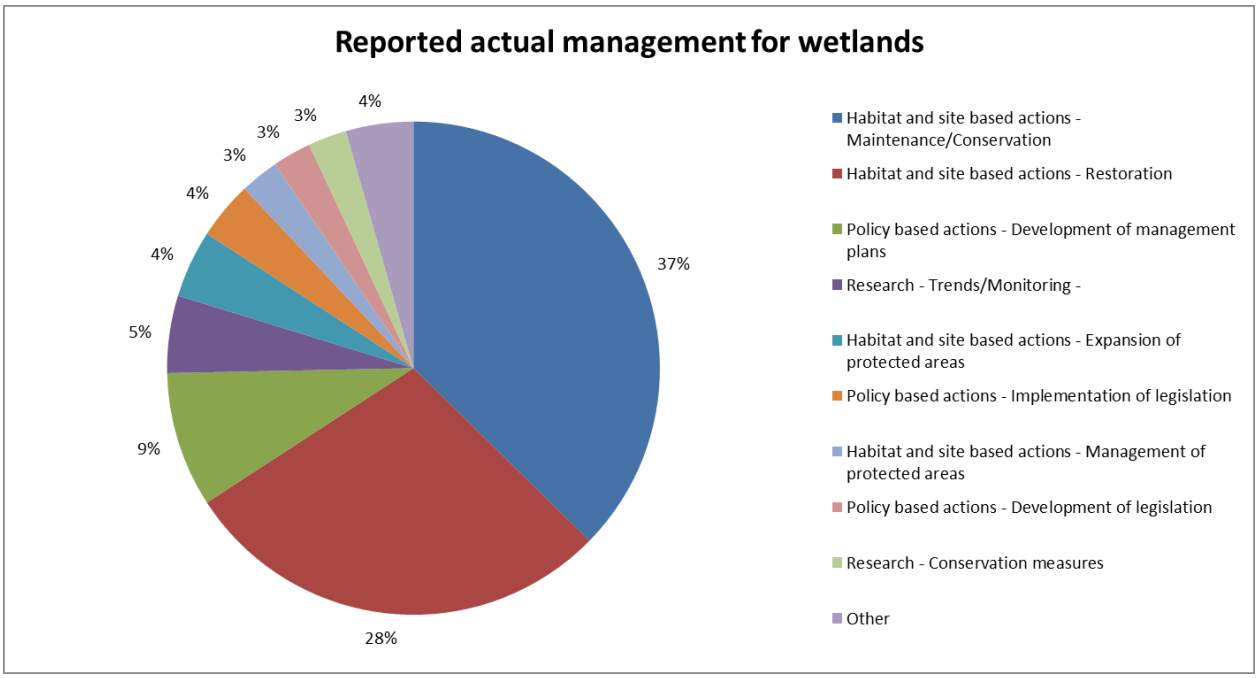


Figure 45 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation measures for wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Since 1993, a management programme for mires and raised bogs restoration has been implemented in the Hautes-Fagnes Walloon nature reserve (Ghiette et al., 1995; Frankard et al., 1998; Frankard & Doyen, 1999; Frankard & Ghiette, 2000; Frankard, 2005; Frankard, 2006a; Frankard & Janssens, 2008; Frankard, 2012). The following approaches have been tested: (1) tree and shrub clearance by cutting or milling; (2) raising the water table by ditch blocking; (3) restoration of inactive areas by lowering the peat surface to a level close to the mean perched water mound or by rotovating or scraping vegetation and subsoil; (4) restoration of heavily cut-over bogs by inundation using peat, clay or PVC dams and by remodelling the peat surface to form lagoons; (5) sheep grazing on inactive areas covered by *Molinia caerulea*.

The programme gave good results, so a large-scale restoration programme based on these local results has been implemented in Wallonia in the framework of six LIFE-Nature projects dedicated to the restoration of peaty habitats in the Ardenne high plateau: LIFE Saint-Hubert (2003–2007), LIFE Croix-Scaille (2006–2009), LIFE plateau des Tailles (2006–2010), LIFE Hautes-Fagnes (2007–2012), LIFE+ Lomme (2010–2014) and LIFE+ Ardenne liégeoise (2012–2018). These projects were financed and managed by the Walloon Government Service, except for LIFE Croix-Scaille, which was managed by a regional conservation organisation (Natagora). This LIFE metaproject in Wallonia aims to restore the whole network of peaty habitats, such as active and degraded peat bogs, transition mires, acidic fens, bog woodlands, wet heathlands and alluvial woodlands, from the south-west to the north-east of the Ardenne high plateau (http://biodiversite.wallonie.be/fr/meta-projet-life-de-restauration-des-tourbieres-de-haute-ardenne.html?IDC=5778). In the framework of these LIFE projects, all the restoration techniques successfully tested in the Hautes-Fagnes nature reserves have been applied on a large scale (Frankard, 2012). Globally, more than 4,000 ha have been already restored (and this should exceed 5,000 ha with the last project). The main activities are eliminating spruce plantations and drains, rotovating or scraping the invasive Purple moor grass, and restoring the water table level and natural

hydrological structure on all sites. In each high plateau, site networks have been fully redesigned to ensure nature recolonization processes, species regional population dynamics and optimum restoration of ecosystem services provided by peat lands (Plunus et al., 2014). Detailed biological monitoring programmes on vegetation, birds, dragonflies and butterflies already demonstrate a positive effect within each project and on the regional conservation status (Parkinson, 2008; Dufrêne et al., 2011).

On the other hand, very few restoration measures are applied to alkaline fens in Belgium. Out of a total potential surface of 800 has, only 40 ha are currently managed by grazing or mowing and only 15 ha of typical habitat still occur. Most of the actions consist of tree and shrub clearance by cutting or milling; raising the water table by ditch blocking; and grazing and mowing in some small areas of protected sites. However, this is not sufficient to restore the alkaline fens habitat.

4.8.5 Species-specific measures

All wetland habitats selected for priority consideration require some species-specific focus. Active raised bogs (7110), Degraded raised bogs still capable of natural regeneration (7120), Transition mires and quaking bogs (7140), and Depressions on peat substrates of the *Rhynchosporion* (7150) need to be managed with the needs of Black grouse (*Tetrao tetrix*) in mind. *Colias palaeno*, *Boloria aquiloniaris* and *Vipera berus* require open habitat connectivity and the latter also needs dry wintering grounds. Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210), Alkaline fens (7230) and *Salix alba* and *Populus alba* galleries (92A0) are especially important for *Maculinea* (*Phengaris*) species (e.g. *Maculinea alcon*), *Gentiana pneumonathe*, *Swertia perennis*, *Euphydryas aurinia*, *Lycaena dispar*, *Crex crex*, orchids, *Sanguissorba*, *Gentiana*, *Eriophorum,* which need different mowing timing. Moreover, on Alkaline fens (7230) special protection of tussock grasses is needed.

4.8.6 Bottlenecks - Problems

Wetlands are sensitive to disturbances. They are complex ecosystems with complicated links between their abiotic and biotic components. Thus, the management and restoration of wetland habitats is a challenging process in which many relationships need to be taken into account. Therefore, the preparation and implementation of management or restoration plans is usually a process with high demands as regards time, expert and financial resources. This complex governance requires a close involvement of stakeholders (Figure 46).

Two of the main bottlenecks for the conservation of wetland habitats are bureaucratic barriers and poor performance of nature conservation administrative bodies. Lack of funds is a key aspect here, connected to poor awareness on the part of policymakers and the general public of the importance of wetlands and the benefits derived from the ecosystem services they provide. This is also reflected in the limited number of experts who have the theoretical and practical knowledge to design and implement conservation plans. Also, due to very limited funding for conservation, landowners are often resistant to the prospects of implementing economically unviable measures. Moreover, land ownership is generally a large problem when it comes to wetland conservation in Europe, as in many cases the habitats are located on private properties, whose numbers can be very high.

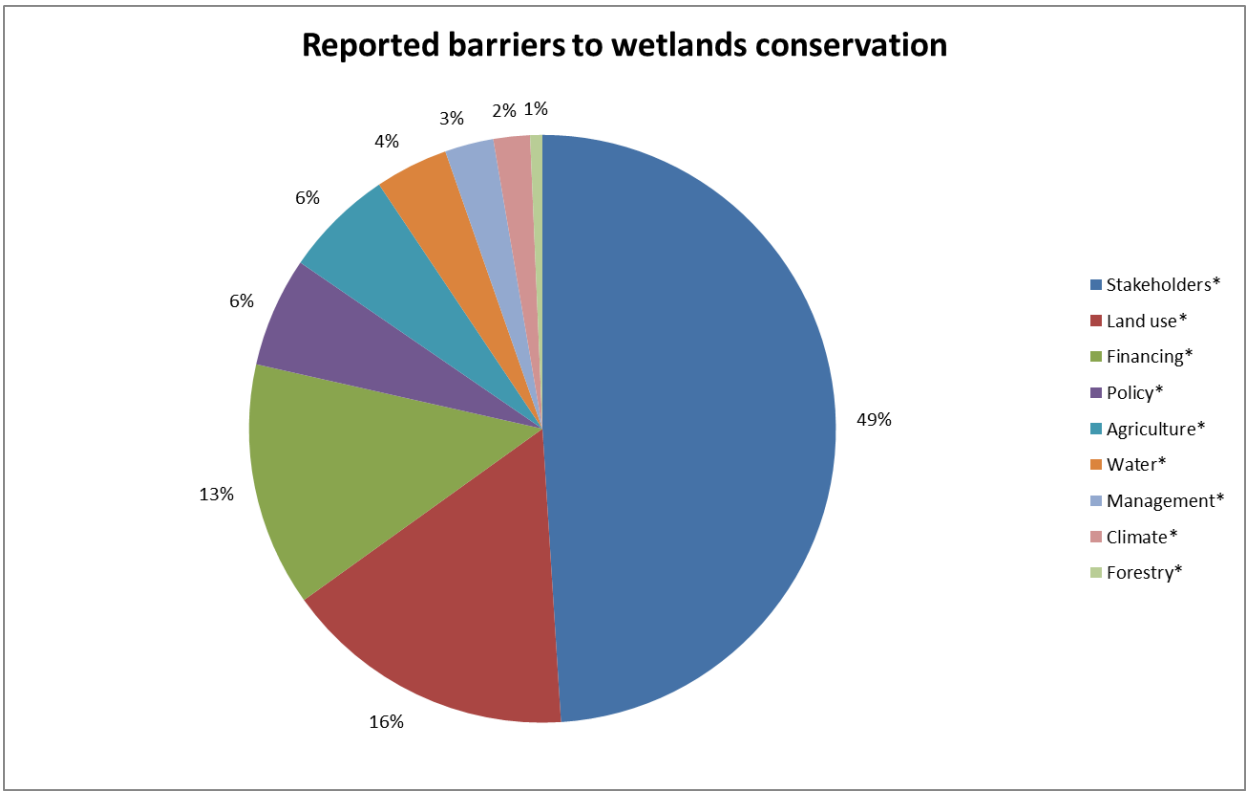


Figure 46 Results from Natura 2000 Biogeographical Process expert consultation: *General conservation barriers for wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

In addition, some countries might pursue policies whose indirect effect would conflict with some requirements for habitat conservation. For instance, the Renewable Energy Act in Germany increased the demand for biomass, including wood or deadwood, the latter being particularly important from a biodiversity standpoint.

Table 21 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 specific conservation barriers for wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Barriers and bottlenecks	***% responses***
Stakeholders - Lack of knowledge / competence / data	15
Stakeholders - Lack of cooperation	14
Financing - Lack of funds for conservation (and complicatedness / difficult access)	10
Land use - Fragmentation	10
Stakeholders - Lack of awareness / negative attitude	9
Stakeholders - Lack of understanding	6
Stakeholders - Lack of skills	5
Agriculture - Intensification	4
Land use - Degradation	4
Policy - EU-national and nature-agri (mining) incoherence	4

In preserving the alkaline fens habitat, serious conservation mistakes occurred due to abandonment of traditional use; this is well documented in a number of nature reserves. Equally, there are significant knowledge and data gaps in terms of hydrology, especially for small sites.

4.8.7 Solutions and opportunities

Solutions to improve the conservation of wetlands require effective cooperation with stakeholders and to raise the financial resources necessary to implement the planned bog conservation measures (Figure 47). Knowledge exchange based on practical implementation of successful management or restoration activities could help to reduce the expertise gap in the preparation of management and restoration plans. On a positive note, knowledge is already available from completed or ongoing projects and is currently being transformed into guidelines. Knowledge exchange could be further improved by creating suitable platforms. The fact that bogs, mires and fens are habitats with a specific character, but with features that are not very variable across the range of the specific habitat type, facilitates the transferability of knowledge to other habitat types.

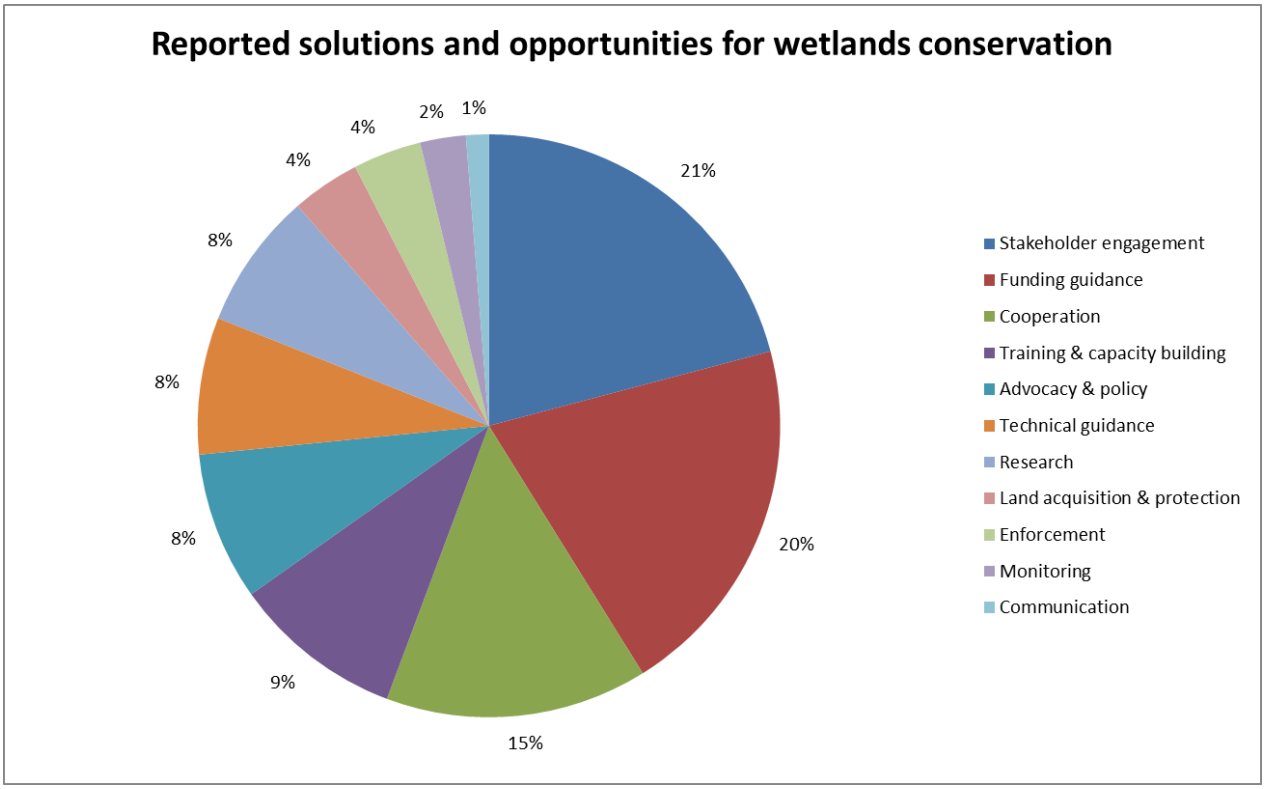


Figure 47 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation solutions and opportunities for wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

When possible, the benefits of wetland conservation should be shown to the general public. In the Bavarian region of Germany, part of the bogs and fens habitats is owned by the Free State of Bavaria, managed by the state forest company. On these sites, exemplary measures can be implemented and shown as 'good practice' in order to convince landowners and policymakers of the advantages of

wetland conservation. Research on the dynamics of wetland habitats, such as peat land hydrology, carbon sequestration, and critical load of nutrients, could also be carried out by or in cooperation with higher education institutions, filling the current knowledge and data gaps.

4.8.8 Relevant cross-cutting issues

The development of cross-sectoral management plans and legislation could represent an important step forward for habitat conservation. Similarly, as has been shown in other habitat types and in other regions, stakeholder participation seems to be crucial for wetland restoration (Figure 48). Restoration is often linked to the improvement of the water regime of the wetland, which usually translates into an increase of the water table. This process is often true not only for the wetland itself, but also for adjacent areas. Therefore, for the success of a restoration project, good communication with the landowners and other stakeholders with an interest in the target area are essential.

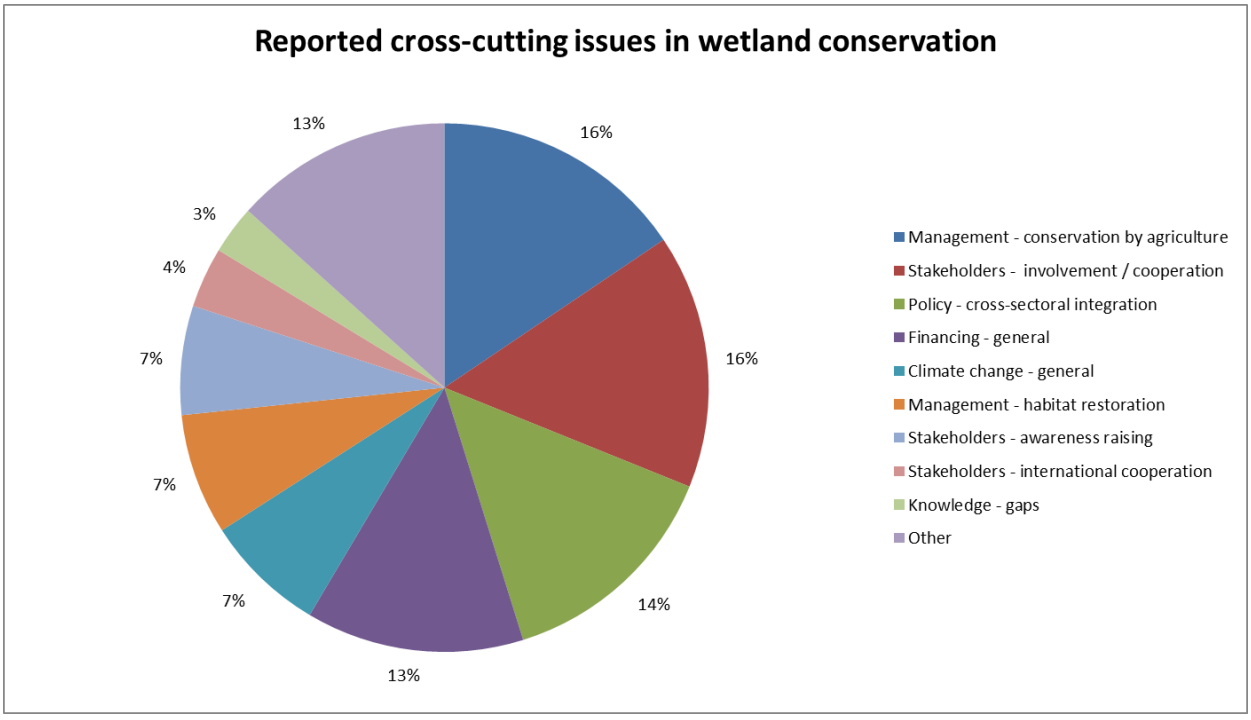


Figure 48 Results from Natura 2000 Biogeographical Process expert consultation: *Cross-cutting issues in wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Synergies with other directives and policy sectors, such as the CAP or the Water Framework Directive, should also be encouraged. In many new Member States, agri-environmental measures through CAP are an important source of income for landowners, and encourage conservation measures. On the other hand, the good ecological status targeted in the Water Framework Directive is dependent on the wetland dynamics within the larger River Basin Management Plans (RBMPs).

4.8.9 Lessons learned / Examples of best practice / Successful and unsuccessful projects

The practical examples of projects listed below can provide useful input to other sites with similar challenges. They highlight cases of best practice to restore the hydrological regime, involving local communities and a range of specific management measures (Figure 49).

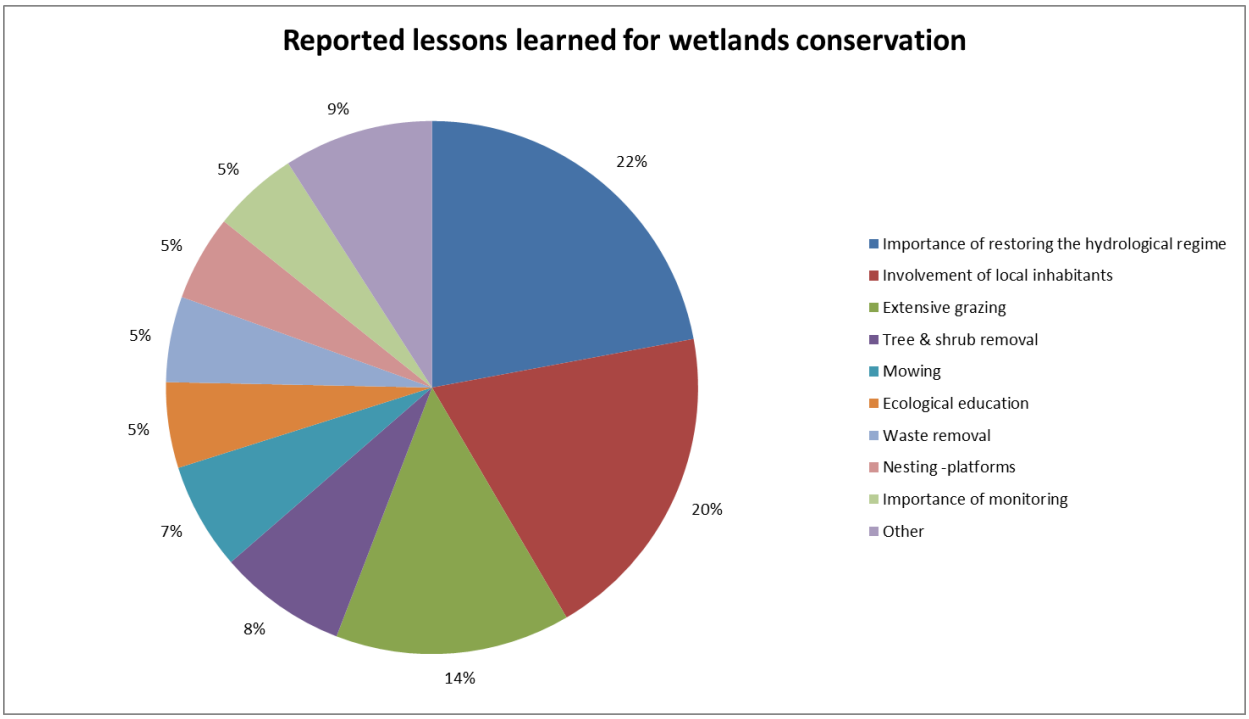


Figure 49 Results from Natura 2000 Biogeographical Process expert consultation: *Lessons learned for wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Both *Sphagnum* acid bogs (71XX) and Calcareous fens (72XX)

Project LIFE06 NAT/PL/000100 – 'Wetlands Butterflies – Conservation and upgrading of habitats for rare butterflies of wet, semi-natural meadows'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3219 or http://poland.rec.org/

The main outputs of the project were:

- removal of shrubs, mowing, restoration of hydrological conditions and recreation of target species habitats;
- organising agri-environmental training for local farmers;
- raising public awareness;
- establishing two nature trails.

Project LIFE09/NAT/PL/000258 – 'Restoration of hydrological system in the Middle Basin of the Biebrza Valley. Phase 1'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3862&docType=pdf

The main aims of the project were to:

- stop degradation processes on hydrogenic habitats in the vicinity of the Rudzki Canal – Ełk river – Jegrznia river – Woźnawiejski canal;
- improve habitat conditions for avifauna of non-forested ecosystems;
- purchase of 19 ha of land.

'Preservation of alkaline fens in the upper Biebrza Valley in the vicinity of Szuszalewo village'

The aim of the project was to protect and preserve the most valuable habitats in the Biebrza National Park, such as alkaline fens (7230). Most of the habitats are private property, so it was important to include the Szuszalewo village community in the project and to have their support. Project activities included scrub clearance in endangered habitats and the participation of private owners in agri-environmental programmes, which covered 103 ha of land. The project was carried out from 2009 to 2010 and was co-financed by the National Fund for Environmental Protection and Water Management, Dąbrowa Białostocka Commune and the Biebrza National Park.

'Allgäuer Streuebörse'

www.streue.de

The project targets were to:

- prevent alkaline fens habitats from being abandoned;
- exchange best experiences concerning these habitats, including using the right machinery and techniques;
- market cuttings/litter to ensure its use on the farms and to keep the regional cycles running.

'Allgäuer Mooralliianz' (Allgäu region Bog Alliance)

http://www.bfn.de/0203_allgaeuer-mooralliianz.html

The main objectives of the project were:

- long-term conservation of hydrologically intact bogs;
- renaturalisation of degraded bogland in the region of the Alpine foothills and bogs in the Ostallgäu and Oberallgäu administrative districts;
- conserving and fostering the development of nutrient-poor moist and wet meadows around the bogland.

Project LIFE06 NAT/D/000003 – 'Rohrhardsberg - Rohrhardsberg, Upper Elz and Wilde Gutach'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3130 or http://www.rohrhardsberg-life.de/

The main project results were:

- successful development and optimisation of habitats (7110);
- restoration of about 25 ha of mires;
- awareness raising.

Project LIFE07 NAT/D/000233 – 'ReHa Federseemoor – Restoration of habitats in the Federsee bog (ReHa Federseemoor)'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3335 or http://www.nabu-federsee.de/index.php?page=111

The aims of the project were to:

- restore and rewet large areas of fens;
- moving large areas of fens.

Project LIFE07 NAT/DK/000100 – 'REFLOW – Re-establishing a natural water flow level in the river system "Mølleåen"'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3352

The main outcome of the project was the clearing of shrubs to improve conservation status for 7140, 7220 and 7230.

Project LIFE08 NAT/DK/000466 – 'HOLMEGAARD MOSE – Restoration of raised bog Holmegaards Mose'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3553&docType=pdf or http://naturstyrelsen.dk/naturbeskyttelse/naturprojekter/life-holmegaards-mose/

The main project results were:

- restoration of conditions that ensure development of the main part of Holmegards Mose into 7110 active raised bogs with a favourable conservation status;
- restoration of about 70 ha of bog;
- hydrological restoration on 70 ha out of the 90 ha foreseen (the action was not carried out on 20 ha because of high nutrient levels which would damage the bog).

Project LIFE09 NAT/SI/000374 – 'WETMAN – Conservation and management of freshwater wetlands in Slovenia'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3832 or http://www.wetman.si/

The main outcomes of the project were:

- improvement of hydrological conditions of bogs by the construction of dykes;
- removal of overgrowth on bogs;
- rebuilding of footpaths in order to prevent habitat destruction;
- awareness raising.

Project LIFE10 NAT/DK/000102 – 'Lille Vildmose – Restoration of active raised bog Lille Vildmose'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4035 or http://naturstyrelsen.dk/naturbeskyttelse/naturprojekter/life-projekt-i-lille-vildmose/

This ongoing project targets the restoration of raised bogs through the construction of dams.

Project LIFE13 NAT/SE/000105 – 'BushLIFE – Restoration of habitats rich in trees and shrubs'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4923 or http://www.lansstyrelsen.se/skane/Sv/Pages/default.aspx.

The expected results are:

- restoration through clearance of trees and bushes;
- restoration by cutting woodland;
- improvement of habitat quality by creating large stumps.

Project LIFE13 NAT/PL/000050 – 'Renaturyzacja II_LIFE_PL – Restoration of hydrological system in the Middle Basin of the Biebrza Valley. Phase II'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5111 or http://www.biebrza.org.pl/.

The expected results are:

- reduced outflow of water to raise the groundwater level and increase the humidity of wetland habitats in the vicinity of Kapicky Canal;
- inhibition of peat mineralisation to suspend the degradation of peatlands and improve environmental conditions for wetland habitats and fauna in project area;
- increased awareness;
- optimally located tourist infrastructure to diminish the negative impacts of tourism on wetland habitats and species.

Project LIFE13 NAT/FR/000762 – 'LIFE Jura peat lands – Functional rehabilitation of the Jura mountains peat lands of Franche-Comté'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4861 or http://www.life-tourbieres-jura.fr/

Drainage and spruce plantation have resulted in severe hydrological disruption of ecosystems, leading to the loss of 50 % of the habitat. The expected project results are:

- rehabilitation of 60 bogs covering 625 ha;
- blocking of 16 km of drainage channels;
- tree felling and shrub clearing;
- extraction zone regeneration over 7 ha;
- purchase of private properties.

Sphagnum acid bogs (7110, 7120, 7140, 7150)

Project LIFE06 NAT/B/000091 – 'PLTHautes-Fagnes – Rehabilitation of heaths and mires on the Hautes-Fagnes Plateau'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3114 or http://biodiversite.wallonie.be/fr/life-tourbieres-hautes-fagnes-2007-2012.html?IDC=3391

The main activities of the project were:

- Purchase of 141 ha of privately-owned land, which turned into a state nature reserve;
- removal of spruce from the land and restoration of vegetation after tree cutting;
- restoration of about 2,800 ha of peat habitats;
- removal of the first 30 cm of topsoil from degraded peat bogs in order to restore peat-building vegetation;
- application of mulching to restore degraded peat bogs;
- better conditions on peat bogs were ensured by the restored water regime.

Project LIFE06 NAT/SI/000069 – 'Cerknisko Jezero – Intermittent Cerknica Lake'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3154 or http://life.notranjski-park.si/

The main outcomes of the project were:

- purchase of 260 ha of land to be set aside for long-term protection of cultural and natural heritage;
- raised groundwater level of the Dujce fen;
- clearing of 1.5 ha of overgrown fen by volunteers;
- awareness raising.

Project LIFE06 NAT/F/000142 – 'Lauter-Donon – Protection of the forests of Basse Lauter and Vosges moyennes'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3136 or http://www.onf.fr/projets_europeens/sommaire/en_cours/llauter-donon/@@index.html

The main outcomes of the project were:

- restoration of 25 ha of wet meadows;
- improved natural hydrological management of the site;
- restoration of 35 ha of active raised bogs.

Project LIFE08 NAT/D/000012 – 'Soonwald – Development of humid and moist forests in the Soonwald'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3518 or http://www.life-soonwald.de/

The main outcomes of the project were:

- Establishment of 35 standing waterbodies;
- using a new conservation and maintenance concept, these conservation measures will continue on a permanent basis;
- logging of spruce and closing up drainage ditches.

Project LIFE09 NAT/DE/000009 – 'Hang- und Hoochmoore – Rebuilding and preserving hanging bogs, raised bogs and transitional mires including the neighbouring habitats in the Hunsrueck and Eifel regions (Rhineland-Palatinate)'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3836 or http://www.life-moore.de/.

The expected results are:

- restoration and protection of 100 ha of bogs in the area;
- stabilisation and activation of CO_2 storage in the bog areas of the project.

Project LIFE12 NAT/HU/000593 – 'KASZO-LIFE – Restoration and conservation of Alluvial forests with Alnus glutinosa and Fraxinus excelsior in the Kaszo area'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4714 or http://www.kaszo-life.eu/

The project area was threatened by a decrease in groundwater levels caused by diminishing total annual rainfall, the earlier demolition of natural water-retaining landforms, and forced drainage of land for flood prevention measures. The expected results are:

- stabilisation of the water supply of swamps, increase in the water level;
- creation of a water reservoir and development of two additional lakes to provide water during the dry season;
- maintenance and conservation of existing water courses and lakes;
- dredging of mud from two existing lakes;

- suppression of invasive alien species;
- creation of an educational trail.

Project LIFE13 NAT/DE/000406 – 'LIFE Hochwald – Restoration and conservation of sloping and transition mires in low mountain range Hunsrück (area Hochwald)'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4905 or http://www.snu.rlp.de/

The area has been affected by various disturbances, such as afforestation with non-native tree species and drainage. The expected project results are:

- general improvement of the conservation status of the targeted habitat types in the long term;
- up to 130 ha of non-native forests or woodlands removed from mires, bog forests and adjacent areas;
- extensive rewetting measures to improve the hydrological status of peat lands;
- enhanced habitat conditions for the characteristic species;
- information campaigns.

Project LIFE13 NAT/PL/000032 – 'Life – Lasy Janowskie PL – In harmony with nature – Life + for Janowskie Forest'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5056 or http://bip.lublin.rdos.gov.pl/.

The expected results are:

- improvement in the conservation status of peat land habitats on 94 ha, including the maintenance of species closely related to peat bogs;
- Cessation or significant reduction in the outflow of water from peat bogs;
- awareness raising.

Project LIFE13 NAT/LU/000068 – 'LIFE grassland Luxembourg –Conservation and management of species-rich grasslands by local authorities'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5020 or http://www.sicona.lu/

The grasslands face strong urbanisation pressures. The project will result in the purchase and restoration of grasslands hydrophilous tall herb fringe communities and transition mires.

Calcareous fens (7210, 7220, 7230)

Project LIFE06 NAT/IT/000060 – 'LIFE FRIULI FENS – Conservation and restoration of calcareous fens in Friuli'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3165&docType=pdf or http://www.lifefriulifens.it/

The main outcomes of the project were:

- overall improvement of about 85 ha of wet habitats;
- non-recurring management on calcareous and alkaline fens;
- cutting of shrubs on the fens;
- increased knowledge by detailed monitoring;
- public understanding of the importance of biodiversity in the wetland ecosystems.

Project LIFE06 NAT/A/000124 – 'UVOR - Untersberg-Vorland'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3148

Changes in land management practice (intensification of agriculture and abandonment of straw meadows) have affected the conservation status of habitats. The main outcomes of the project were:

- restoration of 5.9 ha of fen meadows;
- enrichment of fen meadows with typical plant taxa provided by the botanical garden of the University of Salzburg;
- Increase in the population of the Fen orchid (*Liparis loeselii*) thanks to the project´s optimised hay meadow techniques;
- using the agri-environment payments to landowners as compensation for the unprofitable costs.

Project LIFE06 NAT/D/000006 – 'Schwäbisches Donautal – Swabian Danube valley'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3112&docType=pdf or http://www.donautal-life-natur.de/

The project outcomes were:

- Improvement of over 14 km of ditches and an area of 40 ha (creation of shallow water areas);
- rewetting of 50 ha;
- Establishment of observation towers, an observation hut and three nature trails.

Project LIFE08 NAT/D/000003 – 'Kalkmoore Brandenburgs – Preservation and restoration of base-rich to alkaline fens ('brown moss fens', NATURA 2000 habitat type 7230) in Brandenburg'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3524&docType=pdf or http://www.kalkmoore.de/

The main outcomes of the project were:

- stabilisation of near-natural alkaline fens;
- improved water balance of alkaline fens;
- re-establishment of endangered or extinct plant species.

Project LIFE13 NAT/PL/000024 – 'AlkFens_S_PLife – Conservation of alkaline fens (7230) in southern Poland / Ochrona torfowisk alkalicznych (7230) południowej Polski'

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4983&docType=pdf or http://www.kp.org.pl/.

Expected project results are:

- building of more than 83 dams and rebuilding of two existing dams;
- mowing of 152 ha of mires and their restoration for extensive use;
- purchase of about 3.17 ha of the most valuable alkaline fens plots;
- preparation of full management plans and training of about 15 people to implement conservation measures.

In the future, the results of several recently started LIFE projects should contribute to the management and conservation of the target habitats; e.g. LIFE12 NAT/DK/000803 – 'LIFE WETHAB – Restoration of wet habitats in the Jerup Beach Ridge Plain'; LIFE12 NAT/DE/000091 – 'LIFE Heide-Allianz Heathland alliance: Biodiversity and habitat network in Nördlinger Ries and in the Wörnitz Valley'; LIFE11 NAT/DK/000893 – 'LIFE LAESOE – LIFE LAESOE – Restoration of birdlife and natural habitats at Laesoe'; LIFE10 NAT/SK/000080 – 'Natura 2000 BA – Restoration of Natura 2000 sites in cross-border Bratislava capital region'; LIFE10 NAT/BE/000706 – 'Ardenne liégeoise – Restoration of natural habitats in the Ardenne liégeoise region'.

4.8.10 Opportunities for joint action

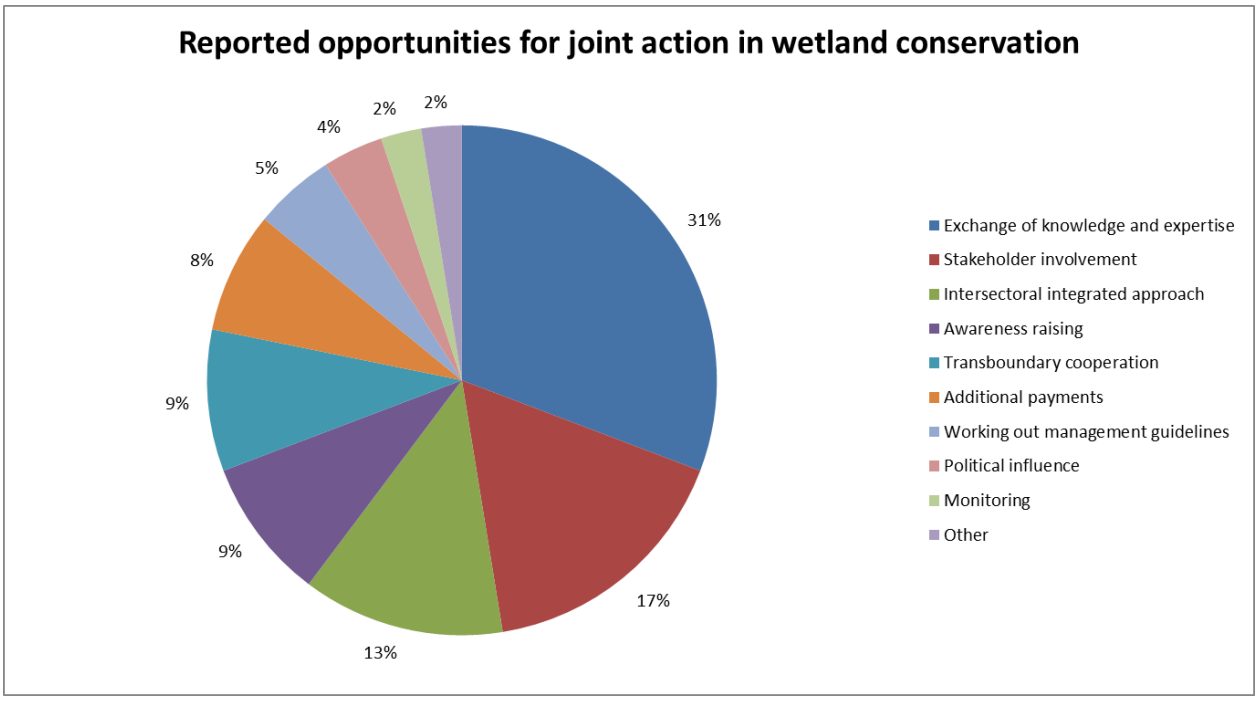


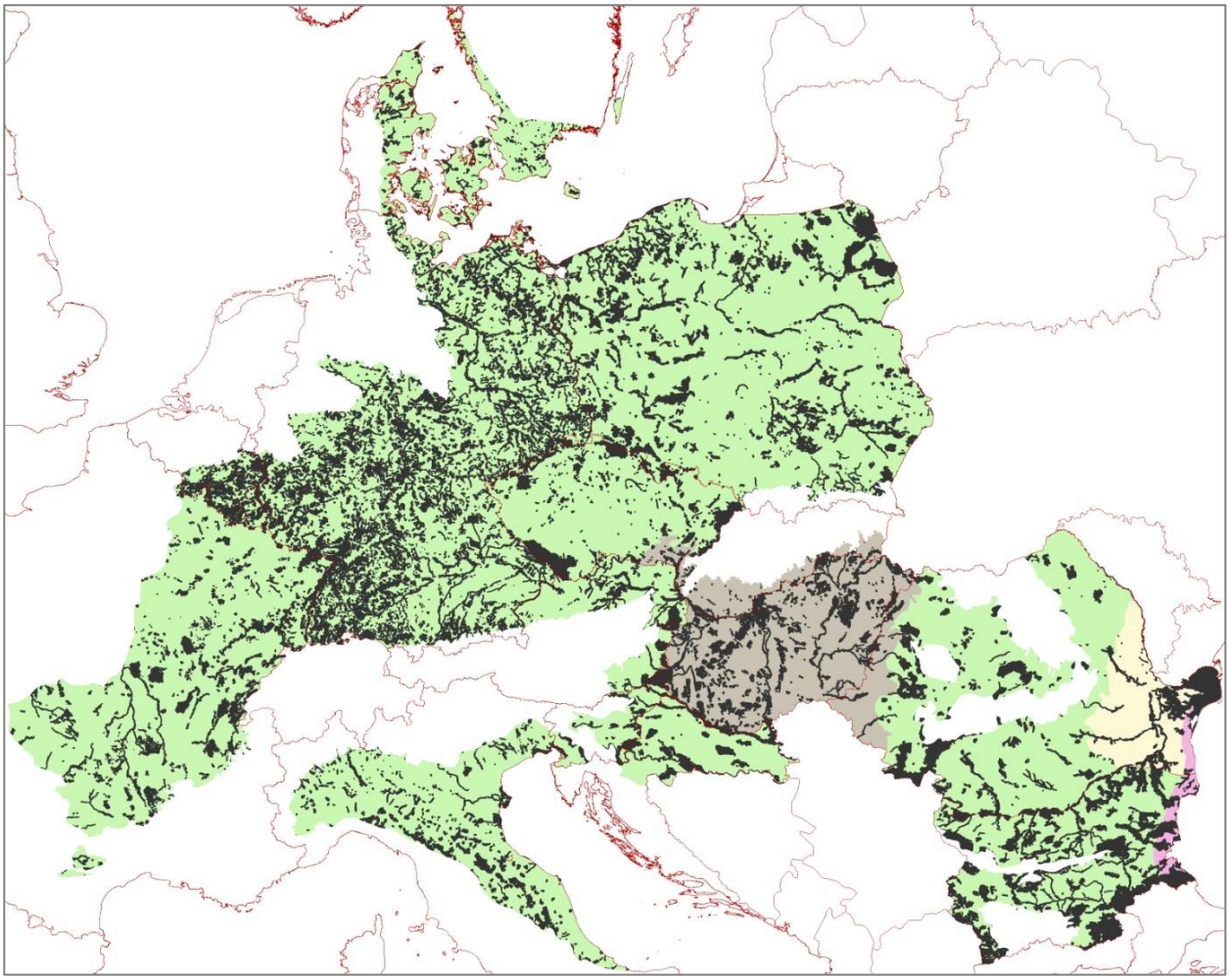
Figure 50 Results from Natura 2000 Biogeographical Process expert consultation: *Potential areas for joint action for the conservation of wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Working with the agricultural administration to develop model approaches for the sustainable use of moorlands in different countries is generally regarded as a good conservation opportunity. A key area of cooperation could be monitoring the performance of the agri-environmental support system and providing feedback to policymakers on progress in achieving ecological goals. Diversifying the income of landowners by encouraging environment-friendly agriculture and sustainable tourism would also work towards the conservation of some wetland habitats (Figure 50).

4.9 Woodland and forest

4.9.1 Summary description

There are very few remaining natural forests in the Continental, Pannonian, Black Sea, and Steppic biogeographical regions. Large areas of forests with extensive or limited management are only found in the eastern part of the region. Across the region, some patterns can be described with respect to forest cover. Conifers become naturally more abundant towards the east and in many areas are favoured for forestry, especially on sandy soil or at higher elevations.



Map 7 Natura 2000 sites containing woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

For example, in Germany and Poland, about 75 % of the forests are coniferous consisting mainly of Scots pine (*Pinus sylvestris*). In the case of deciduous forests, beech (*Fagus sylvatica*) is especially characteristic of the southern and western part of the region. Further east, beech becomes increasingly scarce because it cannot survive the prolonged periods of frost and is also susceptible to dry climates. The natural

distribution of hornbeam (*Carpinus betulus*) stretches further east. Oaks (several *Quercus* species) occur in about half of the area and penetrate deep into Russian territory.

The limits of the distribution of elm (*Ulmus glabra*), lime (*Tilia cordata*) and ash (*Fraxinus excelsior*) correspond in general to the eastern border of the Continental region, the Ural Mountains, and in the south-east reach the borders of the Russian steppes via a belt of forest steppe.

Table 22 Woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

Habitats Directive code and name of Woodland and forest habitats selected for priority consideration
9110 - *Luzulo-Fagetum* beech forests
91E0 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)
9180 - *Tilio-Acerion* forests of slopes, screes and ravines
91D0 - Bog woodland
91F0 - Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*)
9160 - Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*
9170 - *Galio-Carpinetum* oak-hornbeam forests
91H0 Pannonian woods with *Quercus pubescens*
92A0 - *Salix alba* and *Populus alba* galleries
91I0 - Euro-Siberian steppic woods with *Quercus* spp.
91G0 - Pannonic woods with *Quercus petraea* and *Carpinus betulus*
91M0 - Pannonian-Balkanic Turkey oak – sessile oak forests
91AA - Eastern White oak woods
92D0 - Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*)
9110 - *Luzulo-Fagetum* beech forests
91E0 - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)
9180 - *Tilio-Acerion* forests of slopes, screes and ravines
91D0 - Bog woodland
91F0 - Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*)
9160 - Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*
9170 - *Galio-Carpinetum* oak-hornbeam forests

Fourteen woodland and forest habitat types have been selected for priority consideration within the region (Table 22). Twelve of these are forests of temperate Europe and two are of the Mediterranean deciduous forests type (92A0 and 92D0). For each of these habitat types a short description and additional data are given in the annexes: Sites of Community Importance (SCI) and the Habitat area of forest habitat types in the individual Member States.

Compared with forests on other continents, the woodland and forest habitats selected for priority consideration are in general more intensively managed, rather younger and more dominated by even-aged stands. They are, however, regionally diverse in terms of tree species composition, growth, and biodiversity. While natural forests rarely occur, very intensively used plantations are not frequent either. Semi-natural forests, shaped by a variety of social demands and forest management types are most characteristic of forests in the biogeographical regions covered.

Forests provide shelter for a large part of European biodiversity, and their ecological functions (protection of soil, water quality, protection against erosion, etc.) are crucial to our well-being. Forests also protect us from multiple risks, such as landslides, avalanches, and flooding, while fulfilling numerous social functions by providing leisure and aesthetic benefits to European citizens. With regard to climate change, forests are a major carbon reservoir and play a major role in both mitigating and adapting to the effects of burning fossil fuels. From an economic perspective, forests provide timber production; Europe has a global market in the pulp and paper industry. This multifunctionality requires an understanding of forests as ecosystems that need to be managed in a holistic way.

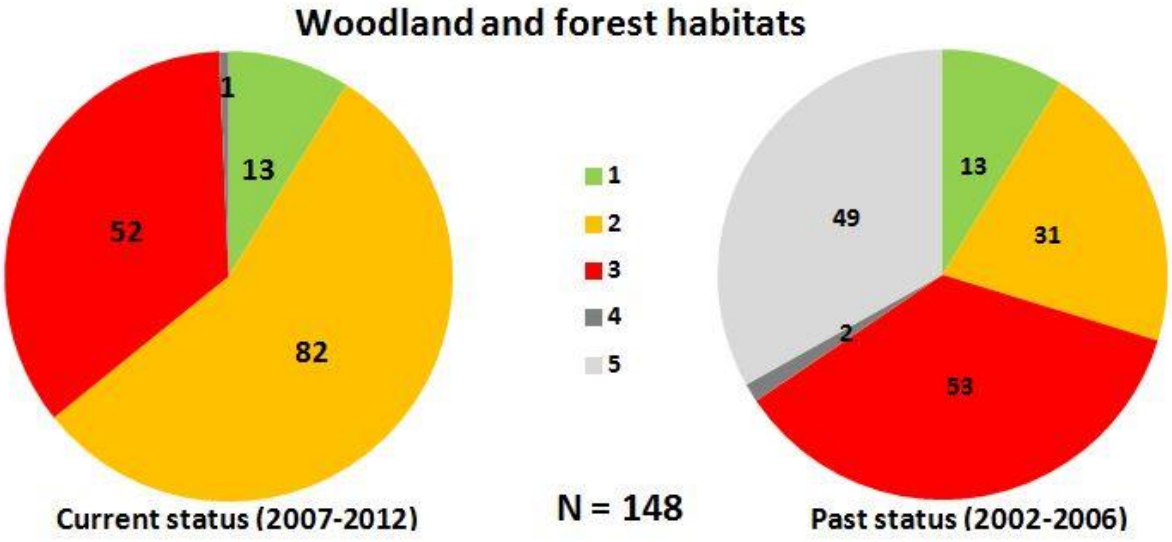


Figure 51 Current and past conservation status of woodland and forest habitats based on Article 17 reporting. Numbers represent individual country/biogeographical region assessments (only habitats selected for priority consideration are included); N is the total number of assessments in each period. 1 = FV: favourable; 2 = U1: unfavourable–inadequate; 3 = U2: unfavourable–bad; 4 = XX: unknown; 5 = N/A: not assessed

Based on Article 17 reporting by the Member States for the period 2002–2006, the overall conservation status of the 14 woodland and forest habitat types selected for priority consideration was either unfavourable–bad (36 % of cases), unfavourable–inadequate (21 % of cases), or not assessed (33 % of cases). For the period 2007–2012, much more data was available and all habitats were assessed. The

number of habitats assessed as unfavourable–bad (35 %) was largely similar to the previous reporting period. However, the number of habitats assessed as unfavourable–inadequate increased to 55 %. This should not necessarily be interpreted as an overall decrease in conservation status, considering that in the previous reporting period (2002–2006) many habitats were not assessed. However, in both reporting periods, only 9 % of habitats selected for priority consideration were assessed as favourable. In all, this suggests that the overall forest habitat types score is unfavourable for both reporting periods.

4.9.2 Issues - pressures - threats

Forests throughout the Continental, Pannonian, Black Sea and Steppic biogeographical regions have been, and still are, significantly affected by human activity. Key pressures include land-use changes, inappropriate management, lack of management, and human disturbance (Figure 52). Across the region, these pressures show variation both in intensity and in the timing of the changes. Natural and semi-natural habitats suffer heavily from fragmentation because of urbanisation and a dense infrastructure network, especially in Western European countries of the Continental Region. The western Continental region is among the most heavily transformed biomes in Europe. On a more general level, the woodland and forest habitats in this biogeographical region suffer from acidification and removal of dead and dying trees, in addition to the absence of natural regeneration as a consequence of dense populations of hoofed game. A particular problem was raised in Germany, where the oak and oak–hornbeam forest habitat type 9160 grows on sites which would be covered by beech forest if there were no anthropogenic influence. The main pressure arising from this fact is that a natural transformation into (mostly) beech (mixed) forest is taking place without management of 9160 stands. Additionally, oak forests are highly susceptible to forest health problems, such as defoliating insects and increased nitrogen input, which often limit the ability to prolong the silvicultural cycle.

The concentration of urbanisation and the development of agriculture in the plains and the large river valleys have resulted in almost total deforestation or very fragmented forest remnants. This process is further advanced by new infrastructure developments, such as the build-up up of ski resorts, particularly in new Member States like Bulgaria. Disposal of household waste is yet another issue in countries such as Poland, where it causes mechanical damage to habitats.

Semi-natural, ‘open forests’ are at threat in regions like southern Poland because of the abandonment of former management schemes and application of conventional forest management.

In Bulgaria, clear cuts, forest replanting with non-native species, removal of dead and dying trees, and species composition change are among the main threats in the Continental biogeographical region. Some of these pressures have also been noted in Poland, in particular the removal of dead and dying trees, the occurrence of invasive alien species as well as soil erosion. In Germany, forestation with species that are not native and extensive harvest of old deciduous trees have been pointed out as significant issues, as is the case in Belgium. In the Pannonian region of Hungary, wild game species such as Wild boar (*Sus scrofa*), Red deer (*Cervus elaphus*) and Roe deer (*Capreolus capreolus*) are seen as an important changing element of the natural system. Damage caused by game to forest regeneration, flora and fauna, has been noted in the Continental region of Belgium too. Here, additional pressures come from invasive alien species, in particular for riparian habitats, and human-induced changes in hydraulic conditions, in

particular soil drainage. Human activities, especially recreational activities, also constitute a substantial threat.

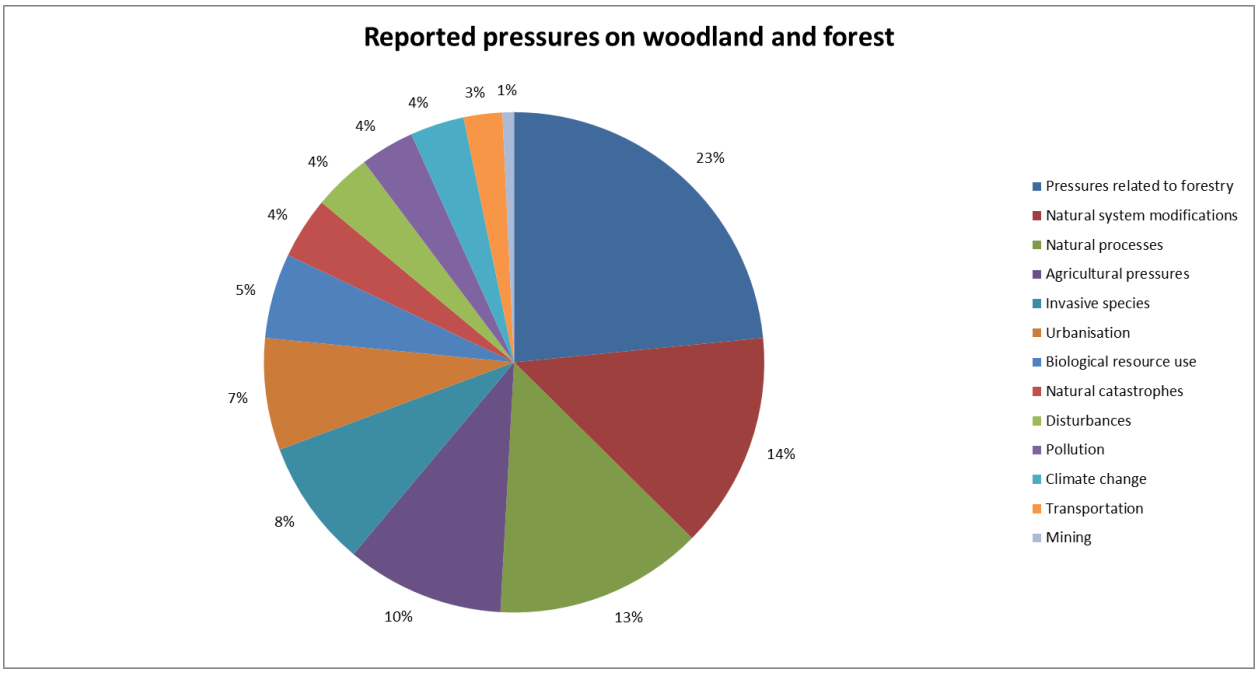


Figure 52 Results from Natura 2000 Biogeographical Process expert consultation: *Pressures on woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

The digging of new drains is not a common activity, but old drainage systems still have serious consequences on the habitats' functions and species composition. Belgium is not, however, an isolated case: human-induced changes in hydraulics and drainage systems that have negative effects, such as the construction of dykes, hydroelectric power plants and water reservoirs, and the draining and redirection of riverbeds, are widespread throughout Poland and documented in Bulgaria, Hungary and Germany. This can also induce a gradual drying of habitats such as bog forests, alluvial forests (91E0) or riparian mixed forests (91F0), in the latter two cases leading to their evolution in the direction of riparian forests of oak and elm-ash. In some cases, the build-up of embankments and flood prevention dykes between the riverbed and habitats prevents natural flooding.

Bog forests are subject to a number of additional pressures, such as the loss of surrounding wetlands, nitrogen input through the air and surroundings, lowering of the groundwater table, decrease in the amount of dead wood, and the effects of previous cultivation of plantation forests on drained peat. Moreover, in places like Poland, the exploitation of peat deposits sometimes take place in the vicinity of protected areas and adds pressures to bog woodland.

Agricultural practices and land-use changes related to built-up infrastructure, urbanisation or increased access are further pressures to these habitats. Alluvial and riparian mixed forests have also been shown to witness increased pressure from land-use changes, in particular wetland transformation into arable land, with agricultural pollution responsible for the long-term deterioration of their environmental status in places such as Bulgaria. Natural regeneration is impaired on alluvial sites by the intensive grazing of cattle, horses and sheep combined with a dense population of hoofed game.

Air pollution and drought have been damaging forests for years. Indeed, in the 1970s, the region's conifers were among the first to suffer from forest death caused by long-range air pollution. International cooperation has led to successful reduction in sulphur emissions, and the deterioration in forest crown conditions has stabilised from 1995 onwards. Climate change is a major threat. Changing temperature and precipitation patterns (especially on the edge of tree species distribution) will probably have a direct effect on forest stands. They will also be indirectly affected by the effects of climate change on the distribution and frequency of viruses, pests, small fires and wind damage.

Table 23 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 level 1 pressures for woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Pressure	% of responses
B02 - Forest and plantation management & use	12
J02 - Human-induced changes in hydraulic conditions	9
K02 - Biocenotic evolution, succession	9
I01 - Invasive non-native species	7
B06 - Grazing in forests / woodland	5
E01 - Urbanised areas, human habitation	5
B01 - Forest planting on open ground	3
L07 - Storm, cyclone	3
M01 - Changes in abiotic conditions	3
J01 - Fire and fire suppression	3

Landslides, avalanches, storms, flooding and erosion are also important pressures. For example, several heavy storms within a relatively short period at the end of 1999 in France, Switzerland and southern Germany caused severe damage to over a million hectares of forests. Similar events have been identified as a pressure in Bulgaria. The burning down of woodland and forest habitats is also a common occurrence and has been highlighted in countries such as Bulgaria and Poland.

4.9.3 Main conservation requirements

Although the first sustainable forest management legislation dates back to 1340 in France, it was only in the 19th century that planning for sustainable development became more widespread. Over the last 25 years, conservation and enhancement of biological diversity have become a critical issue in forest management. Indeed, according to the European Environment Agency, nature-oriented forestry is currently the main trend in European forestry. It is based on somewhat less intensive management methods favouring retaining trees and decaying wood, the establishment of natural tree species and a species mix, as well as the protection of small key biotopes.

The central and northern areas of the Continental, Pannonian, Black Sea and Steppic biogeographical regions are characterised by intensive land use. As nature conservation has to compete with other land-use practices, little room is left for natural or semi-natural areas and there is a tendency towards the designation of small and medium-sized Natura 2000 sites. In this approach, which could be termed

'intensive', the protection of natural sites often involves land or land rights purchasing and direct interventions in the dynamics of the ecosystem. This is required by the property status, as in most cases small parcels are owned by individuals, which decreases the availability of sites for restoration and conservation. This type of management is based on a more distinct environmental culture, greater budgetary provisions and the motivation to recover lost habitats by conserving them at a fixed stage of natural succession in a constrained area ('reserve'-based approach). The proposed Sites of Community Importance (SCI) tend to be larger in size in regions where extensive farming and forestry systems with a high ecological value continue to exist (generally in the south and east of the region, but also in some highlands and mountains in other parts of the region). Here, their conservation is closely related to the maintenance of specific farming systems or forestry practices. In these areas, conservation strategies are different and tend to seek the integration of nature conservation and rural development, in what could be termed an 'extensive' nature conservation strategy. For instance, they may include restrictions on grazing in areas subjected to regeneration activities or no grazing on slopes steeper than 45^{o}.

These two main nature conservation strategies have also been termed 'integrative', that is, integrating all functions into the, rather extensive, land use of large areas, and 'segregative', that is, setting aside areas exclusively for nature conservation purposes amidst intensifying and sometimes unsustainable land use on the remaining areas. However, when looking exclusively at forest habitats, this distinction may be less clear, as forestry has always had a considerably lower ecological footprint than, for example, agriculture. Forestry in Europe has mainly followed an integrative strategy in the past. Many forest areas today can be called 'semi-natural', and the need for habitat restoration is not as apparent as it often is in, for example, wetlands and mires, where economic use has totally altered landscape features and biodiversity levels.

From an economic perspective, the main principle for the management of Natura 2000 forest habitats is that when forest management practices do not lead to a decline in the conservation status of habitats or species and are not contradictory to the Member State's own conservation guidelines, then this form of economic use can be continued. Indeed, the concept of multifunctional forestry lies at the heart of the EU Forest Strategy and is widely acknowledged in Europe. This concept integrates all the important benefits that forests can yield to society (ecological, economic, protective and social functions).

Perhaps the most important conservation requirement in the EU at the moment is the development and implementation of Natura 2000 management plans, especially in the new EU Member States (Figure 53). There is a great need for research on describing habitat status and the effects of various pressures as well as monitoring habitat conservation status in new Member States, as the abundance and availability of data and the time span of the few monitoring systems in place are far less developed than in many Western European Member States. Another generally acknowledged requirement is the removal of alien species through early detection and eradication. A specific but widespread requirement pointed out by experts is the reduction in abundance of wild game, which obstructs the process of natural regeneration. There are calls for the identification of a maximum threshold of game density below which there is no damage to the ecosystem balance. Another targeted management requirement is the need to enable oak natural regeneration to compete successfully against regeneration of other tree species, in particular beech. In Germany, the preservation of hornbeam (*Carpinus betulus*) and oak (*Quercus robur*) as dominant tree species is being favoured by conservationists. In terms of restoration, wet habitats are seen as a priority in view of their significant human-induced modification, which has translated into important a reduction in their area and connectivity.

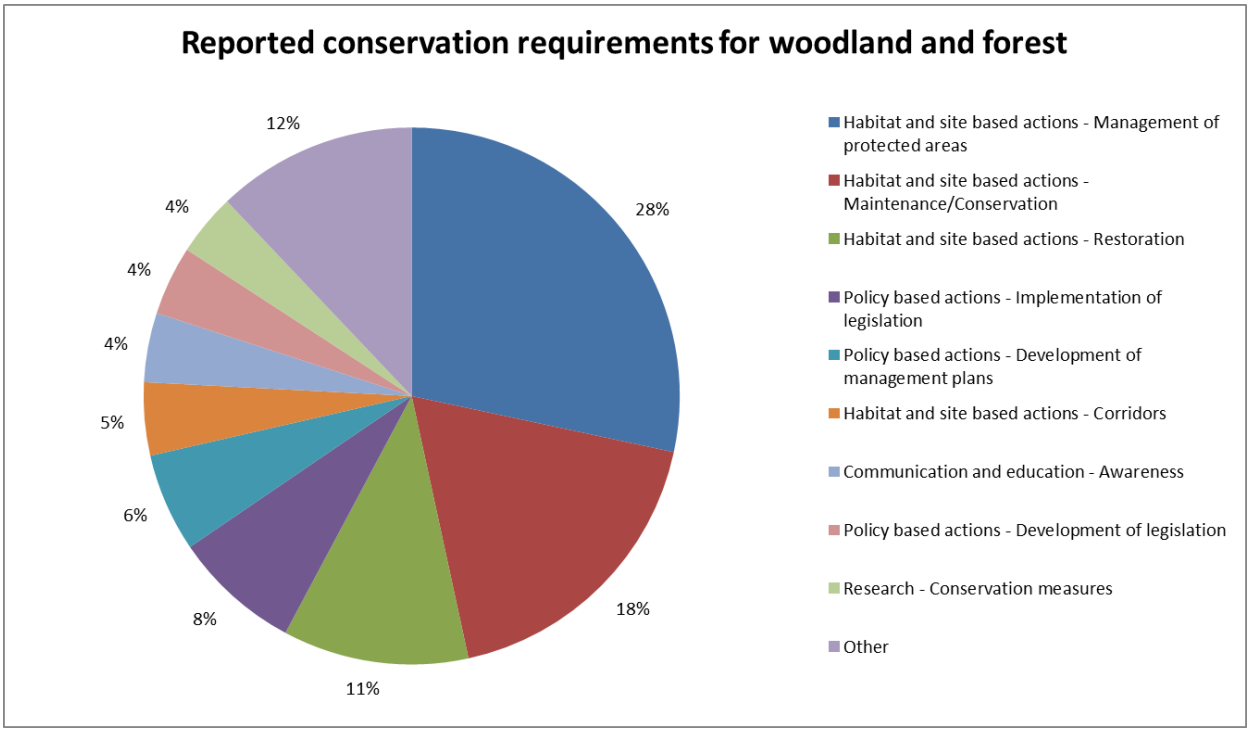


Figure 53 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation requirements for woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*[9]

Removal of household waste and tackling illegal litter dumping is another element identified in particular in the wetland and bog forest habitats of Poland. Here, restoration of appropriate water regimes and counteracting the negative effects of human-induced hydrological changes should also be prioritised. Buffer zones are important in these habitats, as they reduce the vulnerability of ecosystems to activities taking place near to habitat boundaries and reduce the amount of pollution entering the habitat. Tackling pollution has also been highlighted in Bulgaria, especially for wetland habitats located close to industrial areas. No wood harvest between spring and autumn and extraction lines spaced at least 40 m from each other are also seen as management requirements at present.

4.9.4 Management and conservation measures

Appropriate management of the protected areas and site based conservation and restoration acticities are most frequently reported by the experts. Management plans must consider natural dynamics and change an integral part of the nature conservation objective (Figure 54). The natural disturbance of the forest ecosystem through windfalls, lightning and the death of old trees, which is often 'simulated' by harvesting operations in sustainable forestry, is an important factor in maintaining a variety of habitat

[9] Other conservation requirements include: Communication and education - Capacity-building/Training, Habitat- and site-based actions - Community-based initiatives, Habitat- and site-based actions - Identification of new protected areas, Policy-based actions - Community management, Policy-based actions - Livelihood alternatives, Research - Trends/Monitoring, Species-based actions - Limiting population growth.

structures, a mosaic-like distribution of different age groups and a high level of biodiversity. This dynamic understanding of nature conservation is needed on Natura 2000 forest sites if the conservation strategy is to be integrative.

Yet not all the objectives of nature conservation can be reached through sustainable forest management. The setting aside of areas exclusively for nature conservation purposes has to be considered in the case of especially rare or valuable habitats whose conservation status would otherwise decline. Although non-intervention management is normally used for the best-preserved and primary natural habitats, this approach may in some cases also be useful for habitat restoration. There is a lot of evidence (especially for forests) that natural processes have restored natural structure and even species composition better and more cheaply (although normally not faster) than active restoration measures, and important negative impacts of restoration measures have been avoided through 'restoration by natural processes'. Natural vertical and spatial stand structure and composition as well as deadwood resources in particular can be restored by such non-intervention. Non-intervention management on at least 10 % of the area of forest habitats in Natura 2000 is already a legally adopted requirement within the Natura 2000 network in Bulgaria.

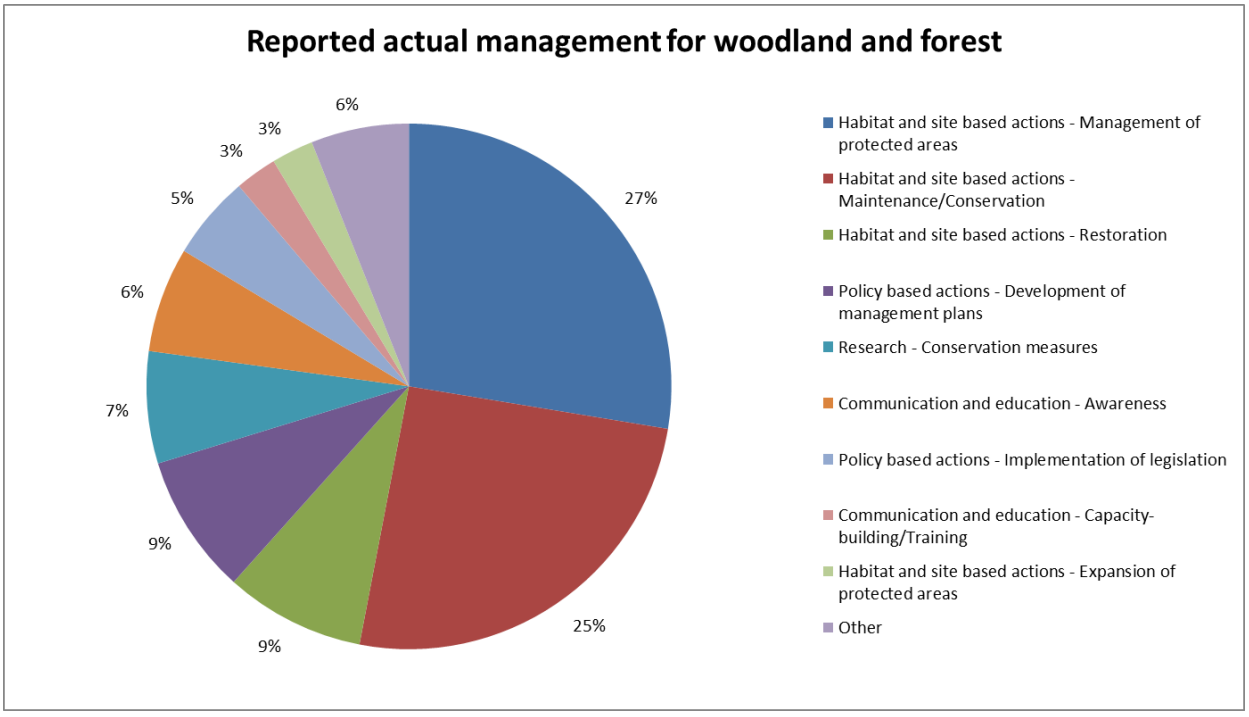


Figure 54 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation measures for woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*[10]

At a landscape scale, a mosaic of various regimes (reserves, coppices, even-aged stands, uneven-aged stands, etc.) is optimal. For example, to encourage biodiversity in beech forests, the regime should be

[10] Other conservation measures include: Habitat- and site-based actions - Identification of new protected areas, Policy-based actions - Development of legislation, Research - Trends/Monitoring, Species-based actions - Recovery management.

irregular mixed stands (unevenly aged and at least 10 % of other deciduous tree species) with natural regeneration and some small regeneration areas (0.5 to 1 ha). As an illustration, in France, a financial scheme for Natura 2000 forest areas makes it possible to alter the forestry regime by 'irregularising' the stands with a non-productive objective for the benefit of a list of animal species such as Capercaillie (*Tetrao urogallus)* and Brown bear (*Ursus arctos*). It should be noted that natural regeneration without protecting plants against ungulate damage is not always possible. For example, natural regeneration appears to be jeopardised in many forests in Wallonia, as deer density has doubled over the last 15 years.

Several LIFE-funded projects have explored whether traditional forestry practices may still have a role to play alongside modern forestry techniques. The aim was not to force a large-scale reversion to forestry practices that were abandoned years ago because they were unprofitable, but rather to explore whether such techniques still have a role to play under certain exceptional conditions. These techniques include coppicing, pollarding and agroforestry with grazing, all of which are costly and labour-intensive in comparison with modern techniques. Coppicing is the traditional method of woodland management, whereby young tree stems are cut down to near ground level. This encourages vigorous regrowth and ensures a sustainable supply of timber for future generations. As an example, coppice forestry is a common practice in Turkey, west of the Bosporus. The maintenance of this technique is still of great value for the rural community. From a biodiversity point of view, it is of value in conserving several rare plants associated with coppice forests. At the local level, it is possible to favour the maintenance of coppices because some species depend on this regime: Hazel grouse (*Bonasia bonasia*) in dense forests, flora and insects in open stages. Pollarding is the woodland management method of encouraging lateral branches by cutting off a tree stem two metres or so above ground level. Agroforestry is based on traditional farming methods, which integrate trees with farming, such as lines of trees with crops growing between them, hedgerows, 'living' fences, windbreaks, pasture trees, woodlots, etc. This mosaic of parcels with different land-use functions creates a biodiversity-rich habitat on which species of Community importance, such as Lady's slipper (*Cypripedium calceolus)* and Stag beetle (*Lucanus cervus*), depend. In some regions, maintenance of this mosaic and of the related 'open forests' is ensured through the agri-environment measures (AEMs) of the respective National Rural Development Programmes (NRDPs), which play an important role in countries such as Poland, Hungary and Bulgaria.

In many forests, lack of dead wood endangers those species that are dependent on it. Dead wood in the form of decaying wood as standing and lying trees is a habitat for a wide range of organisms, especially saproxylic species, and is seen as an important component of biodiversity. After humification, dead wood also constitutes an important component of forest soils. The amount of dead wood varies considerably between forest types, the standing volume of the stands, decay rates, vegetation zones and the level of management carried out in the forest. The quantity of dead wood in natural forests of Eastern Europe can reach 50 to 400 m^3 per hectare, while it is only a few cubic metres in managed forests. WWF has been calling for an increase in dead wood in temperate forests to 20–30 m^3 per hectare by 2030. In countries such as Bulgaria, conservationists have pointed to the need to have at least 15 m^3 of dead wood per hectare. German experts, however, point to 50 m^3 of dead wood per hectare for the favourable conservation status threshold, while in Wallonia there are legal requirements for at least two large dead trees per hectare. Dead wood is not a single habitat, but a complex range of different microhabitats, which can change and evolve over time. All the species of trees, categories of wood (from leaves to roots), sizes and positions have their own specific biodiversity. In addition, large old trees (or mega-trees, veteran trees) also have a major role in providing microhabitats for a variety of organisms. In this sense, experts indicate that territories for maintenance of old-growth trees should cover at least

10 % of the habitat area at a management unit scale. In Poland, there is set-aside for old trees through a forest shelter wood scheme, although here only 5 % of the tree stand is preserved as a 'retention biogroup'. In Wallonia, there are requirements to leave 0.5 living trees of biological interest for each hectare and to create conservation 'islands' of no logging on at least 3 % of the indigenous forest surface. One of the main issues for deadwood conservation is education of both foresters and walkers. Moreover, risks for walkers and legal responsibilities have to be taken into consideration.

Hence, in management plans there also should be a focus on having a proportion of middle-aged trees to ensure the future veteran trees. With respect to the maintenance or development of forest microhabitats, ageing clumps could be considered, for example to conserve the Hermit beetle (*Osmoderma eremita*) in the forest matrix. A point of attention here is the length of the rotation between two cuts. In modern forestry, rotations last approximately 150–160 years for oaks versus approximately 300 years in natural forests. In France it has been suggested that the optimum age/diameter of exploitation in ageing clumps should be doubled. Finally, management of edges to maintain a progressive structure (rising in tiers) will protect the forest against wind, increase landscape amenities, and create feeding areas for ungulates and habitats for species (birds, bats) that help to reduce pests. It will also encourage heliophilous flora species and anthophilous species such as butterflies or syrphidae.

In general, in wetland, bog, alluvial or riparian forests, management is focused on restoring natural hydraulics, either by restoring the water-table level or through lowering dams and other structures to allow for the creation of flood areas, as is the case in Germany and some regions of Poland.

4.9.5 Species-specific measures

In order to obtain a complete picture of the state of a habitat, it is necessary to assess not only abiotic conditions (such as water level) but also species diversity (richness and evenness).

The experts indicated some need for species-specific protection measures for all forest and woodland habitats selected for priority consideration. Bat and bird species should receive special care during hibernation and nesting in *Luzulo-Fagetum* beech forests (9110). Other measures should include non-intervention management, maintaining coppices (e.g. for *Bonasa bonasia*) and protection of firs and oaks (for *Osmoderma eremita*). Oak conservation was also considered important in Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli* (9160).

Two divergent requirements were specified for *Galio-Carpinetum* oak-hornbeam forests (9170). On the one hand, non-intervention management is required for xylobiontic beetles (*Cucujus cinnaberinus*, *Rhysodes sulcatus*, *Osmoderma eremita*) and some birds (woodpeckers, *Ficedula* spp.). On the other hand, semi-natural open forests are important for species such as *Cypripedium calceolus* or *Lucanus cervus*, which prefer a mosaic of light and shadowy patches, originally maintained by extensive forest grazing. In Bog woodland (91D0), active protection of *Lycopodium clavatum* and *Lycopodium annotinum* is necessary, while in Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*) (91F0), experts have suggested upgrading deadwood targets to maintain xylobiontic species and some birds. *Quercus robur*, *Fraxinus oxycarpa*, *Ulmus laevis*, *Ulmus minor*, *Alnus glutinosa*, *Populus nigra*, *Populus alba* as well as

lianas (*Smilax excelsa*, *Periploca graeca*, *Vitis sylvestris*, *Hedera helix*) need to be protected in alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0).

4.9.6 Bottlenecks - Problems

Since the 1960s the absolute forest cover in Europe has been steadily increasing. This is partly due to afforestation programmes and also to regrowth in semi-natural areas after abandonment of cultivation or grazing. However, this increase is not always positive for biodiversity, and the overall expansion masks a serious decline in priority forest ecosystems. The changes that forests have undergone over the past few decades have reduced the environmental quality of forests.

These changes include more intensive management, increased uniformity, fragmentation, use of exotic tree species, introduction or maintenance of animal species for hunting, drainage, and air pollution. The current high demand for exotic wood by regional industries combined with the faster wood production of coniferous trees compared to the broadleaved species makes conservation of habitats with less 'productive' species difficult. Intensification measures, including the drainage of peat lands and wet forests, fertilisation, and forest-tree genetic modification, have had a particularly negative effect on the biodiversity values of forests. Old or semi-natural woodlands have also declined as traditional forestry practices, such as selective cutting, coppicing and grazing by livestock, have made way for monofunctional timber-based forestry.

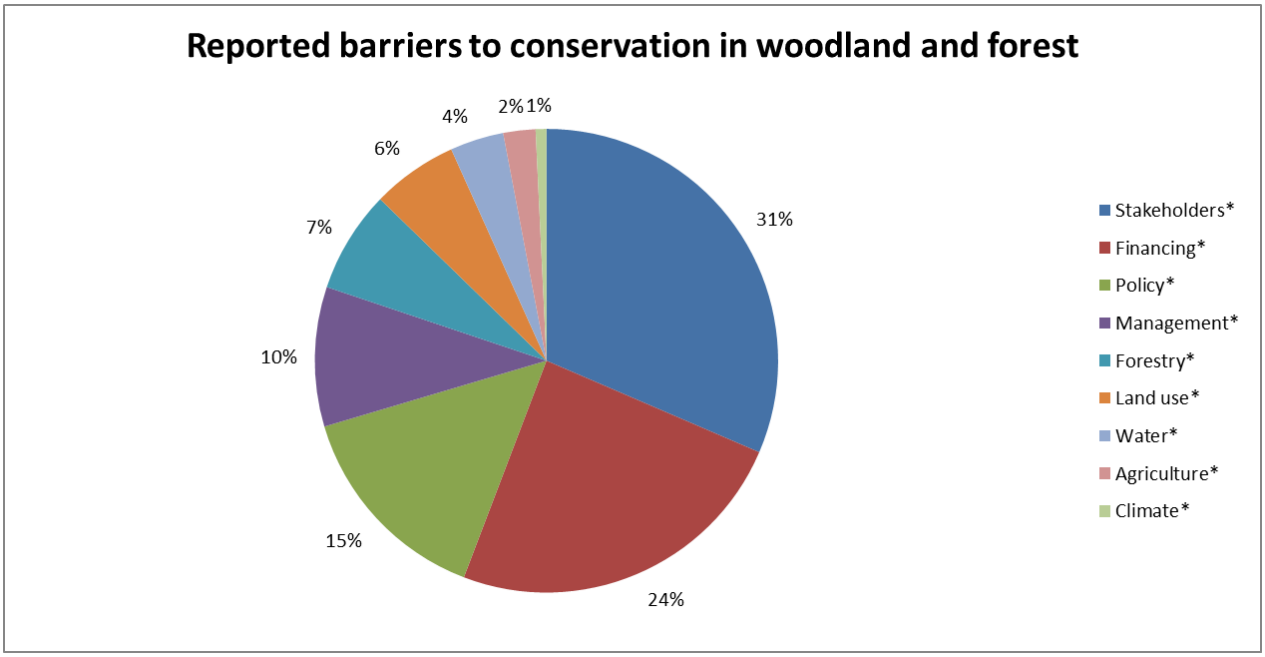


Figure 55 Results from Natura 2000 Biogeographical Process expert consultation: *General conservation barriers for woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

The situation is further exacerbated by the severe fragmentation of the remaining forest resource and the loss of associated habitats such as pastures, hedges, river belts, stream banks, etc., which would have allowed woodland species to move through the landscape via 'ecological corridors'. Between 1990

and 2000, the process of fragmentation, breaking core forest areas larger than 100 ha into smaller units, was significant for example in the northern Carpathians and the Tatra mountains. Likewise, the restoration or effective conservation of a number of forest and woodland habitats, such as bog woodland or riparian forests, depends on a large-scale approach and this aspect is not yet fully understood by stakeholders, especially when management plans include non-protected areas. This is not surprising in the light of the fact that, in countries such as Poland, policies support measures that are harmful to biodiversity, such as traditional regulation of rivers and the creation of tight embankments with the purpose of flood protection. In addition, management plans for Natura 2000 sites themselves are not yet developed in many new Member States, often due to lack of funding.

Concerning tree species, the climatic conditions and the soils are in many places best suited for deciduous forest, with different species being predominant according to geographical location. As a whole, however, conifer forests dominate in several countries of the region, having to a considerable extent replaced local deciduous species in managed forests. Also, in many areas planting of non-native species has had a significant negative impact on biodiversity. For example, forest management practices in the Pannonian region in recent decades have led to the planting of large areas of fast-growing tree species such as the introduced Black locust (*Robinia pseudoacacia*), willows (*Salix* spp.) and poplars (*Populus* spp). Only sparse undergrowth vegetation can survive in these plantations.

Hunting is economically important, both for local consumption and increasingly also for wider markets, and hunting tourism represents a rapidly growing commercial sector. For these reasons, game management is important. The numbers of ducks and pheasants being annually bred and introduced into the wild for hunting purposes are high compared with national estimates of naturally occurring numbers. Stocking of Red deer (*Cervus elaphus*) and Fallow deer (*Dama dama*) as well as Wild boar occurs in many areas, but overstocking, in particular where hunting is commercialised, may result in heavy pressure on forests and crops, creating local conflicts.

Table 24 Results from Natura 2000 Biogeographical Process expert consultation: *Top 10 specific conservation barriers for woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Barriers and bottlenecks	**% of responses**
Financing - Lack of funds for conservation (and complicatedness / difficult access)	16
Stakeholders - Lack of cooperation	10
Stakeholders - Lack of knowledge / competence / data	9
Financing - Lack of forgone income compensation (or subsidies)	8
Policy - Incorrect policy (and/or law)	7
Stakeholders - Lack of awareness / negative attitude	7
Management planning - Lack of management plans	6
Policy - Lack of policy / rules	6
Stakeholders - Lack of skills	4
Forestry - Demand for wood and traditional extractive management	4

A point of attention in relation to management approaches is that the average size of a publicly owned forest in the EU-25 is more than 1,000 ha, while the privately owned forests have an average size of 13

ha. This figure varies considerably from country to country, with the vast majority being less than 3 ha. The owners of small forest properties often lack the skills or the investment capacity to manage their forests, and this may have implications for efficient forest management. Moreover, forest owners are often not involved in the development of management plans (see Figure 55 and Table 24). However, their involvement could enhance their understanding of conservation measures and allow for their needs to be reflected in the final plans. Another problem is the lack of funds to compensate forest owners for profits lost due to the implementation of conservation measures, such as retaining biotope trees and dead wood or designating specific areas for old trees. In some cases, although funding might be available, accessing it can be a sinuous, bureaucratic process for forest owners. Last but not least, an added limitation is that there are not enough experts with theoretical and practical knowledge in sustainable forest management and conservation, which constrains the knowledge pool among stakeholders and the outreach level of extension services. This is the case for some regions of Poland and Bulgaria.

4.9.7 Solutions and opportunities

There are several financing opportunities in the European funding framework that enable the conservation and management of forest biodiversity. These funding instruments address a range of activities, including the enhancement of sustainable forest management techniques, research on the influence of biodiversity on forest ecosystem functions and services, and the conservation of key riparian buffer zones to prevent the negative effects of floods. Currently, at least eight different Community funding instruments, including EAFRD, EFF, the Regional funds, LIFE+ and the 7th Framework Programme for Research and Development, include options to finance forest biodiversity and risk-prevention related activities. This fragmented approach is part of a decision taken in the period 2007–2013 period, the 'integrated funding model', which aims to integrate the funding of biodiversity and Natura 2000 activities in different financing instruments and embed biodiversity goals in other policy sectors. All of this is reflected in the *Financing Natura 2000 Guidance Handbook for the period 2014–2020*.

Examples of three of the possible sources of finance are:

- *Example of 2007–2013 EU LIFE project*: ECSquare: The conservation of the European red squirrel by eradication and control of the grey squirrel: actions for preservation of biodiversity in forest ecosystems. The project focuses on protecting the species from competition from the introduced Eastern grey squirrel. For more information: http://www.rossoscoiattolo.eu/en.
- *Example of 2007–2013 FP 7 project*: FunDivEUROPE: Functional significance of forest biodiversity. This project works on quantifying the influence of biodiversity on ecosystem functions and services and the delivery of timely, relevant and understandable information to policymakers and stakeholders about forest biodiversity and ecosystem services. For more information: www.fundiveurope.eu
- *Example of 2007–2013 European Civil Protection Financial Instrument project*: Accidental, Natural and Social Fire Risk (ANSFR): The prevention and diminution of the human and financial costs of fire through effective risk assessment and management. The overall aim of the ANSFR project is to reduce the human, financial and environmental cost of fires in the partner countries (United Kingdom, Denmark, Italy and Finland) and across Europe. For more information: http://ec.europa.eu/echo/funding-evaluations/financing-civil-protection-europe/selected-projects/accidental-natural-and_en

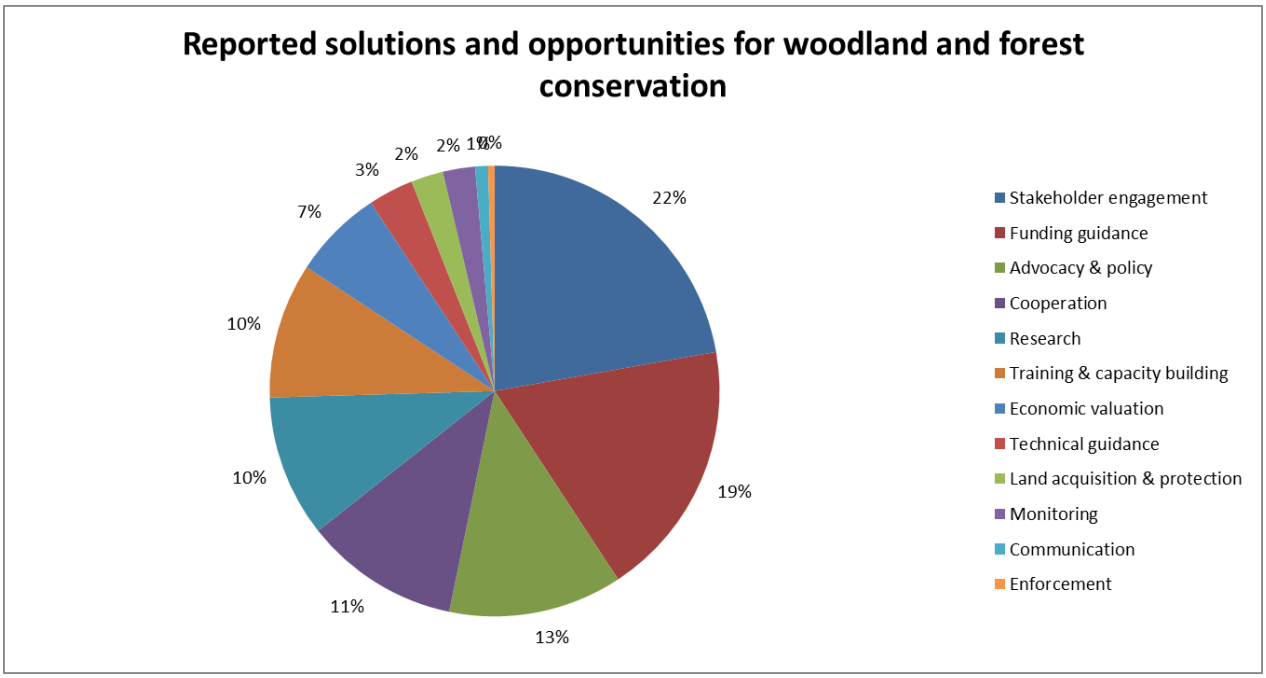


Figure 56 Results from Natura 2000 Biogeographical Process expert consultation: *Conservation solutions and opportunities for woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Forest certification is a market tool to promote sustainable forestry, while helping to raise awareness among the general public. Most of the forests that are certified in the EU come under the scheme of the Forest Stewardship Council (FSC), or the Programme for the Endorsement of Forest Certification schemes (PEFC). In addition, awareness raising, education and training may lead to appropriate forest management. A specific example is increasing awareness of the value and function of dead wood. The elaboration of easily accessible documents for forests owners and managers would be a valuable resource. For example, advice could be given about good practices, and dos and don'ts for the sustainable management of forest habitat types.

In Bulgaria, assessing the monetary value of the various ecosystem services derived from forest and woodland habitats is a step forward in obtaining better funding from the National Tax Policy sector to compensate forest owners for profit lost due to conservation activities. The need to highlight the socio-economic benefits derived from ecosystem services provided by forest and woodland habitats has also been identified in Belgium. On the other hand, in Germany it was observed that making access to funding less bureaucratic would result in more understanding from forest owners in Natura 2000 sites. In the Walloon region of Belgium, indemnities and subsidies directed at habitat restoration have resulted in 20 restoration projects on 22 ha, including riparian forest habitats. Likewise, stakeholder engagement is seen as one of the main keys to success when it comes to conservation. In addition, dissemination of know-how between experts and training the staff of public bodies are regarded as critical tools in achieving a better understanding of the importance of conservation and best management practice. This would also help in developing holistic, cross-sectoral strategies and management plans, moving away from biodiversity-harmful, monosectoral policymaking.

4.9.8 Relevant cross-cutting issues

To be successful in restoring and preserving Natura 2000 forest habitat types, the participation of all stakeholders (including forest owners, rural communities and forestry operators such as contractors, forest industries and conservation NGOs) in managing Natura 2000 areas is particularly important. The conservation of biodiversity often depends on the maintenance of human activities, especially if non-climax vegetation formations are to be maintained. As an illustration, in France and Germany contracts have been drawn up with stakeholders to carry out specific measures designed to enhance the conservation status of habitats and species. These measures may consist of conservation of old trees, creation or conservation of forest ponds or open habitats conservation.

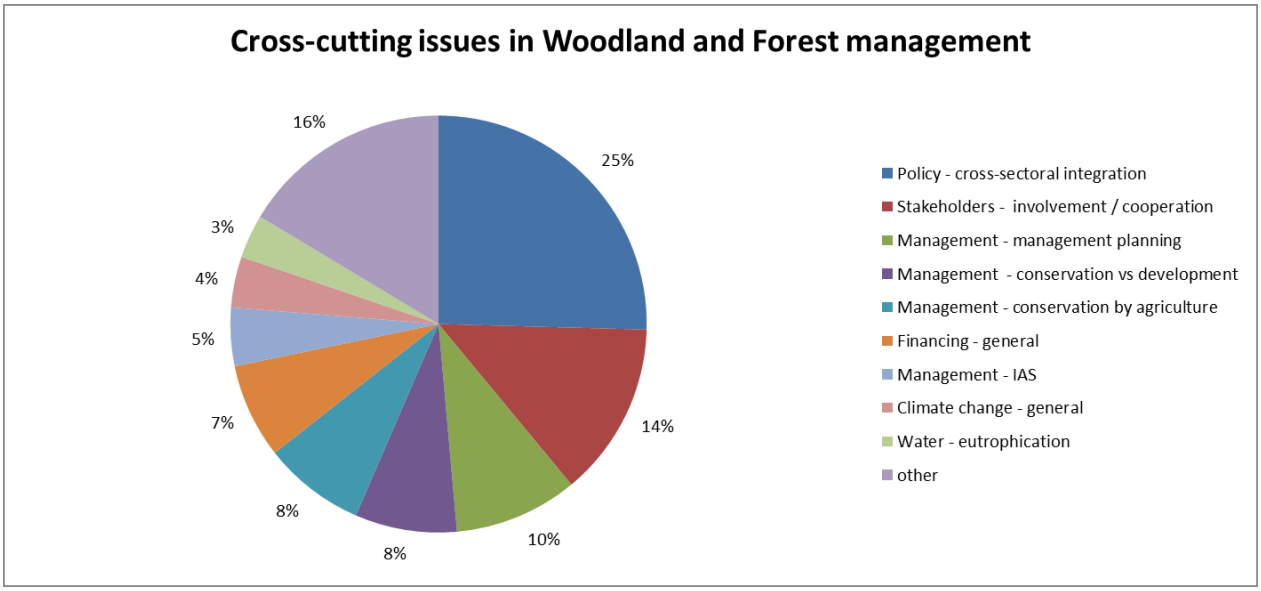


Figure 57 Results from Natura 2000 Biogeographical Process expert consultation: *Cross-cutting issues in woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

Defragmentation of forest ecosystems is a clear cross-cutting issue. Protecting ecosystems at the landscape scale requires an integrated approach involving a number of key policy areas such as regional development, climate change, disaster prevention and resilience, agriculture, forestry, urban, transport, water, and biodiversity protection and enhancement. Spatial planning is a key sector in achieving the balance between protecting valuable habitats and finding space for controlled development and urbanisation. Also, while LIFE projects are welcome as key financing tools for the implementation of conservation plans, there is a general feeling that other EU policies, such as the CAP through its agro-environmental schemes, should provide more conservation support, especially to forest owners. Innovative, sustainable businesses should also be included in the conservation model in order to make it economically viable and attract the collaboration of stakeholders. The Water Framework Directive is another policy that could positively impact conservation in Natura 2000 sites by including maintenance and restoration measures for habitats to reach and retain favourable conservation status in its River Basin Management Plans (RBMP). Last but not least, more efforts could be directed towards designation

and implementation of closer-to-nature flood retention mechanisms, moving away from the traditional, hard engineering solutions.

Other cross-cutting issues include the need for: awareness raising and stakeholder involvement, increased capacity for the planning and implementation of proper management measures, and policy coordination between different sectors.

4.9.9 Lessons learned / Examples of best practice / Successful and unsuccessful projects

Three main models of forest conservation projects can be distinguished:

1. Many European projects (in particular those funded under LIFE) include an initial one-off restoration action in order to bring the forest back to its original high conservation state.
2. Some projects explore innovative ways of combining conservation concerns with economic activities.
3. Other projects focus on wildlife management issues – for instance re-establishing or creating suitable habitats and corridors for woodland species.

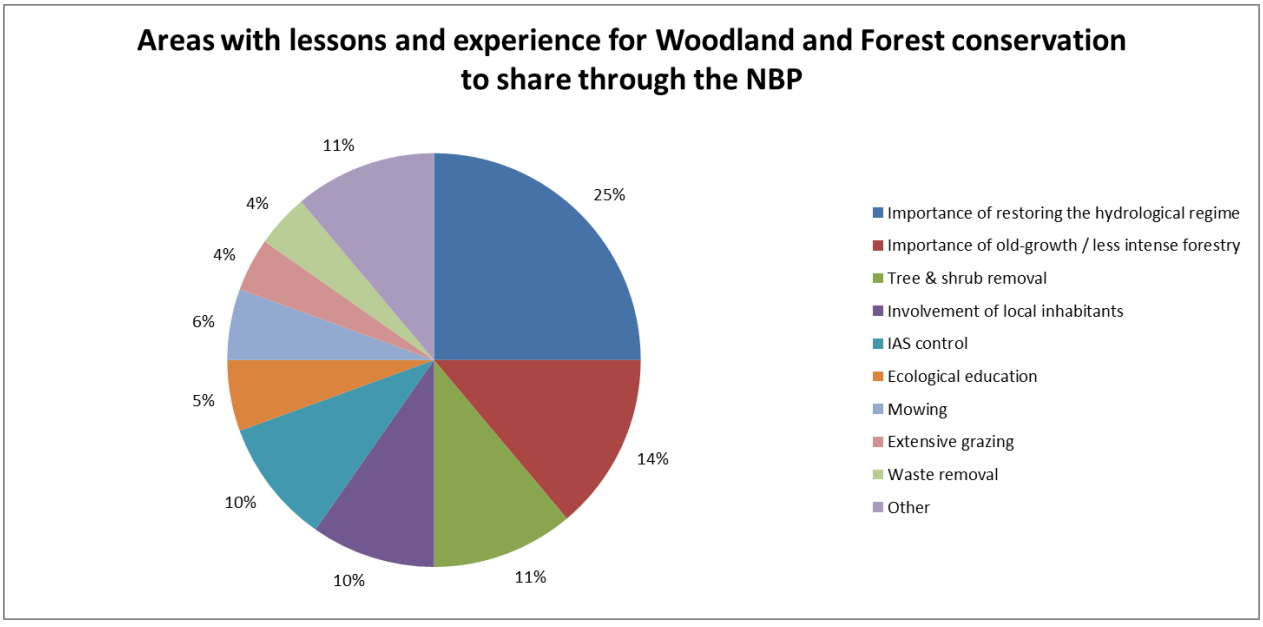


Figure 58 Results from Natura 2000 Biogeographical Process expert consultation: *Lessons learned for woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

One-off restoration actions:

- The Austrian LIFE-Nature project LIFE99 NAT/A/005915 (Rejuvenation of the natural forests of Kalkalpen National Park) illustrates large-scale restoration incorporating sustainable forest management and a well-conceived management plan. It involved the active cooperation of a

broad selection of stakeholders and also piloted and applied new forest restoration techniques to transform former spruce monocultures into more mixed mountain forests. More information at http://www.kalkalpen.at/

- In 1992 the Danish government launched an ambitious 50-year national strategy for Denmark's natural forests. The LIFE95 NAT/DK/000216 project (Restoration of large areas of natural forest for the benefit of endangered birds, plants and biotopes) was designed to help implement the part of the programme relating specifically to the conservation of the 14 most strategically located and important candidate forest sites. Approximately 65 ha of priority natural forest will be purchased, management agreements will be negotiated on 400 ha of private land and urgent management work undertaken on 700 ha of land in two State forests.
- The Bulgarian LIFE13 NAT/BG/000801 project targets the restoration and conservation of riparian forests of habitat type 91E0 in Natura 2000 sites and model areas in Bulgaria.
- The main aim of the Polish LIFE13 NAT/PL/000038 project is to improve the conservation status of habitats in the Ponidzie region, especially those priority habitats listed in Annex I of the Habitats Directive: xerotherm turfs, thermophilic inland sand turfs, thermophilic oak woods, and inland halophilic salty meadows, pastures and reed. The restoration and preservation of an ecosystem mosaic will benefit populations of threatened plants and animals, including species listed in Annex II of the Habitats Directive. A particular focus of the project will be on the flowering plant *Serratula lycopifolia* and the endemic thistle species *Carlina onopordifolia*.
- The German LIFE10 NAT/DE/000009 project aims to restore the old oak woods habitat to a favourable conservation status by removing the invasive Black cherry (*Prunus serotina*) and to improve the conservation status of heath moors within the oak forests by restoring the habitat 'degraded raised bogs' that are capable of regeneration.
- The main objective of the Slovak transnational nature project LIFE10 NAT/SK/000080 is to establish a functional network of Natura 2000 areas in the trilateral border region close to Bratislava (Slovakia) and to secure favourable conservation status for the habitats of European interest found there. Restoration and management activities are being carried out on 16 Natura 2000 sites in Slovakia and one site in Hungary. A wide range of Annex I habitats of the Habitats Directive (forest, grasslands, wetlands and rocky) are targeted.
- Reconstruction of forest habitats was carried out in the protected Natura 2000 areas of Vas county in Hungary. The project aimed to improve the condition of forests by re-establishing missing components necessary for a functioning ecosystem. The project created dead wood, planted rare tree species and created small ponds for amphibians, birds and mammals.
- In Belgium, habitats 9190 and 91D0 have been restored in Wallonia on hydromorphic and peaty soils through five LIFE projects (Saint-Hubert, Plateau des Tailles, Croix-Scaille, Hautes-Fagnes, Haute-Lomme) in Continental high plateaus. In these projects, clearcuts have been made in 1,790 ha of exotic coniferous plantations, using tree branches and trunks to protect the soil from the machinery. Ancient drainage networks have then been neutralised. In terms of forest habitats, the objective was the restoration of 360 ha of broadleaved woods (300 ha of priority habitat 91D0, 60 ha of habitat 9190), 235 ha being protected from game by fences. Methods of restoration included spontaneous broadleaved tree recolonization, plantations and seedlings.

The removal of (exotic) coniferous seedlings is scheduled every five years. Thanks to natural dynamics, the final area of broadleaved forests restored in the areas covered by the five LIFE projects will probably exceed 360 ha.

- The project LIFE09/NAT/PL/000258 'Restoration of hydrological system in the Middle Basin of the Biebrza Valley, Phase I' aims to halt habitat degradation and species loss in the Natura 2000 sites SPA Ostoja Biebrzańska and SAC Dolina Biebrzy. The project runs from 2010 to 2016 and is co-financed by LIFE+, and the National Fund for Environmental Protection.
- From 2001 to 2008, marshes on Belene Island and Persina Island, Bulgaria, were restored as part of the project 'Wetland restoration and pollution reduction' (funded by GEF/World Bank and the Bulgarian Government). The engineering work included cutting the main Danube dyke at three points and building three large sluice gates; reinforcing the internal protection dyke on the island and digging a drainage canal, to protect agricultural lands and the prison blocks on the island. The canal is drained by a new automatic pumping station in order to protect surrounding lands from high underground water levels. Four culverts were constructed to ensure proper water movement between waterbodies on Persina Island. As a result, the natural flooding regime has been restored on more than half of the island. The restored area is managed by Persina Nature Park Directorate. For more information: http://nwrm.eu/case-study/wetland-restoration-persina-bulgaria

Innovative ways of combining conservation concerns with economic activities:

- The research project EFISCEN (European Forest Information Scenario Model) explored the potential of multifunctional forestry as a promising model for the long term (up to 2050). The project compared different scenarios by modelling a multifunctional scenario combining the objective of producing more wood (and thus more employment and more bioenergy possibilities) with ecological objectives (allowing more dead and decaying wood, forest reserves, more diversity in species, spatial and age structure). The results showed that, apart from being able to provide society with sufficient renewable natural resources in the form of timber, active multifunctional forest management can also enhance the ecological and recreational quality of European forests.
- A more concrete example is the process that took place in the German Hainich beech forest; at 150 km² it is one of the largest beech forests in Central Europe. After the reunification of Germany, the regional government declared significant parts of the forest a Natura 2000 site because of its exceptional biodiversity value. The association of private landowners who own much of the land was initially strongly opposed to this designation, fearing that it would prevent them from using the forest for economic purposes. But the conservation authorities soon allayed their fears: the association practises a form of selective forestry known as *Plenterwälder*, which involves the removal of mature trees through a rotation system, and this is entirely compatible with the conservation of a forest's biodiversity. A management agreement was drawn up between the two parties to agree on how to exploit the forest's resources whilst safeguarding the valuable habitats and species present. Thanks to this agreement, private foresters continue to earn a living from their forest without competition from large-scale clear-cutting operations. In the meantime, the National Park has also developed a series of eco-friendly recreational facilities to encourage sustainable tourism. In 2005, it constructed one of Germany's first forest

canopy walks. The walk proved so popular that over 260,000 people came to Hainich in the first year alone.

Wildlife management:

- The shy Capercaillie (*Tetrao urogallus*) and its even more reclusive cousin, the Hazel grouse (*Bonasa bonasia*), are two forest-dwelling birds that are endangered in Central Europe. Their populations have been falling rapidly, not only in the southern Black Forest around the Feldberg massif (the location of the LIFE98 NAT/D/005087 'Integrated habitat protection for the Grouse in the Black Forest' project), but also in other ranges, such as the Jura and the Vosges. This successful project was able to develop forestry practices more compatible with their societal and ecological requirements. Crucially, it succeeded in implementing sustainable and economic solutions for the grouse that are acceptable to all sectors – forestry, hunting, tourism and nature conservation.
- LIFE97 NAT/S/004204 ('Preservation of *Osmoderma eremita* beetle in Sweden') made a significant contribution to preserving and raising awareness of the threatened Hermit beetle in Sweden. It helped to increase knowledge of the status and management needs of the beetle and restored the favourable conservation status of 75 % of the project sites which are home to the beetle, mainly among old oak woods. Long-term management of the sites was also guaranteed through land purchase, national legal protection and agri-environmental agreements.
- The main objective of the Bulgarian 'LIFE for Eagles Forests' (LIFE12 NAT/BG/001218) is to support the long-term conservation status of the Lesser spotted eagle by securing the protection and sustainable management of the forest habitats that are crucial for its existence. This will be achieved through a series of actions in 16 Natura 2000 sites. See also LIFE09 NAT/LT/000235 for a similar project in Lithuania.
- The Bulgarian project 'Multifunctional management of coppice forests: contributions to rural development, maintenance of biodiversity, and climate change mitigation and adaptation in natural resource management' was funded by SEE-ERA.NET (Integrating and strengthening the European research area in Southeast Europe) and implemented between 2007 and 2009.
- Bialowieza National Park, Poland, is a perfect example of the positive results of approximately 100 years of non-intervention in forest management, which greatly benefited its biodiversity.
- Under the project 'Protection of valuable habitats – repurchase of private land' in Biebrza National Park, Poland, 558 ha of privately owned valuable habitats were purchased in 2014. The project was financed by the National Fund for Environmental Protection and Water Management. The LIFE project LIFE11NAT/PL/422 'Preservation of wetland habitats in the upper Biebrza Valley' is being implemented in the same protected area. This project's aim is to conserve the endangered wetland habitats covered by the Natura 2000 sites and to protect valuable species of flora and fauna inhabiting them. The project runs from 2012 to 2017 and is co-financed by LIFE+, the National Fund for Environmental Protection and Water Management, and Biebrza National Park.
- The LIFE+ project 'Salt of Life' (LIFE11 NAT/BG/000362) aims to secure long-term preservation of the Atanasovsko Lake coastal lagoon. The lake is one of the highest conservation value sites in Bulgaria and has great importance for the EU as a rare ecosystem type and as a habitat for

protected species. The project targets the priority habitat 1150 Coastal lagoons as well as a number of birds listed in Annex 1 of the Birds Directive that occur in the Atanasovsko Lake pSCI/SPA.

Communication, cooperation and capacity building have been addressed by various projects. Their further improvement is crucial. Communication, cooperation and capacity building have been addressed by various projects. Their further improvement is crucial if biodiversity in Natura 2000 forests is to be preserved. Examples include:

- The Hungarian 'LIFEinFORESTS' project (LIFE13 INF/HU/001163) is to identify, develop and implement a set of tools to support the development of skills, active communication and cooperation among key stakeholders in the management and conservation of Natura 2000 network forests. The project aims to create a common viewpoint on the implementation of the Natura 2000 objectives.
- The LEADER group of Garfagnana in the Tuscany region (Italy) has implemented a series of forest management projects with the aim of protecting the environment and creating jobs. Key elements included: (1) accredited training for forest workers and the unemployed, in order to reinforce the role of an essential sector for local employment and to restore a damaged or fragile environment, (2) spreading of good practice in the recovery of land and vegetation damaged by erosion and flooding, and (3) specialisation of a forest nursery in the cultivation of native forest species.
- Pro Silva is a European federation of foresters who advocate a type of forest management that has been called 'continuous cover forestry'. It does this through: (1) the exchange of information within regional working groups, (2) the establishment of demonstration forests, (3) meetings and excursions in demonstration forests, and (4) cooperation with educational and scientific institutions and other bodies.

Finally, digital advances in recent decades have opened up possibilities for data gathering and sharing on large scales. For example:

- the European Forest Fire Information System (EFFIS) supports the services in charge of the protection of forests against fires in the EU countries and provides the European Commission and the European Parliament with services and updated and reliable information on woodland fires in Europe (see http://forest.jrc.ec.europa.eu/effis/).
- Another example is the Forest Europe and UNECE/FAO interactive database on indicators of sustainable forest management: http://www.foresteurope.org/news/forest-europe-and-unecefao-launch-interactive-database-indicators-sustainable-forest-management. This information tool provides a comprehensive, up-to-date description of the status and trends of forests and forest management in Europe. Based on six pan-European criteria for sustainable forest management, the database offers a tremendous amount of knowledge on 31 quantitative indicators to anyone interested in learning more about Europe's forest-related data and activities. In addition to characteristics of European forests and forestry data in general, the user also has access to information on the balance of carbon in forest ecosystems, forest health condition, and status of forest biodiversity as well as information on wood energy. The database is available at: http://w3.unece.org/pxweb/.
- In Hungary, an ongoing project entitled 'Multipurpose assessment serving forest biodiversity conservation in the Carpathian region of Hungary' aims to develop data collection procedures

that allow for the provision of fine-scale and thematically rich data for stakeholders. This data collection system will enable the surveying of forest quality for more than 50,000 ha in three national park directorates. The data will be used during the planning process and the project will enhance intersectoral cooperation that ensures the sustained use of the developed schemes.

4.9.10 Opportunities for joint action

The Alpine Convention is a good example of how forest biodiversity, risk prevention and other sustainable development considerations can be integrated into one innovative regulatory framework. It is the world's first binding accord for the protection of a mountainous region. It places special attention on safeguarding the economic and cultural interests of the local population in the signatory states, but also focuses on safeguarding biodiversity in the Alpine region and emphasises the special importance of risk prevention. The new implementation protocols, which are the core of the convention, pertain to the areas of traffic, energy, spatial planning, sustainable development, nature and landscape conservation, alpine farming, mountain forestry, tourism, soil conservation and organisational regulations. The Alpine Convention is already in operation in Germany, Liechtenstein, Austria, Slovenia and France. Protocols on alpine farming, energy, tourism and soil conservation have already been ratified by the EU. The Convention encompasses all areas of sustainability and consequently ensures that an all-inclusive consideration is possible for a large area of Europe. Specifically, it is planned that the signatory states will create cross-border measures for the implementation of a larger ecological linkage in the Alpine region. The Alpine Convention has also already provided examples for making progress in the Carpathians, where similar efforts have been made and an agreement is already operative. More information: http://www.alpconv.org/index_en and http://www.econnectproject.eu/cms/.

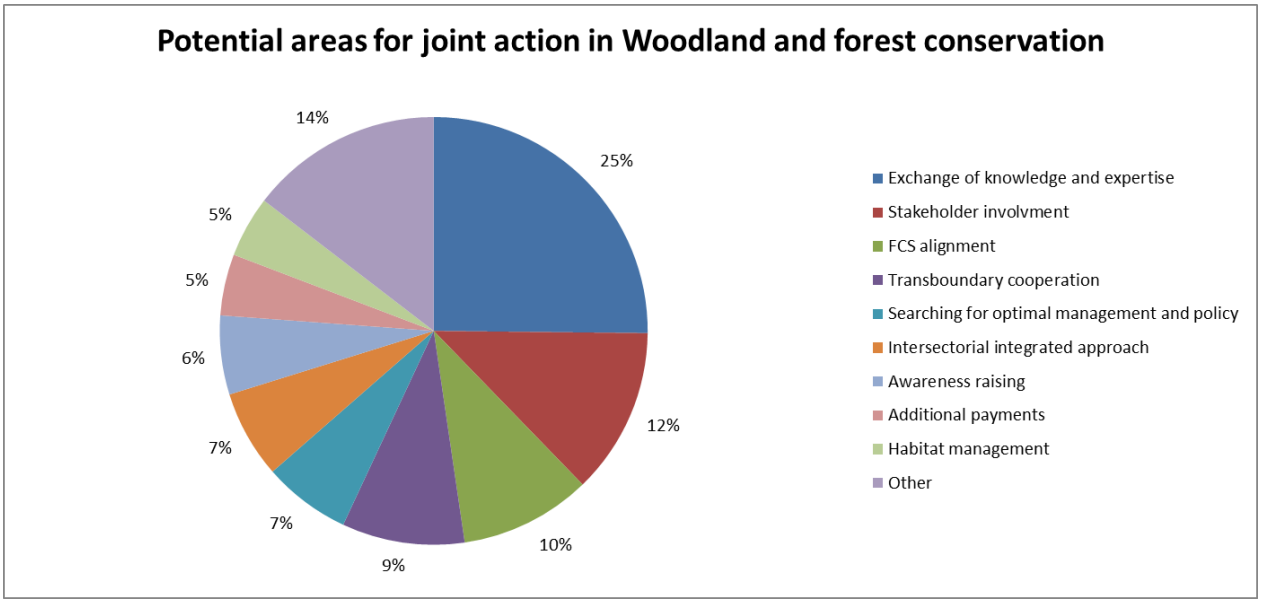


Figure 59 Results from Natura 2000 Biogeographical Process expert consultation: *Potential areas for joint action for the conservation of woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic biogeographical regions*

The BiodivERsA-funded BeFoFu project (www.biodiversa.org/661/download) investigated ecological challenges related to the management of protected forests and governance challenges related to the implementation of Natura 2000. The main finding was that the implementation of Natura 2000 in forests has led to conflicts related to different interests and land-use paradigms (e.g. balancing nature conservation and sustainable timber production) and implementation procedures (e.g. science-based-technical versus participatory-inclusive). Five key policy recommendations were put forward:

1. Specify the 'favourable conservation status' concept to make it more specific and quantifiable, based on the best available ecological knowledge across EU Member States' jurisdictions.
2. Facilitate continuous learning processes across EU Member States, e.g. through guidance documents on management issues.
3. Enhance the integration of Natura 2000 objectives into public and private forest management planning and practices.
4. Reform the funding schemes for Natura 2000 by creating incentives for delivering conservation and societal benefits.
5. Involve local stakeholders and make Natura 2000 a citizens' project.

Floodplain riparian forests offer great opportunities for exchange of experience on conservation and management activities, because this habitat type is found across the Continental region. It would be logical to synchronise and unify criteria and parameters for assessing conservation status. In Bulgaria these forest habitat types are among the most severely affected by human activities. An important lesson learned is that the recovery of species composition through reforestation and planting of typical species is doomed to failure unless there is a parallel focus on the restoration of the hydrological regime.

In relation to monitoring and assessment parameters, it would be useful to develop advanced methods for monitoring the ecological quality of the habitat. An example is Winter and Moeller's (2008) approach to use microhabitats in lowland beech forests as a monitoring tool for nature conservation.

Exchange of good practices is also crucial, especially for countries with no tradition in close-to-nature soft engineering solutions or with limited restoration experience – Bulgaria and Poland are just two examples. The European Centre for River Restoration (ECRR, http://www.ecrr.org/) is a representative example of an initiative that collected best river restoration practices from across the EU. These are holistically planned projects, where economics, flood risk management, hydroelectric power and biodiversity were all taken into account.

4.10 Caves not open to public

Caves represent a secluded environment for an often highly endemic cave fauna of great biogeographical interest. Caves normally host specialist animal species (troglobites) and may include endemic cave species living exclusively in certain cave systems. The typical inhabitants are (half) blind and have completely or partly lost their pigments. The cave-dwelling terrestrial invertebrates are mainly *Orthoptera*, beetles and isopods as well as molluscs and spiders. Among the aquatic cave invertebrates are crustaceans (I*sopoda, Amphipoda*, etc.) A considerable number of the troglobionts are relic and endemic species – including Annex II & IV amphibian *Proteus anguinus*. The caves are of utmost importance as shelters for large bat colonies, including the Habitats Directive Annex II species like *Myotis myotis, M. bechsteinii, M. emarginatus, M. dasycneme, Rhinolophus hipposideros, Barbastella barbastellus*.

Cave environments are particularly vulnerable to a wide range of disturbance due to their low resilience. The main threats are associated with tourism and recreation: mountaineering, climbing, caving, mass tourism. These activities generate pollution from waste disposal and water pollution and can also affect the microclimate inside the caves. Amateur surveys (especially if connected with the excavation cave sediments) and vandalism often result in significant degradation. Cave dwelling animals are also vulnerable to disturbance, especially hibernating bats.

Unregulated economic activities inside and outside the caves can have the adverse effect on caves. Some caves have been used for mushroom cultivation, and as cooling and storage areas. Other pressures include the disposal of solid and liquid waste, wilful destruction of the cave formations and fires. Caves can also be destroyed as a result of quarrying activities. However, stone exploitation can also have a positive effect if it creates new anthropogenic cave systems.

As karst formations possess a very complex hydrology (sinkholes, springs, underground streams, etc.) the maintenance of a high water quality plays an important role in protecting this habitat. This requires measures to be applied at the level of the catchment system as a whole. The management plans for protected karst areas with caves should regulate and reduce human activities in the cave catchment, identify zones to be left without any management (e.g. forestry), and regulate the use of nutrients and pollutants.

Each cave system should ideally be protected though individual and adapted measures regulating access, disturbance and pollution. More accessible caves should be protected by bars, in a way that does not restrict the bats' movements. Another effective measure is designating caves with rich biodiversity and unique cave formations as protected areas. Opening of new caves to the public should be done with the greatest care and be duly regulated. Targeted education programs can help raise awareness among the inhabitants of the karst areas.

Barriers for better protection of this habitat include a lack of best practice and a lack of funding for active conservation. There are opportunities for cooperation including the development and sharing of active or passive methods of protecting the habitat, preparing of educational events and projects.

Projects

Project LIFE07 NAT/RO/000680 Preserving management of the habitat 8310 from the Site Natura 2000 Semenic - Cheile Carasului - http://www.salvatililiecii.ro/

1. Rehabilitation of 65 polluted caves closed to the public (habitat 8310) and elimination of the polluting sources;
2. Preservation of the hibernation, birth and feeding areas for 11 bat species;
3. Development of best practices for cave conservation in nine local communities;
4. Support for the development of better local government and information exchange at a European level;
5. Pollution reduced by about 90% in habitat 8310;
6. Bat species in the area returned to a favourable conservation status.

LIFE08 NAT/IT/000369 Gypsum: protection and management of the habitats linked to the chalky formations of the Emilia-Romagna region - http://www.lifegypsum.it/gypsum/index.asp

1. Closing of 15 natural and four artificial caves and the protection of more than 10 km of habitat 8310;
2. Protection and conservation of all bat species (20) present in the Natura 2000 sites;
3. Increased protection resulting from land purchase (28.5 ha) of more than 15 Km of caves;
4. Requalification of 27 caves more than 20 km long;
5. Long-term management of all the habitats of EU interest associated with the chalky formations, including some 700 caves not open to the public;
6. Increase of the buffer zone by 1 ha to reduce nutrient flows into the caves;
7. Involvement of speleologists in managing the karst caves.

LIFE11 NAT/PL/000432 Ochrona obszaru PKOG - "Protection of valuable natural non-forest habitats typical of the “Orle Gniazda” Landscape Park ". http://lifezpkws.pl/index.php?lang=en

1. Closure to tourists of an ecosystem of caves that harbours six hibernating bat species;
2. The protection of non-forest habitats particularly threatened by the increasing trend for “wild” tourism and recreation activities;

LIFE13 NAT/RO/001488 LIFE Preserving of the Habitat 8310 from the Site Natura 2000 Cheile Nerei – Beusnita - http://www.anpm.ro/web/apm-timis/programe-proiecte

1. Rehabilitate 110 caves closed to the public that are currently degraded and polluted;
2. Preserve 14 species of Chiroptera; protection fences installed at cave entrances;
3. Develop best practices for the management of the targeted habitat at regional, national and European level;
4. Raise awareness among 15 local communities and conservationists groups about the value of caves and the biodiversity they support.

5 Annexes

5.1 List of consulted experts

Werner Ackermann, PAN ecological consultants, Germany; **Stefan Adler**, Nature and Biodiversity Conservation Union (NABU), Germany; **Prof. Antun Alegro**, University of Zagreb, Croatia; **András Ambrus**, Fertő-Hanság National Park Directorate, Hungary; **Prof. Dr Iva Apostolova**, Institute of Biodiversity and Ecosystem Research, Bulgaria; **Helena Bartoszuk**, Biebrza National Park, Poland; **Håkan Berglund**, Swedish Species Information Centre, Sweden; **Urszula Biereznoj-Bazille**, Naturalist Club, Poland; **Dr Axel Buschmann**, Federal Agency for Nature Conservation, Germany; **Emilie Calvar**, Nature Conservancy Franche-Comté, France; **Piotr Chmielewski**, Zamość Wildlife Association, Poland; **Maria Chybowska**, "Bory Tucholskie" National Park, Poland; **Jean-Marc Couvreur**, Observatory for Fauna, Flora and Habitats, Belgium; **Dr Louis-Marie Delescaille**, Department for the study of the Agricultural and Natural Environment, Belgium; **Prof. Dr Marius Dimitrov**, University of Forestry, Bulgaria; **Dobromira Dimova**, Ekoinnovation Ltd., Bulgaria; **Dr Axel Drechsler**, German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany; **Dr Veronika Feichtinger**, District Government of Upper Bavaria, Germany; **Philippe Frankard**, Research Centre for Nature, Forests and Woodland, Belgium; **Aylin Hasan**, Ministry of Environment and Water of Bulgaria, Bulgaria; **Georgi Hinkov Ivanov**, Forest Research Institute, Bulgaria; **Michael Hošek**, Europarc Federation, Germany; **Dr Alexandru Iftime**, Grigore Antipa National Museum of Natural History, Romania; **Dr Christine Keulen**, Department for the study of the Agricultural and Natural Environment, Belgium; **Grzegorz Kupczak**, Head Office of the Slovinski National Park, Poland; **Michał Leszczyński**, Warta Mouth National Park, Poland; **Marta Łysiak**, Regional Directorate for Environmental Protection in Wroclaw, Poland; **Agnieszka Marcela**, Regional Directorate For Environmental Protection in Rzeszów, Poland; **Dr Attila Mesterházy**, Independent, Hungary; **Dr Jürgen Metzner**, German Landcare Association, Germany; **Mirosława Mierczyk-Sawicka**, Regional Directorate for Environment Protection Katowice, Poland; **Dr Tzvetan Mladenov Zlatanov**, Forest Research Institute, Bulgaria; **Stefan Müller-Kroehling**, Bavarian State Institute of Forestry, Germany; **Danièle Murat**, Forest and Nature Agency, Luxembourg; **Dr Csaba Németh**, Őrség National Park Directorate, Hungary; **Dr Adrian Oprea**, Alexandru Ioan Cuza University of Iași, Romania; **Pawel Pawlaczyk**, Naturalist Club, Poland; **Wojciech Rakowski**, Regional Directorate of Environment Protection in Poznań, Poland; **Dipl.-Ing. Werner Rehklau**, Bavarian Environment Agency, Germany; **Günter Riegel**, Nature conservation authority in the administration district of Swabia, Germany; **Prof. Dr Rossen Todorov Tzonev**, Sofia University "St. Kliment Ohridski", Bulgaria; **András Schmidt**, Ministry of Agriculture, Hungary; **András Schmotzer**, Bükk National Park Directorate, Hungary; **Dr Elisabeth Schubert**, PAN ecological consultants, Germany; **Katalin Sipos**, WWF Hungary, Hungary; **Dr Krzysztof Spałek**, Opole University, Poland; **Dr Tibor Standovár**, Eötvös Loránd University, Hungary; **Magdalena Szymańska**, Regional Directorate for Environmental Protection in Krakow, Poland; **Dr Libor Ulrych**, State Nature Conservancy of the Slovak Republic, Slovakia; **Dr Georg Verbuecheln**, North Rhine-Westphalia State Environment Agency (LUA NRW), Germany; **Dr Eddie von Wachenfeldt**, Swedish Species Information Centre, Sweden; **Nora Welschbillig**, Water Management Authority, Luxembourg; **Ir Lionel Wibail**, Observatory for Fauna, Flora and Habitats, Belgium; **Dr Frank Zimmermann**, Brandenburg State Office of Environment, Health and Consumer Protection (LUGV), Germany; **Ir Mihai-Iancu Zotta**, Carpathians Conservation Foundation, Romania.

5.2 Overview of expert habitat descriptions

Table 22 shows the 59 habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process, ordered according to the number of expert descriptions received.

Table 25 Number of expert descriptions per habitat selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process

HABITAT GROUP	HABITAT	DESCRIPTIONS
Woodland and forest	91E0 - Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	16
Rivers and lakes	3150 - Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	15
Grassland	6510 - Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	14
Woodland and forest	91F0 - Riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia, along the great rivers (Ulmenion minoris)	13
Rivers and lakes	3260 - Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	12
Grassland	6210 - Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	12
Grassland	6410 - Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	11
Wetlands	7140 - Transition mires and quaking bogs	10
Wetlands	7230 - Alkaline fens	10
Woodland and forest	9110 - Luzulo-Fagetum beech forests	10
Woodland and forest	91D0 - Bog woodland	9
Rivers and lakes	3130 - Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	8
Rivers and lakes	3140 - Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	8
Rivers and lakes	3160 - Natural dystrophic lakes and ponds	7
Rivers and lakes	3270 - Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation	7
Wetlands	7210 - Calcareous fens with Cladium mariscus and species of the Caricion davallianae	7
Grassland	1530 - Pannonic salt steppes and salt marshes	6
Grassland	6120 - Xeric sand calcareous grasslands	6
Grassland	6430 - Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	6
Grassland	6520 - Mountain hay meadows	6
Wetlands	7110 - Active raised bogs	6
Wetlands	7120 - Degraded raised bogs still capable of natural regeneration	6
Woodland and forest	9180 - Tilio-Acerion forests of slopes, screes and ravines	6
Heathland and scrub	4030 - European dry heaths	5

HABITAT GROUP	HABITAT	DESCRIPTIONS
Heathland and scrub	5130 - Juniperus communis formations on heaths or calcareous grasslands	5
Grassland	6230 - Species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	5
Grassland	6440 - Alluvial meadows of river valleys of the Cnidion dubii	5
Grassland	6240 - Sub-Pannonic steppic grasslands	4
Woodland and forest	9160 - Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	4
Woodland and forest	9170 - Galio-Carpinetum oak-hornbeam forests	4
Grassland	1340 - Inland salt meadows	3
Grassland	2330 - Inland dunes with open Corynephorus and Agrostis grasslands	3
Grassland	6110 - Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi	3
Grassland	6260 - Pannonic sand steppes	3
Wetlands	7150 - Depressions on peat substrates of the Rhynchosporion	3
Woodland and forest	92A0 - Salix alba and Populus alba galleries	3
Coastal	1150 - Coastal lagoons	2
Coastal	2110 - Embryonic shifting dunes	2
Coastal	2130 - Fixed coastal dunes with herbaceous vegetation ("grey dunes")	2
Grassland	2340 - Pannonic inland dunes	2
Grassland	6250 - Pannonic loess steppic grasslands	2
Sparsely and unvegetated land	8310 - Caves not open to the public	2
Woodland and forest	91AA - Eastern white oak woods	2
Woodland and forest	91G0 - Pannonic woods with Quercus petraea and Carpinus betulus	2
Woodland and forest	91H0 - Pannonian woods with Quercus pubescens	2
Woodland and forest	91I0 - Euro-Siberian steppic woods with Quercus spp.	2
Coastal	1130 - Estuaries	1
Coastal	1310 - Salicornia and other annuals colonizing mud and sand	1
Coastal	1410 - Mediterranean salt meadows (Juncetalia maritimi)	1
Coastal	2190 - Humid dune slacks	1
Grassland	6420 - Mediterranean tall humid grasslands of the Molinio-Holoschoenion	1
Woodland and forest	91M0 - Pannonian-Balkanic turkey oak –sessile oak forests	1
Coastal	1210 - Annual vegetation of drift lines	0
Coastal	1240 - Vegetated sea cliffs of the Mediterranean coasts with endemic Limonium spp.	0
Wetlands	7220 - Petrifying springs with tufa formation (Cratoneurion)	0
Heathland and scrub	40A0 - Subcontinental peri-Pannonic scrub	0
Heathland and scrub	40C0 - Ponto-Sarmatic deciduous thickets	0
Grassland	62C0 - Ponto-Sarmatic steppes	0
Woodland and forest	92D0 - Southern riparian galleries and thickets (Nerio-Tamaricetea and Securinegion tinctoriae)	0

5.3 List of species whose conservation is linked to the habitats selected for priority consideration

This list includes all species identified by the experts as being dependent for their conservation on the habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process. Species marked with one asterisk* were also identified during the elaboration of the list of priority habitats (spring 2014). Species marked with two asterisks** were identified during the elaboration of the list of priority habitats (spring 2014) but not during the expert consultation in early 2015. If a species is known by more than one scientific name, first the currently most widely used name is given and then in parenthesis the name as it appears in the annexes of the Birds and Habitats Directives.

5.3.1 Algae and Weeds

Chara spec.

Nitella spec.

Nitellopsis obtusa

5.3.2 Arthropods (other)

Astacus astacus 1091*

Austropotamobius torrentium 1093*

5.3.3 Beetles

Carabus hungaricus 4013

Carabus menetriesi pacholei 1914

Cerambyx cerdo 1088*

Cerambyx scopolii

Cicindelinae

Cucujus cinnaberinus 1086

Graphoderus bilineatus 1082

Lucanus cervus 1083*

Osmoderma eremita 1084*

Prionus coriarius

Rhysodes sulcatus 4026

Rosalia alpina 1087

5.3.4 Birds

Accipiter brevipes A402

Acrocephalus paludicola A294

Acrocephalus schoenobaenus A295

*Actitis hypoleucos** A168*

Aegolius funereus A223

*Alauda arvensis** A247*

Alcedo atthis A229*

Anas acuta A054

Anas clypeata A056

Anas crecca A052

Anas penelope A050

Anas platyrhynchos A053

Anas querquedula A055*

Anas strepera A051

Anser albifrons A041

Anser anser A043

Anser fabalis A039

Aquila pomarina A089*

Ardea alba (Egretta alba) A027

Ardeola ralloides A024

Aythya ferina A059

Aythya fuligula A061

Aythya nyroca A060*

Botaurus stellaris A021*

*Branta ruficollis** A396*

Caprimulgus europaeus A224

Charadrius alexandrinus A138

Charadrius dubius A136

Chlidonias hybrida (Chlidonias hybridus) A196

Chlidonias leucopterus A198

Chlidonias niger A197

Chroicocephalus ridibundus (Larus ridibundus) A179

Ciconia ciconia A031

Ciconia nigra A030*

*Cinclus cinclus** A264*

Circaetus gallicus A080

Circus aeruginosus A081

Columba oenas A207

*Coracias garrulus** A231*

Crex crex A122*

Cygnus cygnus A038

Cygnus olor A036

Dendrocopos leucotos A239*

Dendrocopos medius A238*

Dendrocopos syriacus A429

Dryocopus martius A236*

Egretta garzetta A026

Ficedula albicollis A321

Ficedula parva A320

Ficedula semitorquata A442*

Fulica atra A125

Gallinago gallinago A153

Gallinago media A154

Gavia arctica A002

Gelochelidon nilotica A189

Glareola pratincola A135

Glaucidium passerinum A217

Grus grus A127

Haematopus ostralegus A130

Haliaeetus albicilla A075

Hieraaetus pennatus A092

Himantopus himantopus A131

Hydrocoloeus minutus (Larus minutus) A177

Ichthyaetus melanocephalus (Larus melanocephalus) A176

Ixobrychus minutus A022

Lanius collurio A338

Lanius excubitor A340

Lanius nubicus A433

Locustella luscinioides A292

Lullula arborea A246

Luscinia svecica A272

Lyrurus tetrix (Tetrao tetrix) A107*

Mergellus albellus (Mergus albellus) A068

Mergus merganser A070

Milvus migrans A073

Milvus milvus A074*

Motacilla cinerea A261

Numenius arquata A160*

Nycticorax nycticorax A023

Oxyura leucocephala A071

Pandion haliaetus A094

Pelecanus crispus A020

Pelecanus onocrotalus A019

*Perdix perdix** A644*

Pernis apivorus A072

Phalacrocorax carbo sinensis A391

Philomachus pugnax A151

Picoides tridactylus A241*

Picus canus A234

Platalea leucorodia A034

Plegadis falcinellus A032

Pluvialis apricaria A140

Podiceps cristatus A005

Podiceps grisegena A006

Podiceps nigricollis A008

Porzana parva A120*

Porzana porzana A119

Recurvirostra avosetta A132

Saxicola rubetra A275

Sterna hirundo A193

Sternula albifrons (Sterna albifrons) A195

Sylvia nisoria A307

Tadorna ferruginea A397

Tadorna tadorna A048

Tetrastes bonasia (Bonasa bonasia) A104

Thalasseus sandvicensis (Sterna sandvicensis) A191

Tringa erythropus A161

Tringa nebularia A164

Tringa totanus A162

Vanellus vanellus A142

5.3.5 Butterflies

Coenonympha oedippus 1071*

Euphydryas aurinia 1065*

Euphydryas maturna (Hypodryas maturna)*

Lycaena dispar 1060*

Lycaena helle 4038

Parnassius apollo 1057

*Parnassius mnemosyne** 1056*

*Phengaris arion (Maculinea arion)** 1058*

Phengaris nausithous (Maculinea nausithous)

Phengaris teleius (Maculinea teleius)*

5.3.6 Dragonflies

Coenagrion mercuriale 1044

Leucorrhinia albifrons 1038

Leucorrhinia caudalis 1035

Leucorrhinia pectoralis 1042

Ophiogomphus cecilia 1037*

Sympecma paedisca

5.3.7 Fish

Alosa fallax 1103

*Alosa immaculata** 4125*

*Alosa tanaica** 4127*

Aspius aspius 1130

Barbus barbus 5085

Cobitis taenia 1149

Coregonus albula 2492

Coregonus lavaretus 2494

Cottus gobio 1163*

*Hucho hucho**

Lampetra planeri 1096

Misgurnus fossilis 1145

Neogobius kessleri (Gobio kessleri) 2511*

Petromyzon marinus 1095

Rhodeus amarus (Rhodeus sericeus amarus) 1134

Rhynchocypris percnurus (Phoxinus percnurus) 4009

Romanichthys valsanicola 1998

*Rutilus pigus** 1114*

Salmo marmoratus 1107

Salmo salar 1106*

Salmo trutta

Thymallus thymallus 1109*

Umbra krameri 2011*

5.3.8 Hymenoptera

Wild bees

5.3.9 Mammals

Barbastella barbastellus 1308*

Castor fiber 1337

*Cricetus cricetus** 1339*

*Felis silvestris** 1363*

Lutra lutra 1355*

*Lynx lynx** 1361*

Microtus oeconomus mehelyi 4004

Myotis bechsteinii 1323*

Myotis emarginatus 1321

Myotis myotis 1324

*Rhinolophus ferrumequinum** 1304*

Rhinolophus hipposideros 1303

*Spermophilus citellus** 1335*

5.3.10 Molluscs and other invertebrates

Anisus vorticulus 4056

Margaritifera margaritifera 1029*

Unio crassus 1032*

Vertigo angustior 1014

Vertigo geyeri 1013

Vertigo moulinsiana 1016

5.3.11 Mosses and lichens

Dicranum scoparium

Dicranum viride 1381

Hamatocaulis vernicosus (Drepanocladus vernicosus) 1393

Polytrichum commune

Sphagnum spec.

5.3.12 Moths

Eriogaster catax 1074

5.3.13 Orthoptera

Isophya costata 4048

Stenobothrus eurasius 4055

5.3.14 Plants

Abies alba

Acer campestre

Acer pseudoplatanus

Actaea spicata

Adenophora lilifolia 4068*

Adonis vernalis

Adoxa moschatellina

Aegopodium podagraria

Agrostis capillaris

Aldrovanda vesiculosa 1516

Allium angulosum

Alnus glutinosa

Alyssum borzaeanum

Angelica palustris 1617

Anthoxanthum odoratum

Apium repens 1614

Argusia sibirica

Arnica montana 1762*

Artemisia campestris

Artemisia maritima

Asplenium scolopendrium

Phyllitis scolopendrium

Aster tripolium

Astragalus peterfii 2132

Atriplex pedunculata

Aurinia uechtritziana

Betula pendula

Betula pubescens

Bidens tripartita

Bolboschoenus maritimus

Bupleurum tenuissimum

Cakile maritima

Caldesia parnassifolia 1832

Calluna vulgaris

Caltha palustris

Calystegia sepium

Campanula bohemica 4069

Campanula romanica 2236

Campanula serrata 4070

Camphorosma annua

Cardamine impatiens

Cardaminopsis halleri

Carex brizoides

Carex pilulifera

Carex remota

Carlina onopordifolia 2249

Carpinus betulus

Centaurea arenaria

Centaurea jankae 2253

Cerasus fruticosa

Chamaecytisus albus

Circaea lutetiana

Cirsium brachycephalum 4081

Clematis vitalba

Cnidium dubium

Colchicum arenarium 2285

Cornus sanguinea

Corylus avellana

Corynephorus canescens

Crambe maritima

Crambe tataria 4091

Crataegus spec.

Crepis conyzifolia

Crypsis aculeata

Cyclamen coum

Cyperus fuscus

Cyperus glomeratus

*Cypripedium calceolus** 1902*

Pycreus glomeratus

Cyperus michelianus

Cypripedium calceolus 1902

Deschampsia cespitosa

Deschampsia flexuosa

Dianthus diutinus 4074

Dracocephalum austriacum 1689

Dryopteris carthusiana

Dryopteris filix-mas

Echium maculatum

Echium russicum 4067*

Elymus caninus

Epipactis atrorubens

Epipactis helleborine

Erica arborea

Euonymus europaeus

Euphorbia peplis

Fagus sylvatica

Ferula sadleriana 2170

Festuca gigantea

Festuca rubra

Filipendula ulmaria

Frangula alnus

Fraxinus excelsior

Fritillaria drenovskii 1846

Fritillaria graeca

Galium aparine

Galium moldavicum 2191

Galium rhodopeum

Galium saxatile

Gentianella bohemica 4094

Geranium robertianum

Geranium sylvaticum

Gladiolus palustris 4096*

Glaux maritima

Glechoma hederacea

Gnaphalium uliginosum

Gratiola officinalis

Groenlandia densa

Gymnadenia conopsea

Himantoglossum adriaticum 4104*

Himantoglossum caprinum 2327

Himantoglossum spec.

Hordeum marinum

Impatiens noli-tangere

Inula britannica

Iris aphylla (Iris aphylla ssp. hungarica) 4097

Iris humilis

Iris pseudacorus

Iris sibirica

Juncus gerardii

Jurinea albicaulis

Lathyrus palustris

Ligularia sibirica 1758

Ligustrum vulgare

Linaria odora

Lindernia procumbens 1725

Linum tauricum

Linum tauricum ssp. bulgaricum

Liparis loeselii 1903

Lonicera periclymenum

Lonicera xylosteum

Luronium natans 1831

Luzula luzuloides

Luzula sylvatica

Lycopodiaceae

Lycopodiella inundata

Lycopodium annotinum

Lycopodium clavatum

Lysimachia nemorum

*Marsilea quadrifolia** 1428*

Mercurialis perennis

Milium effusum

Molinia caerulea

Myosoton aquaticum

Najas flexilis 1833

Nardus stricta

Onosma tornensis 2203

Ophrys insectifera

Orchis pallens

Orchis purpurea

Orobanche arenaria

Phalaris arundinacea

Phleum rhaeticum

Phyteuma spicatum

Plantago maritima

Plantago tenuiflora

Poa chaixii

Polypodium vulgare

Polystichum aculeatum

Potentilla aurea

Potentilla erecta

Primula elatior

Prunus avium

Puccinellia distans

Pulsatilla grandis 2093

Pulsatilla patens 1477

Quercus petraea

Quercus robur

Ranunculus ficaria

Ranunculus penicillatus

Ranunculus repens

Rosa arvensis

Rumex acetosa

Ruppia maritima

Ruscus aculeatus 1849

Salicornia ramosissima

Salix alba

Salix aurita

Salix caprea

Salix cinerea

Salix fragilis

Salix viminalis

Sambucus nigra

Sambucus racemosa

Saxifraga hirculus 1528

Schoenoplectiella supina

Scorzonera purpurea

Scutellaria hastifolia

Senecio macrophyllus

Silene dioica

Silene euxina

Silene thymifolia

Silene vulgaris

Solanum dulcamara

Sorbus aucuparia

Sorbus torminalis

Spergularia salina

Stachys sylvatica

Stellaria holostea

Stellaria nemorum

Suaeda maritima

Teucrium scorodonia

Thesium ebracteatum 1437

Thlaspi jankae 2120*

Tilia cordata

Tilia platyphyllos

Triglochin maritima

Ulmus glabra

Vaccinium arctostaphylos

Vaccinium myrtillus

Veratrum nigrum

Veronica officinalis

Viburnum opulus

Viola elatior

Viola persicifolia

Viola pumila

5.3.15 Reptiles and amphibians

Bombina bombina 1188*

Bombina variegata 1193*

Bufo calamita 1202*

Coronella austriaca 1283*

*Elaphe situla** 1293

Emys orbicularis 1220

Hyla arborea 1203*

Lacerta agilis 1261

Pelobates fuscus 1197

Pelophylax lessonae (Rana lessonae) 1207

Pseudepidalea viridis (Bufo viridis) 1201

Rana arvalis 1214*

Rana dalmatina 1209

*Testudo graeca** 1219*

Triturus cristatus 1166*

Triturus dobrogicus 1993*

Vipera ursinii 1298

5.4 Coastal habitats

5.4.1 Short description of the habitats selected for priority consideration

Of the 35 coastal and marine habitats identified in the reference list for the Continental, Pannonian, Steppic and Black Sea biogeographical regions, nine habitat types were selected:

- two open sea and tidal habitats: Estuaries (1130), Coastal lagoons (1150);
- two habitats of shingle and stony beaches: Annual vegetation of drift lines (1210), Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp. (1240);
- two habitats of salt marshes and salt meadows: *Salicornia* and other annuals colonising mud and sand (1310), Mediterranean salt meadows (*Juncetalia maritimi*; 1410);
- three habitats of sea dunes: Embryonic shifting dunes (2110), Fixed coastal dunes with herbaceous vegetation (grey dunes; 2130 *) and Humid dune slacks (2190).

None of the selected habitats occurs in the Pannonian biogeographical region. Only one selected habitat (1310) occurs in the Steppic region, and all nine selected habitat types are present in the Continental and Black Sea regions.

The coastal habitats – aquatic (1130, 1150), transitional (1210, 1240) and terrestrial (1310, 1410, 2110, 2130, 2190) – form a single ecological unit and should not be separated in assessment, planning, conservation and management.

The Estuaries (1130) represent the downstream part of a river valley that is subject to the tides. River estuaries are coastal inlets where, unlike 'large shallow inlets and bays', there is generally a substantial freshwater influence. The mixing of fresh water and sea water and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sand and mud flats. Where tidal currents are faster than flood tides, most sediments deposit to form a delta at the mouth of the estuary. Baltic river mouths, considered as an estuary subtype, have brackish water and no tide, with large wetland vegetation (helophytic) and luxurious aquatic vegetation in shallow water areas. Typical plants: *Zannichellia palustris, Zostera marina, Z. noltii, Spartina maritima, Sarcocornia perennis* and species of the genera *Chara, Myriophyllum, Potamogeton,* and *Ruppia.*

The deterioration of natural habitats has been observable for many years in both estuaries and coastal lagoons. Gradual eutrophication and toxic pollution, as well as the adverse effects of human activities on the movement of water and the habitat, have adverse effects on living conditions, in particular for fish and birds.

Coastal lagoons (1150) are shallow aquatic environments located in the transitional zone between terrestrial and marine ecosystems. Conditions range from fresh water to hypersaline, depending on the water balance. Lagoons are known to be biodiversity hotspots and important spawning and nursing grounds for many fish species. The benthic flora is often rich and may include threatened or declining plants such as stoneworts (Charales). Salt basins and salt ponds may also be considered lagoons, providing they originated from a transformed natural old lagoon or a salt marsh, and are characterised by minor impact from exploitation. Typical plant species: *Callitriche* spp., *Chara canescens, C. baltica, C. connivens, Eleocharis parvula, Lamprothamnion papulosum, Potamogeton pectinatus, Ranunculus baudotii, Ruppia maritima,* and *Tolypella nidifica*. In flads and gloes also *Chara* spp. (*Chara tomentosa),*

Lemna trisulca, Najasmarina, Phragmites australis, Potamogeton ssp., *Stratiotes aloides, Typha* spp. Animal species: *Edwardsia ivelli* (Cnidaria); *Armandia cirrhosa (*Polychaeta); *Victorella pavida (*Bryozoa*)*; *Brachionus* spp. (Rotifera*)*; *Abra* spp., *Murex* spp. (Molluscs); *Artemia* spp. (Crustaceans); *Cyprinus* spp., *Mullus barbatus (*Fish).

Annual vegetation of drift lines (1210) includes formations of herbaceous annual plants that start the dune building. It is found on beaches with sand and/or fine gravel near the shoreline, where the organic matter brought by the waves accumulates and decomposes, creating a substrate rich in sea salts and decomposing organic matter. It is formed by the plants *Cakile maritima, Salsola kali, Chamaesyce peplis, Atriplex* spp. (particularly *A. glabriuscula*), and *Polygonum* spp.; in the Black Sea this habitat includes communities with *Cakile maritima* and *Argusia (Tournefortia) sibirica.*

The habitat type Vegetated sea cliffs of the Mediterranean coasts with endemic *Limonium* spp. (1240) is developed in the cliffs and rocky shores of the Mediterranean, the Mediterraneo-temperate eastern Atlantic (south-western Iberia) and the Black Sea. The following plants are typical of the habitat: *Crithmum maritimum*, *Limonium* spp., *Crucianella rupestris*, *Plantago subulata*, *Silene sedoides*, *Sedum litoreum*, *Erodium corsicum, Spergularia macrorhiza,* and *Asteriscus maritimus.* Many *Limonium* species, in particular, are endemics of extremely local occurrence.

Salicornia and other annuals colonising mud and sand (1310) represent salt marshes from the upper parts of the intertidal zone, the interface between land and sea, which are strongly controlled by geomorphological, physical and biological processes, such as sedimentation in interaction with the vegetation, tidal regime and wind-wave pattern. For its establishment it requires soil with high ion concentration and low oxygen availability, as well as gently sloping sea banks protected from the direct impact of the sea (Šajna et Kaligarič, 2005). It can also develop in abandoned salt pans and on the edges of some still active salt-extraction basins. These formations are composed mostly of annuals, in particular Chenopodiaceae of the genus *Salicornia* or grasses, colonising periodically inundated muds and sands of marine or interior salt marshes. Typical species: *Salicornia* spp., *Microcnemum coralloides, Suaeda maritima, Cyperus pannonicus, Spergularia media, Spergularia marina, Lepidium latifolium, Chenopodium* spp*., Atriplex* spp. *Dianthus guttatus, Artemisia santonicum.*

The habitat type Mediterranean salt meadows (*Juncetalia maritimi*; 1410) includes various Mediterranean and western Pontic (Black Sea) communities of the *Juncetalia maritimi*. Several subtypes are distinguished having characteristic species composition. Typical species: *Limonium narbonense, Puccinellia palustris, Aster tripolium, Juncus maritimus, J. littoralis, J. acutus, Spartina maritima, Carex extensa*, *Aster tripolium*, *Scorzonera parviflora, Merendera sobolifera, Taraxacum bessarabicum, Samolus valerandi, Hordeum nodosum*, *H. maritimum, Trifolium squamosum*, *T. michelianum*, *Alopecurus bulbosus*, *Carex divisa*, *Ranunculus ophioglossifolius*, *Linum maritimum.*

Embryonic shifting dunes (2110) are characterised by psammophilous perennial plants (geophytes and hemicryptophytes) that give rise to the formation of the first sandy drift, called ’embryo dune’. They are constituted by ripples or raised sand surfaces of the upper beach or by a seaward fringe at the foot of the tall dunes. Typical plants: *Elymus farctus, Sporobolus virginicus, Cyperus capitatus, Otanthus maritimus, Echinophora spinosa, Eryngium maritimum, Medicago marina, Anthemis maritima, A. tomentosa, Eryngium maritimum, Pancratium maritimum*.

The priority habitat Fixed coastal dunes with herbaceous vegetation (grey dunes; 2130) is characterised by inland stable dune formations sheltered from salt winds, coastal erosion and sand burial. Fixed dunes are colonised by more or less closed perennial grasslands (hemicryptophytes and chamaephytes) associated with abundant carpets of lichens and mosses. They occur on coasts of the Atlantic, North Sea, Baltic and Black Sea; several subtypes are distinguished. The typical plant species include: *Phleum arenarium, Aira* spp., *Anacamptis pyramidalis, Bromus hordeaceus, Carex arenaria, Cerastium* spp., *Corynephorus canescens, Erodium glutinosum, E. lebelii, Galium verum, Gentiana campestris, G. cruciata, Koeleria* spp., *Milium scabrum, Myosotis ramosissima, Ononis repens, Polygala vulgaris* var. *dunensis, Silene conica, S. otites, Trifolium scabrum, Tuberaria guttata, Viola curtisii, V. rupestris* var. a*renaria,* the moss *Tortula ruraliformis* and lichens *Cladonia convoluta, Cladonia rangiformis.*

Humid dune slacks (2190) represent the wetland component of dune systems, occurring in humid depressions of dune systems, where the underlying water table reaches the surface. Dune slacks appear as flat valleys in the dune system, usually extremely rich in species and associated with other wetland habitats. This habitat requires undisrupted hydrological conditions, in particular for the groundwater balance. Typical species of plants: *Liparis loeselii, Petalophyllum ralfsii, Salix rosmarinifolia*, *S. arenaria, Carex trinervis. Animal species: Bufo calamita;* in the Veneto region of Italy dune slacks are important for a range of amphibians including the priority species **Pelobates fuscus* ssp. *insubricus*, *Rana dalmatina* and *Bufo viridis*.

As shown in the figure below, the selected coastal habitats are not evenly distributed throughout the Continental, Pannonian, Black Sea and Steppic biogeographical regions. Based on Article 17 reporting for the period 2007–2012, the largest area is covered by the habitat type *Salicornia* and other annuals colonising mud and sand (1310) in Romania. Coastal lagoons (1150) are abundant in Poland and Italy. Estuaries (1130) are abundant in Romania and Germany. Other habitat types are less abundant.

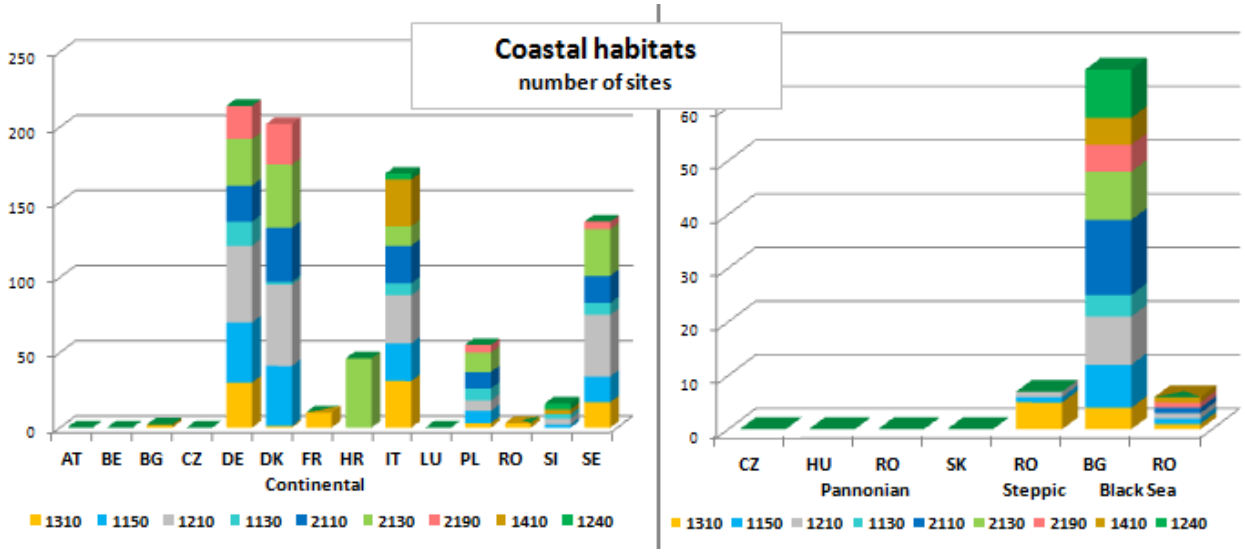


Figure 60 Number of SCIs with coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region.

Table 26 Number of SCIs with coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BU**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
1310	0	0	1	0	30	1	10	0	31	0	3	3	0	17
1150	0	0	0	0	40	40	0	0	25	0	8	0	2	17
1130	0	0	0	0	16	2	0	0	8	0	8	0	3	8
1210	0	0	0	0	51	54	0	0	32	0	7	0	4	41
2110	0	0	0	0	24	36	0	0	25	0	11	0	0	18
2130	0	0	0	0	31	42	0	46	13	0	13	0	0	31
2190	0	0	0	0	22	27	0	0	0	0	5	0	0	5
1410	0	0	1	0	0	0	0	0	31	0	0	0	3	0
1240	0	0	0	0	0	0	0	0	4	0	0	0	4	0

	Pannonian				STE	Black Sea			Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		CON	PAN	STE	BLS	
1310	0	0	0	0	5	4	1		96	0	5	5	106
1150	0	0	0	0	1	8	1		132	0	1	9	142
1130	0	0	0	0	0	4	0		45	0	0	4	49
1210	0	0	0	0	1	9	1		189	0	1	10	200
2110	0	0	0	0	0	14	1		114	0	0	15	129
2130	0	0	0	0	0	9	0		176	0	0	9	185
2190	0	0	0	0	0	5	1		59	0	0	6	65
1410	0	0	0	0	0	5	1		35	0	0	6	41
1240	0	0	0	0	0	9	0		8	0	0	9	17

The number of SCI sites which contain these habitats within each Member State and biogeographical region are summarised in the figure below, collected from the Fact sheets for the Pre-Scoping Document for the Continental, Pannonian, Black Sea and Steppic biogeographical regions.

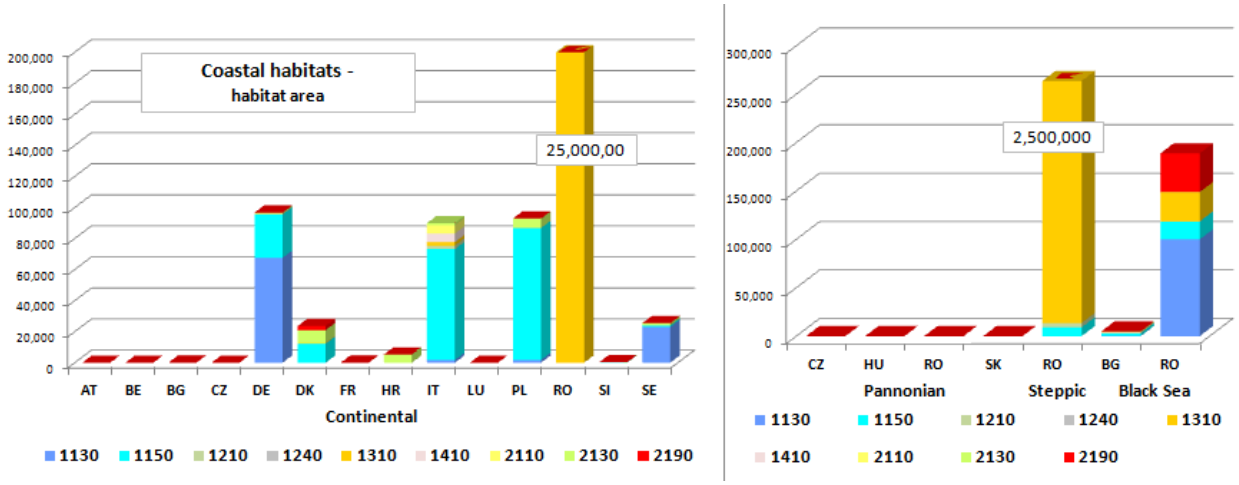


Figure 61 Area (in hectares) of coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region.

Table 27 Area (in hectares) of coastal habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BG**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
1130					67,563	30			1,700		*1,726		3	23,000
1150					27,894	12,200			*71,481		85,000		150	1,000
1210					427	240			2,167		100		4	48
1240									98				30	
1310			11		40	250	10		2,238			25,000,000	70	180
1410			2						5,452				20	
2110					64	260			2,005		100			230
2130					698	8,300		5,252	1,275		6,000			1,200
2190					74	2,600					140			50

*Only area in SCI, because the area was not reported in the Article 17 report

	Pannonian				Steppic	Black Sea			Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		**CON**	**PAN**	**STE**	**BLS**	
1130						300	100,000		94,022	0	0	100,300	194,322
1150					*9,062	2,577	18,400		197,725	0	9,062	20,977	227,764
1210					*4,531	178	300		2,986	0	4,531	478	7,995
1240						370			128	0	0	370	498
1310					2,500,000	170	30,000		25,002,799	0	2,500,000	30,170	27,532,969
1410						186	10		5,474	0	0	196	5,670
2110						549	30		2,659	0	0	579	3,238
2130						477	70		22,725	0	0	547	23,272
2190						58	40,000		2,864	0	0	40,058	42,922

5.4.2 References

Reports and scientific papers

Aliaume C., Do Chi T., Viaroli P., Zaldívar J. M. 2007. Coastal lagoons of Southern Europe: recent changes and future scenarios. Transit. Waters Monogr. 1:1-12. http://siba2.unile.it/ese/twm.

BfN. Verzeichnis der in Deutschland vorkommenden Lebensraumtypen des europäischen Schutzgebietssytems Natura 2000. https://www.bfn.de/0316_typ_lebensraum.2.html.

Draft Management Plan of Slowinski National Park and overlapping Natura 2000 sites. http://dziennikurzedowy.mos.gov.pl/attachments/article/350/zarz%C4%85dzenie%20nr%2031.pdf.

EC. 2011. 'The Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones, with Particular Attention to Port Development and Dredging - Guidance Document'. Luxembourg: Office for

Official Publications of the European Communities. http://ec.europa.eu/environment/nature/natura2000/management/docs/Estuaries-EN.pdf.

Fenu G., Carboni M., Acosta A. T. R., Bacchetta G. 2013. Environmental Factors Influencing Coastal Vegetation Pattern: New Insights from the Mediterranean Basin. Folia Geobotanica 48: 493-508.

HELCOM. 2007. Baltic Sea Action Plan. HELCOM ministerial meeting. Krakow, Poland, 15 Nov 2007.

HELCOM. 2009. Biodiversity in the Baltic Sea – An integrated thematic assessment on biodiversity and nature conservation in the Baltic Sea: Executive Summary. Balt. Sea Environ. Proc. No. 116A, 24 pp.

HELCOM. 2010. Ecosystem Health of the Baltic Sea 2003–2007: HELCOM Initial Holistic Assessment. Balt. Sea Environ. Proc. No. 122, 68 pp.

HELCOM. 2013. Red List of Baltic Sea underwater biotopes, habitats and biotope complexes. Baltic Sea Environmental Proceedings No. 138, 69 pp.

Houston J.A. 2008. Management of Natura 2000 habitats. 2190 Humid dune slacks. European Commission, 24 pp.

Kettunen, M., Torkler, P. and Rayment, M. (2014) Financing Natura 2000 Guidance Handbook. Part I – EU funding opportunities in 2014-2020, a publication commissioned by the European Commission DG Environment (June 2014) http://ec.europa.eu/environment/nature/natura2000/financing/docs/Natura2000financingHandbook_part%201.pdf

Layout and Morphodynamics of Foredunes and Vegetation Fluctuation research project. https://pl-pl.facebook.com/FoMoBi.

Management Plan of Slowinski National Park http://planyochrony.slowinskipn.pl/.

Minelli, Alessandro, Bezzi, Annelore. 2009. Lagoons, Estuaries and Deltas Boundaries between the Sea and Rivers. Quaderni Habitat. Roma : Udine: Ministero dell'Ambiente e della Tutela del Territorio e del Mare [u.a.]. http://www.udinecultura.it/opencms/opencms/release/ComuneUdine/cittavicina/cultura/it/musei/storianaturale/pubblicazioni/quaderni/23-lagune-en.html.

National Prioritised Action Framework (NPAF) for Natura 2000 Bulgaria for the EU Multiannual Financing Period 2014-2020. http://dicon-bg.com/data/ufiles/files/NPAF_Bulgaria_EN.pdf.

Naturvardsverket. 2011. naturtyper. Vägledning för svenska naturtyper i habitatdirektivets bilaga. http://www.naturvardsverket.se/Stod-i-miljoarbetet/Vagledningar/Natura-2000/.

Pawlaczyk P. 2014. The accumulation and carbon emissions by peatlands including alkaline bogs. Naturalists Club. http://alkfens.kp.org.pl/wp-content/uploads/2013/01/2014-09-03_Us%C5%82ugi-ekosystemowe_7230_v-final.pdf.

Prisco I., Acosta A.T.R., Ercole S. 2012. An overview of the Italian coastal dune EU habitats. Annali Di Botanica (Roma) 2012, 2: 39–48.

Relini, Giulio, Basso, Daniela. 2009. Marine Bioconstructions Nature's Architectural Seascapes. Quaderni Habitat. Roma : Udine: Ministero dell'Ambiente e della Tutela del Territorio e del Mare [u.a.]. http://www.udinecultura.it/opencms/opencms/release/ComuneUdine/cittavicina/cultura/it/musei/storianaturale/pubblicazioni/quaderni/22-biocostruzioni-en.html.

Ruffo, Sandro, and Paolo Audisio. 2002. Sand Dunes and Beaches: Environments between Land and Sea. Quaderni Habitat. Udine: Museo friulano di storia naturale. http://www.udinecultura.it/opencms/opencms/release/ComuneUdine/cittavicina/cultura/it/musei/storianaturale/pubblicazioni/quaderni/04-spiagge-en.html.

Scartona F, Cecconi G, Cerasuolo C, Valle R. 2013. The importance of dredge islands for breeding waterbirds. A three-year study in the Venice Lagoon (Italy) - Ecological Engineering 54: 39–48.

Second Scientific Conference Management in river valleys in Natura 2000 areas. https://natura2000poznan.wordpress.com/.

Shipman B., Stojanovic T. 2007. Facts, Fictions, and Failures of Integrated Coastal Zone Management in Europe. Coastal Management, 35:375–398.

Šajna N., Kaligarič M. 2005. Vegetation of the Stjuža coastal lagoon in Strunjan Landscape Park (Slovenia): a draft history, mapping and nature-conservation evaluation. Annals for Istrian and Mediterranean studies. Series historia naturalis 15, 1: 79-90.

Tzonev R, Dimitrov M., Roussakova V. 2005. Dune vegetation along Bulgarian Black Sea coast. Hacquetia 4, 1:7-32.

Vassilev V. et al. 2013. National Action Plan for Conservation of Wetlands of High Significance in Bulgaria 2013 - 2022 http://bbf.biodiversity.bg/document-137.

WWF Baltic Ecoregion Programme. 2013. Baltic Sea Action Plan 2013. 23 pp.

5.5 Grasslands

5.5.1 Short description of the habitats selected for priority consideration

The following provides an overview of the 18 selected grassland habitat types. We have grouped the explanation of the different grassland habitat types in four clusters and kept numbering continuously.

Cluster one concerns four grassland habitat types. *Festuco-Brometalia* (6210) and *Nardus* (6230) grasslands are common across Europe; we describe these together with 6120 and 6110.

1. *Festuco-Brometalia* grasslands (6210) are among the most species-rich plant communities and contain a large number of rare and endangered species. The plant types that occur on calcareous grassland are typically short and hardy, and include grasses and herbs such as trefoil. Sometimes these types of grasslands are rich habitats for various orchid species.
2. The most common Natura 2000 mountain grassland habitat type is the species-rich *Nardus* grassland (6230). These grasslands host many species included in the Habitats Directive Annexes II and IV, ranging from butterflies such as the *Maculinea alcon*, grasshoppers and crickets, e.g. *Pholidoptera transsylvanica*, and mountain-specific bird communities, the most significant of which are the Black grouse (*Tetrao tetrix*), Rock ptarmigan (*Lagopus mutus*) and Rock partridge (*Alectoris graeca*).
3. Habitat type (6120) is calcareous and xeric grasslands. These are dry, frequently open grasslands on more or less calcareous sands (*Koelerion glaucae*, *Sileno conicae-Cerastion semidecandri*, Sedo-Cerastion in parts).
4. Rupicolous calcareous or basophilic grasslands (6110) are open, patchy communities of the *Alysso-Sedion albi* on exposed bedrock or loose rock, dominated by annuals and succulents.

Cluster two concerns six meadow habitat grassland types (6410, 6430, 6440, 6520, 6510 and 1340*).

5. *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410) are planar to montane *Molinia* meadows on base-rich to calcareous as well as acidic wet or alternately wet/humid sites. These evolve mostly under extensive management and late mowing regimes.
6. Habitat type 6430 concerns hydrophilous tall herb fringe communities and tall grass swards on eutrophic sites along water courses and woodland edges and in the area of the subalpine tree line, including (1) riparian tall herb fringe vegetation of the *Convolvuletalia sepium* and the *Glechometalia hederaceae* classes, and of the Filipendulion alliance, (2) humid herbaceous perennial saum communities of woodland edges and (3) subalpine and high montane riparian tall herb fringe vegetation along water courses, but also along woodland edges and roadside verges and on clear-fellings (Betulo-Adenostyletea).
7. Habitat type 6440 is subcontinental alluvial meadows of river valleys with a natural flooding regime (*Cnidion dubii*).
8. Lowland hay meadows (6510) are extensively managed hay meadows (rich in flowers) of the planar to submontane zones (Arrhenatherion, Brachypodio-Centaureion nemoralis). This includes dry meadows (e.g. *Arrhenateretum elatioris, subass*. with *Salvia pratensis*) and typical communities, as well as extensively managed, species-rich, humid to wet meadows (with e.g. *Sanguisorba officinalis*).

9. Mountain hay meadows (6520) are species-rich extensively managed mesophilic meadows of the montane (normally above 600 m) to subalpine zones with vegetation of the Polygono-Trisetion.
10. Inland salt meadows (1340*) are non-coastal natural salt basins made up of a complex of habitat types consisting of zones of seepage of saline water, running or stagnant saline water with adjacent typical halophilous vegetation (i.e. salt meadows with *Puccinellia distans*, *Juncus gerardii*, and reed beds of brackish waters).

Cluster three groups grasslands habitat types characteristic of the Pannonian, Steppic, and Black Sea biogeographical regions:

11. Pannonic sand steppes (6260), and
12. Ponto-Sarmatic steppes (62C0), which concern natural, open grassland communities usually dominated by tussock-forming narrow-leaved grasses of the genera *Festuca* and *Stipa*.

Within these regions further habitat types that are included are:

13. Habitat type 6240 concerns subcontinental steppic grasslands with vegetation of the *Festucion valesiacae* alliance and related syntaxa.
14. Habitat type 6250 (Pannonic loess steppic grasslands) are grassland communities rich in perennial grasses and herbs on loess deposits.
15. Pannonic salt steppes and salt marshes (1530) are highly influenced by the Pannonian climate with its extreme temperatures and arid summers. The halophytic vegetation consists of plant communities on dry saltpans and steppes, wet salt meadows and the annual plant communities of periodically flooded salt lakes, with their typical zoning. The vegetation of salt steppes and salt marshes is determined by two main factors: water and the amount of salt in the soil and water.
16. Pannonic inland dunes (2340) are often a mosaic of vegetation types including open, lichen rich dunes and a variety of grasslands.

Cluster four concerns the final two grassland habitat types that are included: 2330 and 6420:

17. Inland dunes (2330) are open and usually patchy grassland on siliceous inland dunes: ephemeral-rich Aira swards (Thero-Airion alliance), Grey hair-grass communities (*Corynephorion canescens*), perennial patchy dry sandy grasslands with *Agrostis vinealis*, *Carex arenaria* a.o.
18. Mediterranean tall humid grasslands of the Molinio-Holoschoenion (6420) with species such as *Scripoides vulgaris*, *Molinia caerulea* and *Schoenus nigricans* concern a typical vegetation of wet Mediterranean habitats.

The surface area of habitats and the number of SCIs which contain these habitats in each Member State are summarised in Figure 62 and Figure 63, collected from the fact sheets for the Pre-Scoping Document for the Natura 2000 Seminar at Continental, Pannonian, Black Sea and Steppic regions.

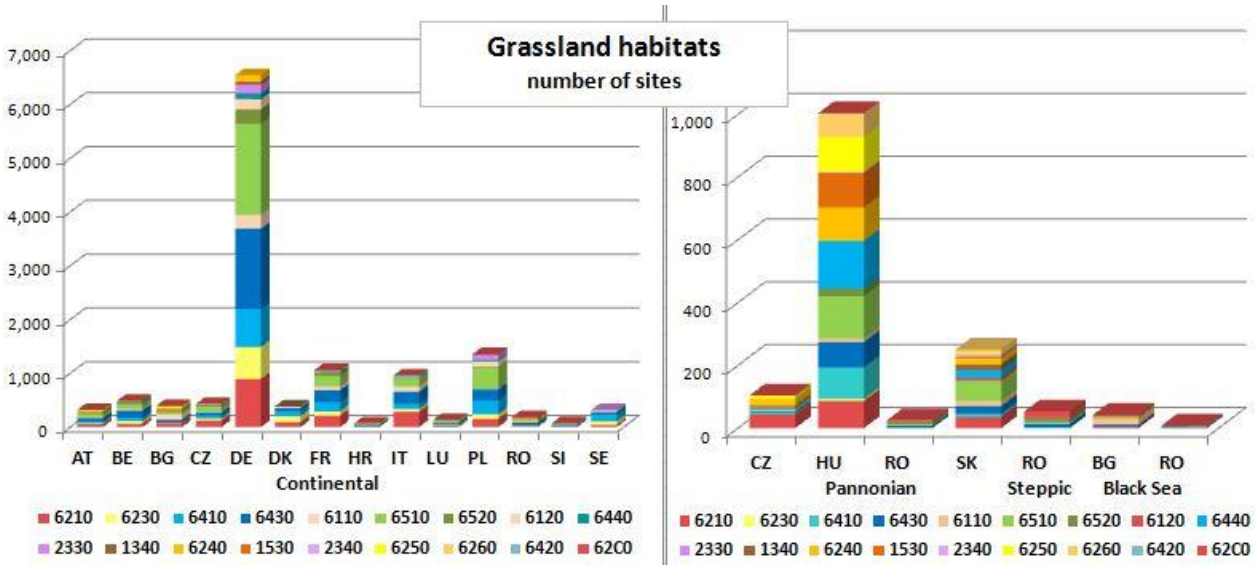


Figure 62 Number of SCIs with grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region. Data are presented in Table 28

Table 28 Number of SCIs with grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BU**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
6210	52	64	73	124	897	92	213	7	284	21	153	16	17	37
6230	19	50	10	34	594	114	79	2	53	12	85	7	3	70
6410	33	56	4	60	705	90	168	10	94	22	255	14	19	124
6430	61	136	50	50	1,492	56	225	12	225	23	208	49	7	40
6110	17	28	101	17	259	0	71	0	99	9	7	13	6	3
6510	68	95	41	99	1,694	0	200	18	151	41	394	24	15	19
6520	12	50	21	13	267	0	63	1	11	0	17	0	3	0
6120	0	6	0	0	189	22	13	0	0	4	106	6	0	14
6440	6	0	3	5	105	0	7	3	0	0	29	9	0	0
2330	0	1	0	17	168	5	12	0	0	0	90	0	0	8
1340	0	0	3	2	54	6	10	0	2	0	13	0	0	0
6240	32	0	23	9	121	0	0	7	0	0	0	18	0	0
1530	4	0	14	0	0	0	0	1	0	0	0	15	0	0
2340	4	0	7	0	0	0	0	2	0	0	0	0	0	0
6250	7	0	34	0	0	0	0	2	0	0	0	0	0	0
6260	4	0	2	0	0	0	0	2	0	0	0	0	0	0
6420	0	0	3	0	0	0	0	0	41	0	0	0	0	0
62C0	0	0	6	0	0	0	0	0	0	0	0	15	0	0

	Pannonian				**STE**	**Black Sea**			Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		CON	PAN	STE	BLS	
6210	43	86	0	36	0	5	0		2,050	165	0	5	2,220
6230	0	7	0	0	0	0	0		1,132	7	0	0	1,139
6410	5	101	1	10	2	0	1		1,654	117	2	1	1,774
6430	4	80	6	24	11	6	2		2,634	114	11	8	2,767
6110	3	11	0	17	0	18	0		630	31	0	18	679
6510	5	135	5	64	7	3	1		2,859	209	7	4	3,079
6520	0	24	0	0	0	0	0		458	24	0	0	482
6120	0	0	0	10	2	0	1		360	10	2	1	373
6440	3	152	3	23	5	0	1		167	181	5	1	354
2330	3	0	0	0	0	0	0		301	3	0	0	304
1340	5	0	0	19	0	0	0		90	24	0	0	114
6240	22	107	0	20	0	2	0		210	149	0	2	361

	Pannonian				STE	Black Sea			Biogeographical Region				Total
Habitat	CZ	HU	RO	SK	RO	BU	RO		CON	PAN	STE	BLS	
1530	0	110	9	5	8	2	1		34	124	8	3	169
2340	0	4	1	7	0	0	0		13	12	0	0	25
6250	9	110	0	6	0	0	0		43	125	0	0	168
6260	2	76	0	9	0	0	0		8	87	0	0	95
6420	0	0	0	0	0	2	1		44	0	0	3	47
62C0	0	0	0	0	18	4	0		21	0	18	4	43

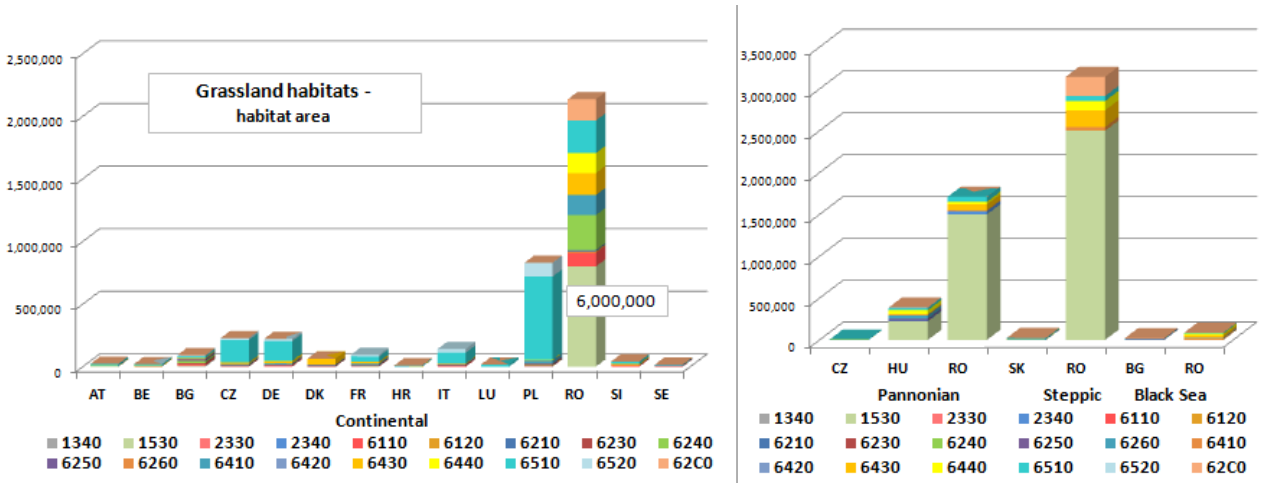


Figure 63 Area (in hectares) of grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region. Data are presented in Table 29

Table 29 Area (in hectares) of grassland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region

	Continental													
Habitat	AT	BE	BG	CZ	DE	DK	FR	HR	IT	LU	PL	RO	SI	SE
1340			1,016	82	396	20	771		4		1,060			
1530	3,750		5,701					1				6,000,000		
2330		26		904	6,818	10	600		350		3,500			160
2340	8		1,161					83						
6110	4	53	11,920	144	440		2,000		5,727	88	300	110,000	9,400	1,300
6120		2			885	130	200				4,500	10,000		80
6210	2,500	406	97,209	13,930	34,754	4,100	60,000	3,455	121,847	310	3,000	130,000	6,500	6,900
6230	480	600	9,371	8,799	7,066	10,100	7,800	29	6,725	10	*7,728	*359	*398	2,900
6240	320		16,324	91	1,305			131				280,000		
6250	16		14,959					3						
6260	290		63					78						
6410	2,500	256	459	8,022	8,724	5,900	12,300	191	2,869	8	*27,435	160,000	1,904	8,900
6420			23						2,805					
6430	1,000	6,051	7,633	14,595	*14,679	47,200	15,000	81	5,865	27	3,000	175,000	9,604	700
6440	900		429	126	5,041		10	2,509			1,640	160,000		
6510	13,00	11,88	14,61	179,46	156,72		*42,32	5,84	86,274	16,57	665,00	260,000	19,16	500

	Continental													
Habitat	**AT**	**BE**	**BG**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
	0	0	4	6	2		0	8		5	0		6	
6520	500	550	6,176	15,565	17,999		*12,785	10	30,262		110,000		134	
62C0			1,651									170,000		

	Pannonian				Steppic	Black Sea			Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		**CON**	**PAN**	**STE**	**BLS**	
1340	23			250					3,349	273	0	0	3,622
1530		223,000	1,500,000	25	2,500,000	1,057	200		6,009,452	1,723,025	2,500,000	1,257	10,233,734
2330	58								12,368	58	0	0	12,426
2340		100	40,000	25					1,252	40,125	0	0	41,377
6110	4	30		12		513			141,376	46	0	513	141,935
6120				5	*4,543		*4,531		15,797	5	4,543	4,531	24,876
6210	892	8,500		4,366		10,961			484,911	13,758	0	10,961	509,630
6230		26							62,365	26	0	0	62,391
6240	267	25,000		650		13			298,171	25,917	0	13	324,101
6250	14	22,000		350					14,978	22,364	0	0	37,342
6260	87	40,000		100					431	40,187	0	0	40,618
6410	16	10,500	10,000	250	40,000		10,000		239,468	20,766	40,000	10,000	310,234
6420						*2	10,000		2,828	0	0	10,002	12,830
6430	24	2,500	70,000	358	200,000	1,287	30,000		300,435	72,882	200,000	31,287	604,604
6440	1,109	49,000	30,000	3,200	110,000		20,000		170,655	83,309	110,000	20,000	383,964
6510	686	27,000	60,000	13,700	60,000	1,364	10,000		1,471,365	101,386	60,000	11,364	1,644,115
6520		3,000							193,981	3,000	0	0	196,981
62C0					230,000	5,950			171,651	0	230,000	5,950	407,601

5.5.2 References for grasslands selected for priority consideration

Reports and scientific papers

Alegro, A, LJ. Markovic, O. Antonic, S. Bogdanovic, 2006: Historical and functional aspects of plant biodiversity-an example on the flora of the Vukova Gorica region (Central Croatia). Candollea 61: 135-166.

Alegro, A., 2009: Mahovi tresetari u Hrvatskoj. Državi zavod za zaštitu prirode, Zagreb.

Alegro, A., 2009: Travnjaci primorskih padina sjevernog Velebita – Tipologija i sukcesije. Hrvatsko botaničko društvo, Zagreb.

Alegro, A., 2010: Travnjaci Parka prirode Medvednica – Tipologija i sukcesije. BIOM – Udruga za biološka istraživanja, Zagreb.

Alegro, A., 2010: Travnjaci vršnih dijelova sjevernog Velebita – Tiplogije i sukcesije. Hrvatsko botaničko društvo, Zagreb.

Alegro, A., 2011: Analiza potencijalne i stvarne rasprostranjenosti vrsta Mannia triandra, Dicranum viride, Buxbaumia viridis i Drepanocladus vernicosus na području Hrvatske. Stručna studija. Državni zavod za zaštitu prirode, Zagreb.

Alegro, A., 2011: Makrofita. U: Mihaljević, Z., (voditelj projekta), Studija – Testiranje bioloških metoda ocjene ekološkog stanja (Okvirna direktiva o vodama, 2000/60/EC) u reprezentativnim slivovima Panonske i Dinaridske ekoregije. Biološki odsjek PMF-a. pp. 227-261.

Alegro, A., Bogdanovic, S., Brana, S., Jasprica, N., Katalinic, A., Kovacic, S., Nikolic, T., Milovic, M., Pandza, M., Posavec-Vukelic, V., Randic, M., Ruscic, M., Šegota, V., Šincek, D., Topic, J., Vrbek, M., Vukovic, N., 2010: Botanički važna područja Hrvatske. Školska knjiga i Priridislovno-matematički fakultet Sveučilišta u Zagrebu, Zagreb.

Alegro, A., Bogdanovic, S., Resetnik, I., Borsic, I., Cigic, P., Nikolic, T., 2013: Flora of the seminatural marshland Savica, part of the (sub)urban flora of the city of Zagreb (Croatia). Nat. Croat. 22, 111-134.

Ambrus, A. Habitat management on wet meadows of Fertőhomok and Hidegség for wetland invertebrates http://www.ferto-hansag.hu/_user/browser/File/English%20Version/Researches/Fertohomok_Ujlak090623_aa_ang21.pdf https://www.researchgate.net/profile/Andras_Ambrus3/publications.

Ambrus, A. The case of Orange Eggar (Eriogaster catax) with the agri-environmental schemes in Hungary http://www.ferto-hansag.hu/_user/browser/File/English%20Version/Researches/Sargagyapjasszovo_ambrus_jav2.pdf.

Ambrus, A: False Ringlet (Coenonympha oedippus Fabr.) in the Hanság (NW- Hungary) http://fhnp.nemzetipark.gov.hu/_user/browser/File/English%20Version/Researches/oedipus_Bosarkany2_eng_DCS.pdf.

Andres, C. and Reisinger, E. 2001. Regeneration einer Binnensalzstelle mit Heckrindern. Erste Ergebnisse einer ganzjährigen Beweidung auf Flora, Vegetation, Heuschrecken und Wiesenbrüter an den Numburger Salzstellen (Nordthüringen). – Natur- und Kulturlandschaft 4: 290–299.

Andres, C. 1999. Zur Regeneration von Salzwiesen aus Schilfröhrichten und Queckenrasen – erste Ergebnisse von Dauerflächenuntersuchungen an den Numburger Salzstellen (Nordthüringen). – Braunschweiger Geobotanische Arbeiten 6: 19–27.

Barańska K. 2014. Podręcznik najlepszych praktyk ochrony kseroterm. Centrum Koordynacji Projektów Środowiskowych, Warszawa.

Barańska K., Jermaczek J. 2009. Poradnik utrzymania i ochrony siedliska przyrodniczego 6210 murawy kserotermiczne. Wydawnictwo Klubu Przyrodników, Świebodzin.

Biró M., Czúcz B., Horváth F., Révész A., Csatári B., Molnár Zs. 2013. Drivers of grassland loss in Hungary during the post-socialist transformation (1987-1999). Landscape Ecology 28(5): 789-803.

Bokdam, J. u. Gleichman, M. 2000. Effects of grazing by free ranging cattle on vegetation dynamics in a continental north-west European heathland. Journal of Applied Ecology 37: 415-431.

Bölöni, J., Molnár, Zs. Biró, M. and Horváth, F. 2008. Distribution of the (semi-)natural habitats in Hungary I. Marshes and grassalands — Acta Bot. Hung. 50 (Suppl.): 59-105.

Boros, Ecsedi and Oláh (ed). 2013. Ecology and Management of Soda Pans in the Carpathian Bason. Hortobágy Environmental Association, Balmazújváros.

Brunn, E. 2009. Feuermanagement auf Bundesliegenschaften in Brandenburg. – In: Bundesamt fuer Naturschutz (Hrsg.): Naturschutz und Biologische Vielfalt. – Bonn-Bad Godesberg. Heft 73/2009: 165-178.

Nature Conservation Agency of the Czech Republic. 2010. Cataloque of biotopes of the Czech Republic, second edition.

Conrady, D., Schmidt-Ruhe, B. U. Hurtig, K.-P. 2015. Energieholznutzung als Erstpflege zur Erhaltung von Heide-Lebensräumen auf ehemaligen Militärflächen. Natur und Landschaft.

Culmsee, H. u. Wahmhoff, W. 2013. Entwicklung eines leitbildorientierten Monitorings für den Naturschutz auf Flächen des Nationalen Naturerbes. Natur und Landschaft 88: 204-212.

Delescaille, L.M. 2005. La gestion des pelouses sèches en Région Wallonne. In: Mahy, G., Woué, L. & Honnay, O. (coord.). Les pelouses calcicoles: du paysage aux gènes (20-22 mai 2004, Vierves-sur-Viroin). Les Presses Agronomiques de Gembloux: 49-54.

Delescaille, L.M. 2006. La restauration des pelouses calcicoles en Région Wallonne: aspects scientifiques et techniques (première partie). Parcs et Réserves, 61 (4): 4-11.

Delescaille, L.M. 2007. La restauration des pelouses calcicoles en Région Wallonne: aspects scientifiques et techniques (seconde partie). Parcs et Réserves, 62 (1): 4-15.

Delescaille, L.M. et Frankard, P. 2015. Le statut de conservation du genévrier commun (Juniperus communis L.) en Wallonie. Parcs et Réserves (à paraître).

Delescaille, L.M., Jacquemart, A.L. and Taupinart, E. 2006. L'apport de la banque de graines du sol dans la restauration des pelouses calcicoles: un exemple dans la vallée du Viroin (prov. Namur, Belgique). Parcs et Réserves, 61 (3): 4-12.

Donath T.W., Hözel N., Otte A. 2003. The impact of site conditions and seed dispersal on restoration success in alluvial meadows. App. Veg. Sci. 6: 13 - 22.

Draft Management Plans for Polish Natura 2000 sites: Dolina Łachy PLH020003, Dębniańskie Mokradła PLH020002, Łąki Nowohuckie, Las Pilczycki PLH020069, Dolina Widawy PLH020036, Łęgi Odrzańskie PLH020018, Grądy w Dolinie Odry PLH020017, Pasmo Krowiarki PLH020019, Grodczyn i Homole koło Dusznik PLH020039, Góry i Pogórze Kaczawskie PLH020037, Dolina Biebrzy PLH200008 and Góry Kamienne PLH020038.

Duna-Ipoly National Park Directorate. 2011: Final report of Conservation of Euro-siberian steppic woods and Pannonic sand steppes in "Nagykörösi pusztai tölgyesek" pSCI (LIFE06 NAT/H/000098).

Duna-Ipoly National Park Directorate. 2015: Management plans of Érd-Tétényi-plató (HUDI20017), Debegió-hegy (HUDI20014), Érd-Százhalombattai táblarög (HUDI2005), Felső-Tápió (HUDI20019), Kirvai löszgyepek (HUDI20028), Székek (HUDI20046), Sárrét (HUDI20044), Szigethalmi homokbuckák (HUDI20045), Tápiógyörgye-Újszilvási szikesek (HUDI20024) Natura 2000 sites.

Enyedi MZ, Ruprecht E, Deák M. 2007. Long-term effects of the abandonment of grazing on steppe-like grasslands. Applied Vegetation Science 11(1): 55-62.

Frankard, P. 2006. Les techniques de gestion des milieux naturels et semi-naturels mises en oeuvre depuis 1994 dans la RND des Hautes Fagnes. 2. Evaluation des techniques de restauration des landes sèches, des landes tourbeuses et des genévrières testées sur le plateau des Hautes Fagnes. Hautes Fagnes, 2006 (4): 21-29.

Frankard, Ph. 2014. Les nardaies montagnardes à Meum athamanticum du plateau d'Elsenborn (Est de la Belgique). Evolution spontanée depuis l'arrêt des pratiques agropastorales. Impact de la gestion conservatoire par la fauche ou la mise à feu contrôlée. Lejeunia, n.s. 192: 30 p.

Gafta D., Mountford J. O. (coord.), Manual de interpretare a habitatelor Natura 2000 din România /Interpretation Manual of Natura 2000 Habitats in Romania/. Risoprint Publishing House, Cluj-Napoca, 101 pp.

Goldammer, J.G.; Brunn, E.; Held, A.; Johst, A.; Kathke, S.; Meyer, F.; Pahl, K.; Restas, A. u. Schulz, J. 2012. Kontrolliertes Brennen zur Pflege von Zwergstrauchheiden (Calluna vulgaris) auf munitionsbelasteten Flächen: Problemstellung und erste Erfahrungen im Pilotvorhaben im Naturschutzgebiet "Heidehof-Golmberg" (Landkreis Teltow-Fläming). – In: Bundesamt fuer Naturschutz (Hrsg.): Naturschutz und Biologische Vielfalt. – Bonn-Bad Godesberg. Heft 127/2012: 65-95.

Goriup P. 2008. Natura 2000 IN Romania Species Fact Sheets. EU Phare Project on Implementation of Natura 2000 Network in Romania EU Phare EuropeAid/12/12160/D/SV/RO for Ministry of Environment and Sustainable Development, 502 pp.

Grygoruk et al. 2013. Climate-Adapted Management Plan for the Biebrza National Park. http://www2.ioer.de/download/habit-change/HABIT-CHANGE_5_3_1e_BNP_CAMP_for_Biebrza_NP.pdf

Gumiero, B., Mant, J., Hein, T., Elso, J & Boz, B. 2013. Linking the restoration of Rivers and Riparian zones/Wetlands in Europe: sharing knowledge through case studies. Ecological Engineering Volume 56: 36–50.

Haerdtle, W.; Assmann T.; Van Diggelen, R u. Von Ooheimb, G. 2009. Renaturierung und Management von Heiden. - In: Zerbe, S. u. Wiegleb, G. (Hrsg.): Renaturierung von Ökosystemen in Mitteleuropa. Spektrum Akademischer Verlag, Heidelberg. 317-347.

Halada L, Evans D, Romão C, Petersen JE. 2011. Which habitats of European importance depend on agricultural practices? Biodiversity and Conservation 20(11): 2365-2378.

Haraszthy L. (ed). 2014. Natura 2000 fajok és élőhelyek Magyarországon [Natura 2000 species and habitats in Hungary]. Pro Vértes Közalapítvány Csákvár.

Hölzel, N. & Otte, A. 2003. Restoration of a species-rich flood meadow by topsoil removal and diaspore transfer with plant material. − Applied Vegetation Science 6: 131−140.

Horváth, F., Kovács-Láng, E., Báldi, A., Gergely, E. and Demeter, A. 2003. Európai jelentőségű természeti területeink felmérése és értékelése. (Survey and evaluation of areas of European interest in Hungary). — MTA ÖBKI, Vácrátót.

Kaiser, T.; Mertens, D. u. Zimmermann, M. 2009. Naturschutzgroßprojekt Lüneburger Heide, Niedersachsen. Eine Bilanz nach 14-jähriger Projektlaufzeit. Natur und Landschaft 84: 353-360.

Kiehl, K., Kirmer, A., Donath, T.W., Rasran, L. and Hölzel, N. 2010. Species introduction in restoration projects – Evaluation of different techniquies for the establishment of semi-natural grasslands in Central and Northwestern Europe. − Basic and Applied Ecology 11: 285−299.

Kiskunsági National Park Directorate. 2011. Final report of Conservation of the Pannon endemic Dianthus diutinus (LIFE06 NAT/H/000104).

Kostrakiewicz K. 2010. Wpływ luk na rekrutację siewek ginących gatunków w płatach łąk trzęślicowych Molinietum caeruleae W. Koch 1926. Chrońmy Przyr. Ojcz. 66(3): 184 - 189.

Kostrakiewicz K. 2011. The effect of gap size on colonization process im Molinietum caeruleae meadows with different habitat conditions. Pol. J. Ecol. 59(4): 677 - 686.

Książkiewicz, Bierężnoj-Bazille, Krajewski, Gołdyn. 2014. New records of vertigo geyeri (Lindholm 1925), vertigo moulinsiana (Dupuy 1849) and vertigo angustior (Jeffrey's 1830) in Poland. Folia Malacologica (in prep.).

Lake, S.; Bullock, J.M. u. Hartley, S. 2001. Impacts of lifestock grazing on lowland heathland in the UK. English Nature Research Reports No. 422, Peterborough, 142 S.

Legislation in Wallonia (South Belgium): Arrêté du Gouvernement Wallon. Mesures générales - 24/03/2011, Arrêté du Gouvernement wallon. Arrêté catalogue - 03/06/2011.

Lorenz, A.; Tischew, S.; Osterloh S. u. Felinks, B. 2013. Konzept für maßnahmebegleitende, naturschutzfachliche Erfolgskontrollen in großen Projektgebieten am Beispiel des Managements von FFH-Lebensraumtypen in der Oranienbaumer Heide. Naturschutz und Landschaftsplanung 45(12): 365-372.

Management plan for Natura 2000 site Kalina - Lisiniec PLH120007: http://edziennik.malopolska.uw.gov.pl/WDU_K/2014/2988/akt.pdf

Management plan for Natura 2000 site: Jadowniki Mokre: http://edziennik.malopolska.uw.gov.pl/WDU_K/2014/6515/akt.pdf

Management Plan of Natura 2000 Graniczny Meander Odry Zarządzenie nr 36/2013 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 23 grudnia 2013 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Graniczny Meander Odry PLH240013 (Dz. Urz. Woj. Śl. z dnia 30 grudnia 2013 r. poz. 7874).

Management Plan of Natura 2000 Podziemia Tarnogórsko-Bytomskie Zarządzenie Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 kwietnia 2014 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Podziemia Tarnogórsko-Bytomskie (Dz. Urz. Woj. Śl. z dnia 29 kwietnia 2014r. poz. 2576).

Management Plan of Natura 2000 site Cieszyńskie Źródła Tufowe: Zarządzenie nr 38/2013 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 31 grudnia 2013 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Cieszyńskie Źródła Tufowe PLH240001 (Dz. Urz. Woj. Śl. z dnia 8 stycznia 2014 r. poz. 118).

Management Plan of Natura 2000 Suchy Młyn Zarządzenie nr 32/2012 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 grudnia 2012 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Suchy Młyn PLH240016 (Dz. Urz. Woj. Śl. z dnia 24 grudnia 2012 r. poz. 6035).

Mangement Plan for Natura 2000 site: Pustynia Błędowska PLH120014 http://edziennik.malopolska.uw.gov.pl/WDU_K/2014/4258/akt.pdf.

Mause, R. 2009. The use of prescribed fire for maintaining open Calluna heathlands in North Rhine-Westphalia, Germany. International Forest Fire News No. 38: 75-80.

Mayer et al. (2012) BE-NATUR: Transnational Management of Natura 2000 Sites, Protected Area Management, Dr. Barbara Sladonja (Ed.), available from: http://dx.doi.org/10.5772/50653 or http://www.intechopen.com/books/protected-area-management/be-natur-transnational-management-of-natura-2000-sites.Mc Donald A.W., Baker J.P., Vegelin K. 1996. Seed bank classification and its importance for the restoration of species-rich flood-meadows. J. Veg. Sci. 7: 157 - 164.

Meshinev T., Apostolova I., Petrova A., Georgiev V. 2009. Grasslands in North-Eastern Bulgaria - tradition and changes. In: Veen P., Jefferson R., de Smidt J., van der Straaten J. (eds) Grasslands in Europe of high nature value. pp. 247-255. KNNV Publishing, Zeist, The Netherlands.

Meyer, F. 2015. Stand und Perspektiven für das Offenland-Management auf Flächen des Nationalen Naturerbes in Deutschland – unter besonderer Beachtung von Calluna-Heiden. Natur und Landschaft.

Molnár Zs. Biró M., Bartha S., Fekete G. 2012. Past Trends, Present State and Future Prospects of Hungarian Forest-Steppes. In: Werger, MJA, van Staalduinen, MA (eds.): Eurasian Steppes. Ecological Problems and Livelihoods in a Changing World. Springer, Dordrecht, Heidelberg, New York, London, pp. 209-252.

Mountford O., Gafta D., Anastasiu P., Barbos M., Nicolin A., Niculescu M. and Oprea A. 2008. Natura 2000 in Romania. Habitat fact sheets. EU Phare Project on Implementation of Natura 2000 Network in Romania. EU Phare EuropeAid/12/12160/D/SV/RO for Ministry of Environment and Sustainable Development, 243 pp.

Muller S., Dutoit T., Alard D., Grevillot F. 1998. Restoration and rehabilitation of species-rich grasslands ecosystems in France: a review. J. Rest. ecol. 6: 94 - 101.

Newton, A.C.; Stewart, G.B.; Myers, G.; Diaz, A.; Lake, S.; Bullock, J.M. u. Pullin, A.S. 2009. Impacts of grazing on lowland heathland in north-west Europe. Biological Conservation 142: 935-947.

Nicula G.(il.), Manafu A (red.), Stanciu E. (red.). 2012. Natura 2000 în România. Fundaţia Centrul Naţional pentru Dezvoltare Durabilă, Bucureşti, 256 pp.

Nikolic, T., Antonic, O., Alegro, A. L., Dobrovic, I., Bogdanovic, S., Liber, Z., Resetnik, I. 2008. Plant species diversity of Adriatic islands: an introductory survey. Plant Biosystems 142: 435-445.

Papp, B., Alegro, A., Šegota, V., Šapic, I., Vukelic, J. 2013b. Contribution to the bryophyte flora of Croatia II. The Northern Velebit. Studia botanica hungarica 44: 213-228.

Papp, B., Alegro, A., Šegota, V., Špic, I., Vukelic, J. 2013a. Contribution to the bryophyte flora of Croatia I. Gorski kotar Region (W Croatia). Studia botanica hungarica 44: 193-211.

Patzelt A., Wild U., Pfadenhauer J. 2001. Restoration of wet fen meadows by topsoil removal. Vegetation development and germination biology of fen species. Restor. Ecol. 9: 127 - 136.

Piernik A. 2010. 1340* Śródlądowe słone łąki, pastwiska i szuwary Glauco-Puccinietalia - zbiorowiska śródlądowe. [In:] Mróz W. Monitoring siedlisk przyrodniczych. Przewodnik metodyczny. Część pierwsza: 46 - 60. Biblioteka Monitoringu Środowiska. Warszawa.

Piqueray, J. & Mahy, G. 2010. Revue bibliographique sur la restauration des pelouses calcicoles en Europe: contraintes rencontrées et solutions proposées. Biotechnol. Agron. Soc. Environ., 14(3), 471-484.

Piqueray, J., Bottin, G., Delescaille, L.-M., Bisteau, E. and Mahy, G. 2005. Evaluation des restaurations de pelouses calcicoles en région wallonne: coûts, structure écologique et diversité botanique. Parcs et Réserves, 60 (4): 22-35.

Piqueray, J., Bottin, G., Delescaille, L.-M., Bisteau, E., Colinet, G. & Mahy, G. 2010. Rapid restoration of a species-rich ecosystem assessed from soil and vegetation indicators: the case of calcareous grasslands restored from forest stands. Ecological Indicators 2010, doi10.1016/j.ecolind.2010.06.007.

Poshold P., Biewer H. 2005. Diaspore and gap availability are limiting species richness in wet meadows. Folia Geobot. 40:13 - 34.

Rana – Buero Fuer Ökologie und Naturschutz Frank Meyer. 2014. Managementplan für das FFH-Gebiet “Wittstock-Ruppiner Heide“ (Landkreis Ostprignitz-Ruppin) – 1. Zwischenbericht. Unveröff. Gutachten im Auftrag des Bundesforstbetriebes Brandenburg, Potsdam.

Reiter, K. U. Doerpinghaus, A. 2015. Das Nationale Naturerbe - Definition, Bilanz, Ausblick. Natur und Landschaft.

Rößling, H. & Hermann, A. 2008. Management von Salzstellen in Brandenburg – Erfahrungen aus einem LIFE-Natur-Projekt in Brandenburg. − Naturschutz und Biologische Vielfalt 69: 159−170.

Rößling, H. 2010. Managementstrategien für den Erhalt von Binnensalzstellen in Brandenburg. − In: Landesumweltamt Brandenburg (LUA) (Hrsg.): Binnensalzstellen in Brandenburg, S. 45−49. Potsdam.

Sabovljevic, M., Aalegro, A., Sabovljevic, A., Marka, J., Vujicic, M. 2011. An insight into diversity of the Balkan peninsula bryophyte flora in the European background. Rev. Écol. (Terre Vie) 66: 399-413.

Sârbu A., Sârbu I., Oprea A., Negrean G., Cristea V., Coldea Gh., Cristurean I., Popescu Gh., Oroian S., Tănase C., Bartók K., Gafta D., Anastasiu P., Crişan Fl., Costache I., Goia I., Maruşca Th., Oţel V., Sămărghiţan M., Hentea S., Pascale G., Răduţoiu D., Baz A., Boruz V., Puşcas M., Hiriţiu M. & Frink J.

2007. Arii speciale pentru protecţia şi conservarea plantelor în România/Important Plant Areas for Protection and Conservation in Romania/, Publishing House "Victor B. Victor", Bucureşti, 396 pp.

Sârbu I., Ştefan N. and Oprea A. 2013. Plante vasculare din România. Determinator ilustrat de teren/Vascular plants of Romania. An illustrated field guide/Edit. "Victor B Victor", Bucureşti, ISBN 978-606-8149-08-0, 1320 pp.

Scotton et al. Guidelines for restoration of species-rich grasslands. http://www.salvereproject.eu/sites/default/files/Guideline%20restoration%20-%20reduziert.pdf

Špačková I., Kotorová I., Lepš J. 1998. Sensivity if seedling recruitment to moss litter and dominant removal in an oligotrophic wet meadow. Folia Geobot. 33:17 - 30.

SZIE-VÁTI-ÖBKI-KVVM 2009: Management plans of Izsáki Kolon-tó (HUKN30003), Szigeti homok (HUDI20047), Turjánvidék (HUDI20051), Veresegyházi-medence (HUDI20055), Tengelici-homokvidék (HUDD20040) Natura 2000 sites.

Tallowin J.R.B., Smith R.E.N. 2001. Restoration of Cirsio-Molinietum fen meadow on an agriculturally improved pasture. Restor. Ecol. 9: 167 - 178.

Vassilev K. and Apostolova I. 2013. Bulgarian steppic vegetation - an overview. In: Baumach H. and Pfutzenreuter, S. (eds) Steppenlebensraume Europas - Gefahrdung, Erhaltungsmassnahmen und Schutz. pp. 191-200. Erfurt.

Veen P, Jefferson R, de Smidt J, van der Straaten J. 2009. Grasslands in Europe of High Nature Value. Utrecht: KNNV Uitgeverij.

Verhulst J., Báldi A., Kleijn, D. 2004. Relationship between land-use intensity and species richness and abundance of birds in Hungary, Agriculture, Ecosystems & Environment, Volume 104, Issue 3, December 2004, Pages 465-473, ISSN 0167-8809, http://dx.doi.org/10.1016/j.agee.2004.01.043. http://www.sciencedirect.com/science/article/pii/S0167880904001045.

Vukovic, N., Borsic, I., Župan, D., Alegro, A., Nikolic, T. 2013. Vascular flora of Jarun (Zagreb, Croatia). Nat. Croat., 22: 275-294.

Wibail, L., Goffart, Ph., Smits, Q., Delescaille, L.M., Couvreur, J.M., Keulen Chr., Delmarche, C., Gathoye, J.-L., Manet, B. & Derochette, L. 2014. Évaluation de l'état de conservation des habitats et espèces Natura 2000 en Wallonie. Résultats du Rapportage Article 17 au titre de la Directive 92/43/CEE pour la période 2007-2012. DGOARNE, Département de l'Étude du Milieu Naturel et Agricole-Direction de la Nature et de l'Eau, Gembloux, 277 p.

Zimmermann, F. 2004. Biotope in Brandenburg – Heiden. Naturmagazin.

Zimmermann, F. 2012. Vielfalt gesichert? Ein Überblick zur aktuellen Gefährdungssituation von Arten und Lebensräumen in Brandenburg. Naturschutz und Landschaftspflege in Brandenburg 21 (3): 96-110.

Zimmermann, F. 2014. Die FFH-Lebensräume in Brandenburg. Beschreibung – Bewertung – Schutz. Naturschutz und Landschaftspflege in Brandenburg 23 (3, 4) (in print).

Zulka K.P., Milasowszky N., Lethmayer C. 1997. Spider biodiversity potential of an ungrazed and a grazed inland salt meadow in the National Park `Neusiedler See-Seewinkel' (Austria): implications for management (Arachnida: Araneae). Biodiv. and Conserv. 6:75 - 88.

Websites

Ardenne Liégeoise Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4048

Arrêté Mesures générales et Arrêté Catalogue
http://environnement.wallonie.be/legis/consnat/cons045.htm

Bocages Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4297

Camps Militaires Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=2916

Croix Scaille Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=2920

Haine Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=1738

Haute-Meuse Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=1992

Herbages Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4319

http://biodiversite.wallonie.be/fr/projets-life.html?IDC=3260

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.getProjects&themeID=88&projectList

http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/agriculture.pdf

http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/grassland.pdf

http://ec.europa.eu/environment/nature/info/pubs/docs/biogeos/Continental.pdf

http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

http://ec.europa.eu/environment/nature/natura2000/financing/index_en.htm

http://ec.europa.eu/environment/nature/natura2000/management/docs/report%20LOT3_Task%201-European_review.pdf

http://ec.europa.eu/environment/nature/natura2000/management/docs/FARMING%20FOR%20NATURA%202000-final%20guidance.pdf

http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/1530_Pannonic_salt_steppes.pdf

http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/6230_Nardus_grasslands.pdf

http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/6210_Seminatural_dry_grasslands.pdf

http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/6260_Pannonic_sand_steppes.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/documents/mediterranean_seminar_input_document_draft_20140516_en.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/documents/alp-background-document-grasslands-updated_en.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/index_en.htm

http://eunis.eea.europa.eu/

http://inpn.mnhn.fr/docs/cahab/tome4_1.pdf

http://inpn.mnhn.fr/docs/cahab/tome4_2.pdf

http://siedliska.gios.gov.pl/pdf/siedliska/2009-2011/wyniki_monitoringu_siedlisk_4030.pdf

http://www.bfn.de/0316_natura2000+M52087573ab0.html

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/continental_biogeografical_region.pdf

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/blacksearegeg.pdf

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/pannonian.pdf

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/steppic.pdf

http://www.eea.europa.eu/publications/report_2004_1/at_download/file

http://www.financing-natura2000.eu/wp-content/uploads/2014/01/part_1N.pdf

http://www.financing-natura2000.eu/wp-content/uploads/2014/01/part_2N.pdf

http://www.gios.gov.pl/siedliska/pdf/metodyka_monitoringu_siedlisk_2011_91F0.pdf

http://www.naturawal.be/images/stories/natura/Legislation/AGW_Catalogue/agw%20catalogue%2020110603.pdf

http://www.renaturyzacja.biebrza.org.pl/407,general-information.htmlhttp://www.gorna.biebrza.org.pl/664,welcome.html
http://www.biebrza.org.pl/161,protection-of-non-forest-ecosystems.html

http://www.surf-nature.eu/fileadmin/SURFNATURE/Publications/Sustainable_Tourism_Thematic_Booklet.pdf

Krkonose National Park Administration: www.krnap.cz.

Lesse Lomme Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=1744

Lorraine Belge Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=366

NaturaWal: http://www.naturawal.be/

Official portal for Agro-Environment Schemes in Wallonia:
http://agriculture.wallonie.be/apps/spip_wolwin/article.php3?id_article=59

Pays Mosan Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5041

Plateau des Hautes Fagnes Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3114

Plateau des Tailles Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=2917

Prairies Marécageuses Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=523

Saint-Hubert Life Project
http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=2469

Walloon section of the 2013 Reporting: http://biodiversite.wallonie.be/fr/resultats-du-rapportage-article-17-au-titre-de-la-directive-92-43-cee-pour-la-periode-2007-2012.html?IDD=4237&IDC=5803

www.efncp.org/download/grasslands_report_2012.pdf

5.6 Heathland and scrub

5.6.1 Short description of the habitats selected for priority consideration

European dry heaths (4030) are humid to dry heaths, dominated by ericaceous species, with few or no trees. These occur from non-coastal lowlands to low mountain ranges and the Alps. They are found on siliceous soils or soils in which the calcium has been leached from the surface layers. Dry heaths are characterised by dwarf shrub species. These include the lowland *Calluna* heaths, facies rich in *Empetrum nigrum* or *Vaccinium myrtillus*. Species such as *Ulex gallii*, *Potentilla erecta*, *Festuca ovina*, *Athoxanthum oderatum*, *Thymus polytrichus*, *Viola riviniana* and *Danthonia decumbens* are frequent associates. In Central European heathlands the representation of species which make up Western European heathlands progressively decreases. *Calluna vulgaris* and *Genista pilosa* are often the only low shrubs common to both Central and Western European heathlands. On the other hand, a number of species with eastern distributions and typical of dry grasslands are found in Central European *Calluna*-dominated vegetation. Further, low-altitudinal heathlands never occupied such extensive areas in Central Europe as they do in the west, because *Calluna vulgaris* and its associated species reach their ecological and geographical limits in more continental climates, and their competitive ability is limited. Indeed, near the limits of its range, *Calluna* is less vigorous, possibly due to drought stress and the effects of lower temperatures. Nevertheless, some areas with fragmented patches of heathland may still be found in continental areas of Central Europe, such as the Rhine Valley, central and eastern Germany, central Bohemia, and the western and north-western fringes of the Pannonian Basin.

Habitat type 5130 concerns formations with *Juniperus communis* of the planar to montane zones of either of the following two facies: (a) grazed or fallow, dry and semi-dry calcareous grassland with juniper scrub and (b) heaths (*Calluna* heaths) which have been encroached upon by *Juniperus communis* (juniper-rich facies of *Calluna* heaths). In fact, while 'juniper heaths' (1530) are valuable from a conservation point of view, they are actually a sign of inappropriate grazing practices or of undergrazing of the *Calluna* heaths or semi-dry calcareous grasslands. In such situations *Juniperus* becomes prevalent as a 'pastoral weed' and commences scrub incursion. In a second stage of this process other scrub species which are sensitive to browsing can persist in the centre of dense juniper scrub and may speed up the succession. Typical plant species include *Juniperus communis*, *Crataegus* spp., *Rosa* spp., *Prunus spinosa*.

Subcontinental peri-Pannonic (40A0) scrub are low deciduous scrub and natural woodland fringes (*Prunion fruticosae*) in locations with favourable temperatures and calcareous or siliceous substrates. The habitat forms a mosaic-like vegetation with steppe grassland (6210) and forest-steppe elements or plants of the rupicolous Pannonian grasslands (6190) often along the fringes of woodlands. It includes the subshrubs *Prunus tenella* (syn. *Amygdalus nana*) and *P. fruticosus*. Their composition includes rare species such as *Paeonia tenuifolia*, *Tulipa urumoffii*, *Edraianthus serbicus*, *Cachris alpina*, and *Sempervivum erythraeum*.

Habitat type (40C0) is deciduous thickets of the wooded steppe zone of the Pontic and Sarmatic regions and of adjacent areas, including the Thracian steppe zone. They occur within and around the zone of

occurrence of easternmost White cinquefoil oak woods, Tartar maple steppe oak woods and sub-Euxinian steppe woods. Within the EU this habitat type only occurs in the Romanian and Bulgarian Dobrogea region.

The surface area of habitats and the number of SCIs which contain these habitats in each Member State are summarised in Figure 64 and Figure 65, collected from the fact sheets for the Pre-Scoping Document for the Natura 2000 Seminar at Continental, Pannonian, Black Sea and Steppic regions.

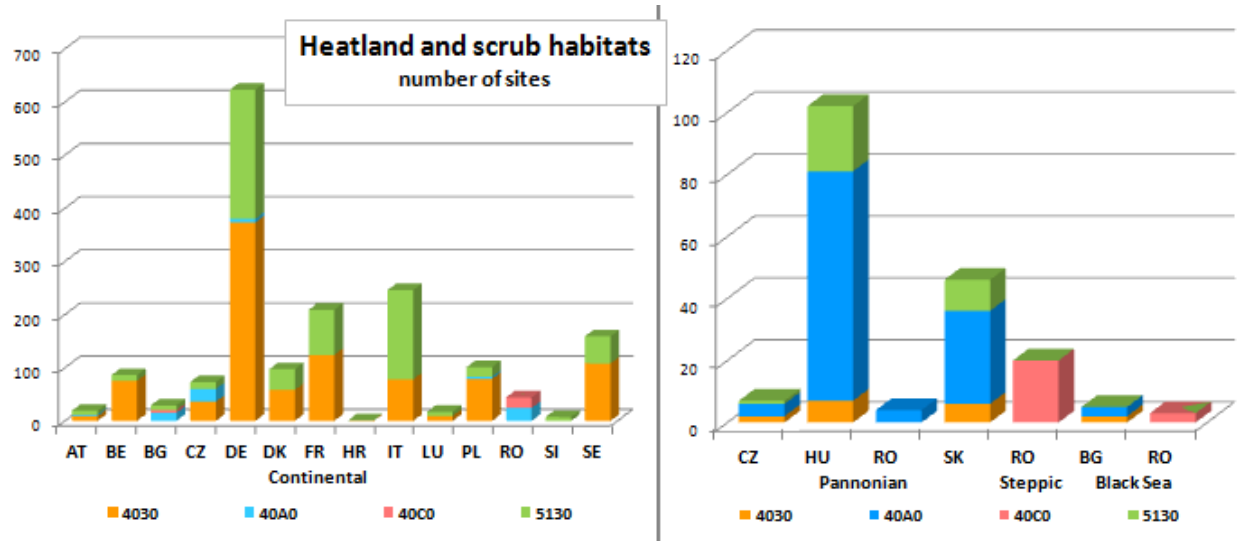


Figure 64 Number of SCIs with heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region. Data are presented in

Table 30 Number of SCIs with heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BU**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
4030	9	75	0	36	373	58	124	1	78	9	79	0	0	108
40A0	3	0	15	24	7	0	0	0	0	0	4	24	0	0
40C0	0	0	5	0	0	0	0	0	0	0	0	20	0	0
5130	7	11	9	13	243	39	85	0	168	8	18	0	7	51

	Pannonian				**STE**	**Black Sea**		Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**	CON	PAN	STE	BLS	
4030	2	7	0	6	0	2	0	950	15	0	2	**967**
40A0	4	74	4	30	0	3	0	77	112	0	3	**192**
40C0	0	0	0	0	20	0	3	25	0	20	3	**48**
5130	1	21	0	10	0	0	0	659	32	0	0	**691**

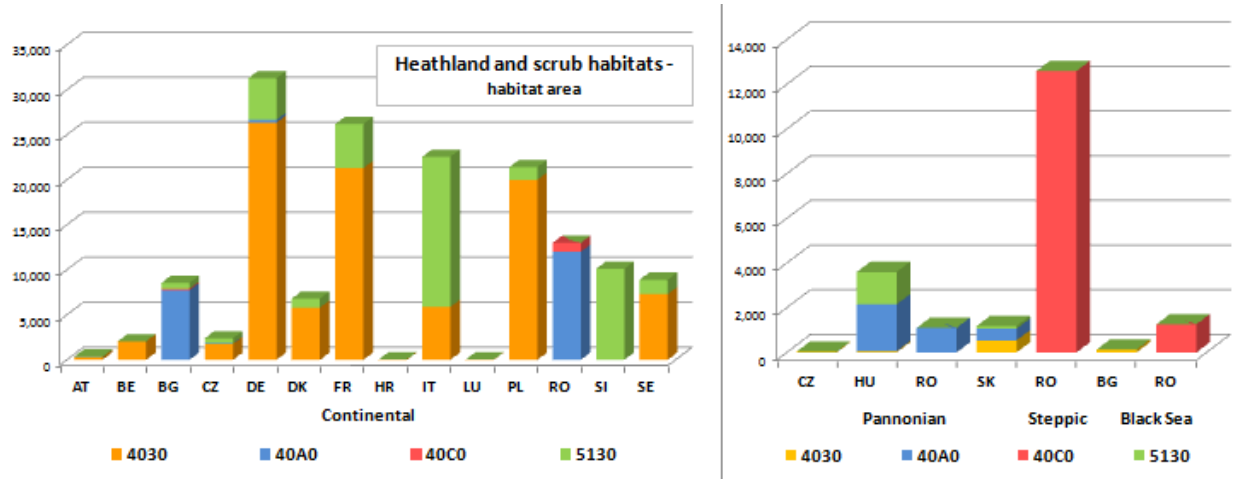


Figure 65 Area (in hectares) of heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region. Data are presented in Table 31

Table 31 Area (in hectares) of heathland and scrub habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BG**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
4030	300	2,050		1,779	26,355	5,800	21,300	45	5,871	35	20,000			7,300
40A0	15		7,728	63	311						1	12,000		
40C0			163									1,000		
5130	50	6	659	550	4,627	1,000	4,900		16,689	1	1,400		10,110	1,600

	Pannonian				**Steppic**	**Black Sea**			**Biogeographical Region**				**Total**
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		**CON**	**PAN**	**STE**	**BLS**	
4030	34	50		540		123			90,835	624	0	123	91,582
40A0	1	2,100	1,100	520		4			20,118	3,721	0	4	23,843
40C0					12,600		*1,260		1,163	0	12,600	1,260	15,023
5130	4	1,450		122					41,592	1,576	0	0	43,168

* only area in SCI, because the area was not reported in the Article 17 report

5.6.2 References

Reports and scientific articles

Barańska K. 2014. Podręcznik najlepszych praktyk ochrony kseroterm. Centrum Koordynacji Projektów Środowiskowych, Warszawa.

Barańska K., Jermaczek J. 2009. Poradnik utrzymania i ochrony siedliska przyrodniczego 6210 murawy kserotermiczne. Wydawnictwo Klubu Przyrodników, Świebodzin.

Bokdam, J. u. Gleichman, M. 2000. Effects of grazing by free ranging cattle on vegetation dynamics in a continental north-west European heathland. Journal of Applied Ecology 37: 415-431.

Bokdam, J. u. Gleichman, M. 2000. Effects of grazing by free ranging cattle on vegetation dynamics in a continental north-west European heathland. Journal of Applied Ecology 37: 415-431.

Brunn, E. 2009. Feuermanagement auf Bundesliegenschaften in Brandenburg. – In: Bundesamt fuer Naturschutz (Hrsg.): Naturschutz und Biologische Vielfalt. – Bonn-Bad Godesberg. Heft 73/2009: 165-178.

Brunn, E. 2009. Feuermanagement auf Bundesliegenschaften in Brandenburg. – In: Bundesamt fuer Naturschutz (Hrsg.): Naturschutz und Biologische Vielfalt. – Bonn-Bad Godesberg. Heft 73/2009: 165-178.

Ciortan I, Negrean G. 2014. Subcontinental peri-pannonic scrub from Geopark plateau Mehedinti (Romania). Muzeul Olteniei Craiova. Oltenia. Studii şi comunicări. Ştiinţele Naturii. Tom. 30 No. 1/2014.

Conrady, D., Schmidt Ruhe, B. U. Hurtig, K.-P. 2015. Energieholznutzung als Erstpflege zur Erhaltung von Heide-Lebensräumen auf ehemaligen Militärflächen. Natur und Landschaft.

Culmsee, H. u. Wahmhoff, W. 2013. Entwicklung eines leitbildorientierten Monitorings für den Naturschutz auf Flächen des Nationalen Naturerbes. Natur und Landschaft 88: 204-212

Delescaille, L.M. 2005. La gestion des pelouses sèches en Région Wallonne. In: Mahy, G., Woué, L. & Honnay, O. (coord.). Les pelouses calcicoles: du paysage aux gènes (20-22 mai 2004, Vierves-sur-Viroin). Les Presses Agronomiques de Gembloux: 49-54.

Delescaille, L.M. 2006. La restauration des pelouses calcicoles en Région Wallonne: aspects scientifiques et techniques (première partie). Parcs et Réserves, 61 (4): 4-11.

Delescaille, L.M. 2007. La restauration des pelouses calcicoles en Région Wallonne: aspects scientifiques et techniques (seconde partie). Parcs et Réserves, 62 (1): 4-15.

Delescaille, L.M. et Frankard, P. 2015. Le statut de conservation du genévrier commun (Juniperus communis L.) en Wallonie. Parcs et Réserves (à paraître).

Delescaille, L.M., Jacquemart, A.-L. & Taupinart, E. 2006. L'apport de la banque de graines du sol dans la restauration des pelouses calcicoles: un exemple dans la vallée du Viroin (prov. Namur, Belgique). Parcs et Réserves, 61 (3): 4-12.

Frankard, P. 2006. Les techniques de gestion des milieux naturels et semi-naturels mises en oeuvre depuis 1994 dans la RND des Hautes Fagnes. 2. Evaluation des techniques de restauration des landes sèches, des landes tourbeuses et des genévrières testées sur le plateau des Hautes Fagnes. Hautes Fagnes, 2006 (4): 21-29.

Frankard, Ph. 2014. Les nardaies montagnardes à Meum athamanticum du plateau d'Elsenborn (Est de la Belgique). Evolution spontanée depuis l'arrêt des pratiques agropastorales. Impact de la gestion conservatoire par la fauche ou la mise à feu contrôlée. Lejeunia, n.s. 192: 30 p.

Goldammer, J.G.; Brunn, E.; Held, A.; Johst A.; Kathke, S.; Meyer, F.; Pahl, K.; Restas, A. u. Schulz, J. 2012. Kontrolliertes Brennen zur Pflege von Zwergstrauchheiden (Calluna vulgaris) auf munitionsbelasteten Flächen: Problemstellung und erste Erfahrungen im Pilotvorhaben im Naturschutzgebiet “Heidehof-Golmberg“ (Landkreis Teltow-Fläming). – In: Bundesamt fuer Naturschutz (Hrsg.): Naturschutz und Biologische Vielfalt. – Bonn-Bad Godesberg. Heft 127/2012: 65-95.

Gussevm Ch. V. 2012. 22F4 Strandzha heaths of Tree heath (Erica arborea) andCommon Heather (Calluna vulgaris). In: Biserkov, V. et al. /eds/. Red Data Book of Bulgaria, Vol. 3. Natural Habitats. in print.

Haerdtle, W.; Assmann T.; van Diggelen, R u. von Oheimb, G. 2009. Renaturierung und Management von Heiden. - In: Zerbe, S. u. Wiegleb, G. (Hrsg.): Renaturierung von Ökosystemen in Mitteleuropa. Spektrum Akademischer Verlag, Heidelberg. 317-347.

Kaiser, T.; Mertens, D. u. Zimmermann, M. 2009. Naturschutzgroßprojekt Lüneburger Heide, Niedersachsen. Eine Bilanz nach 14-jähriger Projektlaufzeit. Natur und Landschaft 84: 353-360.

Lake, S.; Bullock, J.M. u. Hartley, S. 2001. Impacts of lifestock grazing on lowland heathland in the UK. English Nature Research Reports No. 422, Peterborough, 142 S.

Legislation Wallonia (South Belgium): Arrêté du Gouvernement Wallon. Mesures générales - 24/03/2011 Arrêté du Gouvernement wallon. Arrêté catalogue - 03/06/2011.

Lorenz, A.; Tischew, S.; Osterloh S. u. Felinks, B. 2013. Konzept für maßnahmebegleitende, naturschutzfachliche Erfolgskontrollen in großen Projektgebieten am Beispiel des Managements von FFH-Lebensraumtypen in der Oranienbaumer Heide. Naturschutz und Landschaftsplanung 45(12): 365-372.

Management plan for Natura 2000 site Wały
http://edziennik.malopolska.uw.gov.pl/WDU_K/2014/2477/akt.pdf

Mause, R. 2009. The use of prescribed fire for maintaining open Calluna heathlands in North Rhine-Westphalia, Germany. International Forest Fire News No. 38: 75-80.

Meyer, F. 2015. Stand und Perspektiven für das Offenland-Management auf Flächen des Nationalen Naturerbes in Deutschland – unter besonderer Beachtung von Calluna-Heiden. Natur und Landschaft.

Newton, A.C.; Stewart, G.B.; Myers, G.; Diaz, A.; Lake, S.; Bullock, J.M. u. Pullin, A.S. 2009. Impacts of grazing on lowland heathland in north-west Europe. Biological Conservation 142: 935-947.

Nilsen L.S., Johansen L., Velle L.G. 2005. Early stages of Calluna vulgaris regeneration after burnig of coastal heath in central Norway. Applied vegetation Science 8: 57 - 64.

Piqueray, J. and Mahy, G. 2010. Revue bibliographique sur la restauration des pelouses calcicoles en Europe: contraintes rencontrées et solutions proposées. Biotechnol. Agron. Soc. Environ., 14(3), 471-484.

Piqueray, J., Bottin, G., Delescaille, L.M., Bisteau, E. and Mahy, G. 2005. Evaluation des restaurations de pelouses calcicoles en région wallonne: coûts, structure écologique et diversité botanique. Parcs et Réserves, 60 (4): 22-35.

Piqueray, J., Bottin, G., Delescaille, L.M., Bisteau, E., Colinet, G. and Mahy, G. 2010. Rapid restoration of a species-rich ecosystem assessed from soil and vegetation indicators: the case of calcareous grasslands restored from forest stands. Ecological Indicators. 2010, doi10.1016/j.ecolind.2010.06.007

Pop AI, Turtureanu D, Folfa D. 2009. Management plan considerations for Râpa Roşie Natural Reservation. Environment & Progress – 13/2009, Cluj – Napoca.

Ramil Rego P, Rodríguez Guitián MA, López Castro H, Ferreiro da Costa J., Muñoz Sobrino C. 2013. Loss of European Dry Heaths in NW Spain: A Case Study. Diversity, 5: 557-580.

Rana – Buero fuer Ökologie und Naturschutz Frank Meyer. 2014. Managementplan für das FFH-Gebiet "Wittstock-Ruppiner Heide" (Landkreis Ostprignitz-Ruppin) – 1. Zwischenbericht. Unveröff. Gutachten im Auftrag des Bundesforstbetriebes Brandenburg, Potsdam.

Reiter, K. U. Doerpinghaus, A. 2015. Das Nationale Naturerbe - Definition, Bilanz, Ausblick. Natur und Landschaft.

Sedláková I, Chytrý M. 1999. Regeneration patterns in a Central European dry heathland: Effects of burning, sod-cutting and cutting. Plant Ecol. 143, 77-87.

Webb NR. 1998. The traditional management of European heathlands. J. Appl. Ecol. 35, 987-990.

Wibail, L., Goffart, Ph., Smits, Q., Delescaille, L.-M., Couvreur, J.-M., Keulen Chr., Delmarche, C., Gathoye, J.-L., Manet, B. and Derochette, L. 2014. Évaluation de l'état de conservation des habitats et espèces

Natura 2000 en Wallonie. Résultats du Rapportage Article 17 au titre de la Directive 92/43/CEE pour la période 2007-2012. DGOARNE, Département de l'Étude du Milieu Naturel et Agricole-Direction de la Nature et de l'Eau, Gembloux, 277 p.

Zimmermann, F. 2004. Biotope in Brandenburg – Heiden. Naturmagazin.

Zimmermann, F. 2012. Vielfalt gesichert? Ein Überblick zur aktuellen Gefährdungssituation von Arten und Lebensräumen in Brandenburg. Naturschutz und Landschaftspflege in Brandenburg 21 (3): 96-110.

Zimmermann, F. 2014. Die FFH-Lebensräume in Brandenburg. Beschreibung – Bewertung – Schutz. Naturschutz und Landschaftspflege in Brandenburg 23 (3,4) (in print).

Websites

http://biodiversite.wallonie.be/fr/projets-life.html?IDC=3260

http://ec.europa.eu/environment/nature/info/pubs/docs/biogeos/Continental.pdf

http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

http://ec.europa.eu/environment/nature/natura2000/financing/index_en.htm

http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/4060_Alpine_Boreal_heaths.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/documents/atl-background-document-15062012_en.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/index_en.htm

http://eunis.eea.europa.eu/

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/continental_biogeografical_region.pdf

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/blacksea reg.pdf

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/pannonian.pdf

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/steppic.pdf

http://www.efncp.org/hnv-showcases/bulgaria/rusenski-lom/facts-and-figures/

http://www.financing-natura2000.eu/wp-content/uploads/2014/01/part_1N.pdf

http://www.financing-natura2000.eu/wp-content/uploads/2014/01/part_2N.pdf

http://www.floraofromania.transsilvanica.net/flora%20of%20romania/ac%20XII%201101-1200/tulipa%20hungarica/tulipa%20urumoffii%20bulgaria.pdf

http://www.fundatia-adept.org/bin/file/life/STIPA%20Conservation%20Action%20Plan%20EN%20Final%20reduced.pdf

https://cmsdata.iucn.org/downloads/parks_20_1_crofts.pdf

www.efncp.org/download/EFNCP_Permanent-Pastures-and-Meadows.pdf

5.7 Rivers and lakes

5.7.1 Short description of the habitats selected for priority consideration

The plant communities of the habitat Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* (3130) are characterised by amphibious short perennial vegetation of mostly small ephemerophytes with *Littorella uniflora* being considered as the defining component. Other characteristic plants are *Lindernia procumbens*, *Cyperus fuscus*, *C. flavescens*, *C. michelianus*, *Limosella aquatica*, *Pilularia globulifera*, *Eleocharis ovata*, *Eleocharis acicularis*, *Juncus bufonius*, *J. bulbosus* ssp. *bulbosus, Scirpus setaceus*, *Potamogeton polygonifolius*, *Isoëtes lacustris*, *Myriophyllum alterniflorum*, and *Sparganium minimum*.

The habitat type Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (3140) is typical for lakes and pools with waters fairly rich in dissolved bases (pH often 6-7) or with mostly blue to greenish, very clear, waters that are poor (to moderate) in nutrients, and base rich (pH often > 7.5). The bottom of these unpolluted waterbodies is covered with charophyte, *Chara* and *Nitella*, algal carpets and the plant communities belong to the associations *Charion fragilis* and *Nitellion flexilis* with characteristic plants *Chara vulgaris*, *Chara aspera*, *Chara hispida*).

Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (3150) include all sorts of shallow lakes and pools, ponds, ditches and canals, with high natural productivity. They have mostly dirty grey to blue-green, more or less turbid, waters, particularly rich in dissolved bases (pH usually > 7), with free-floating surface communities of the *Hydrocharition* or, in deep, open waters, with associations of large pondweeds (*Magnopotamion*). The characteristic plants are from genera *Lemna*, *Spirodela*, *Wolffia*, *Hydrocharis*, *Utricularia*, *Potamogeton*, *Myriophyllum*, *Nuphar* and occasionally *Chara*.

The last standing water habitat type chosen is Natural dystrophic lakes and ponds (3160) with high humid acid content. The water is tinted brown by peat and humic acids, the habitat occurs generally on peaty soils in bogs or in heaths with natural evolution toward bogs, and the pH is often low, 3 to 6. Plant communities belong to the alliance *Sphagno-Utricularion*, and are typically dominated by *Sphagnum* spp., *Utricularia* spp., *Rhinchospora fusca*, *R. alba*, *Nuphar lutea*, *Carex rostrate*, *Carex lasiocarpa*, *Nymphaea candida*, *Drepanocladus* spp., *Warnstorfia trichophylla*, and *W. procera*.

The habitat Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) is developed in the flowing water of streams, channels, rivers and permanent or ephemeral basins with flowing water of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses. Several variants of this habitat can be distinguished, depending on geology and river type. Their characteristic plants are *Ranunculus* spp. (*Ranunculus fluitans*, *R. aquaticus*, *R. trichophyllus*, *R. peltatus*, *R. saniculifolius)*, *Potamogeton nodosus*, *Potamogeton crispus*, *Potamogeton natans*, *Scirpus lacustris*, *Sagittaria sagittifolia*, *Sparganium emersum*, *Myriophyllum* spp., *Callitriche* spp., *Sium erectum*, *Zannichellia palustris*, and *Fontinalis antipyretica*. This habitat is sometimes associated with *Butomus umbellatus* bank communities.

Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270) occur from plain to submontane levels, with annual pioneer nitrophilous vegetation of the *Chenopodion rubri* p.p.

and the *Bidention* p.p. alliances. During spring and at the beginning of summer, sites look like muddy banks without any vegetation (it develops later in the year). If the conditions are not favourable, this vegetation has a weak development or could be completely absent. The sites are dominated by pioneer vegetation; the characteristic plants are *Chenopodium rubrum*, *Rumex palustris*, *Rumex maritimus*, *Persicaria lapathifolia*, *Potentilla supina*, *Bidens frondosa*, and *Bidens tripartita*.

The number of SCI sites which contain these habitats within each Member State and biogeographical region are presented in summary in Figure 66 and Table 32, collected from the fact sheets for the Pre-Scoping Document for the Natura 2000 Seminar for the Continental, Pannonian, Black Sea and Steppic biogeographical regions.

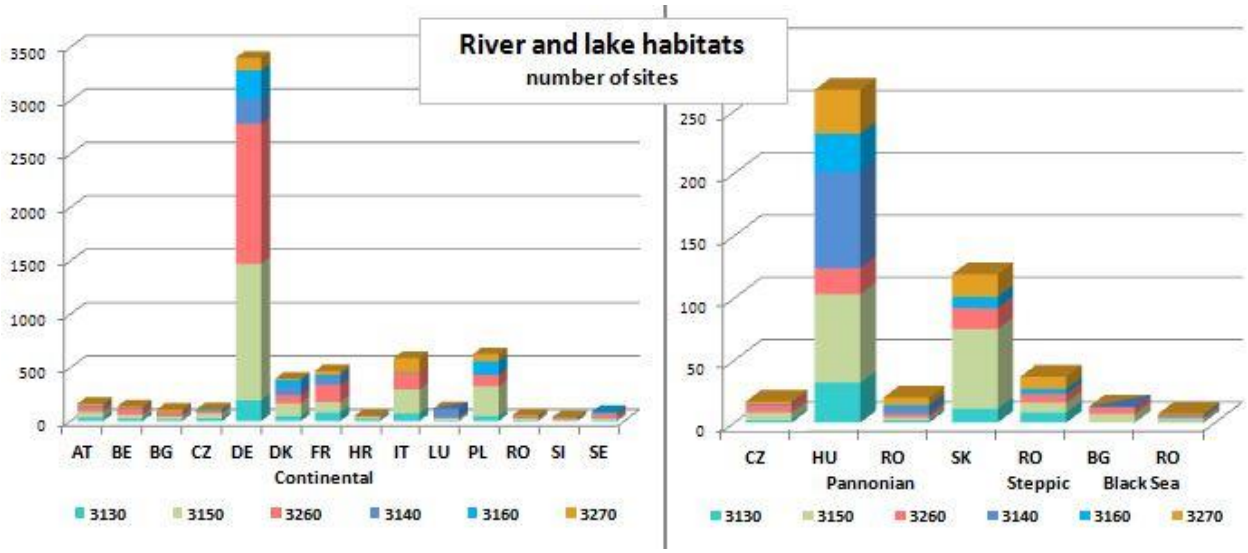


Figure 66 Number of SCIs with river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region. Data are presented in Table 32

Table 32 Number of SCIs with river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BU**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
3130	31	25	14	25	196	44	80	19	73	8	44	6	3	10
3150	51	33	28	45	1277	119	98	18	224	16	280	15	9	15
3260	40	54	30	16	1310	79	159	8	148	10	106	15	11	45
3140	15	6	8	8	239	76	75	0	6	84	4	0	7	0
3160	1	4	1	10	261	68	21	0	0	0	125	5	0	14
3270	24	12	25	6	117	10	35	2	139	0	67	12	4	0

	Pannonian				**STE**	**Black Sea**		Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**	CON	PAN	STE	BLS	
3130	2	32	2	11	8	0	1	578	47	8	1	634
3150	6	71	2	64	8	7	2	2228	143	8	9	2,388
3260	6	21	3	17	7	5	2	2031	47	7	7	2,092
3140	1	77	5	0	0	1	1	528	83	0	1	612
3160	0	31	2	9	4	0	1	510	42	4	1	557
3270	2	35	6	18	10	0	1	453	61	10	1	525

Figure 67 shows that the largest areas of the selected river and lake habitats are in Romania (several habitat types, the most abundant are Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (3150) and Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) in the Continental region and 3150 also in the Steppic region) and in Denmark (especially habitat type 3260). Other habitat types in other countries are less abundant (Figure 67 and Table 33).

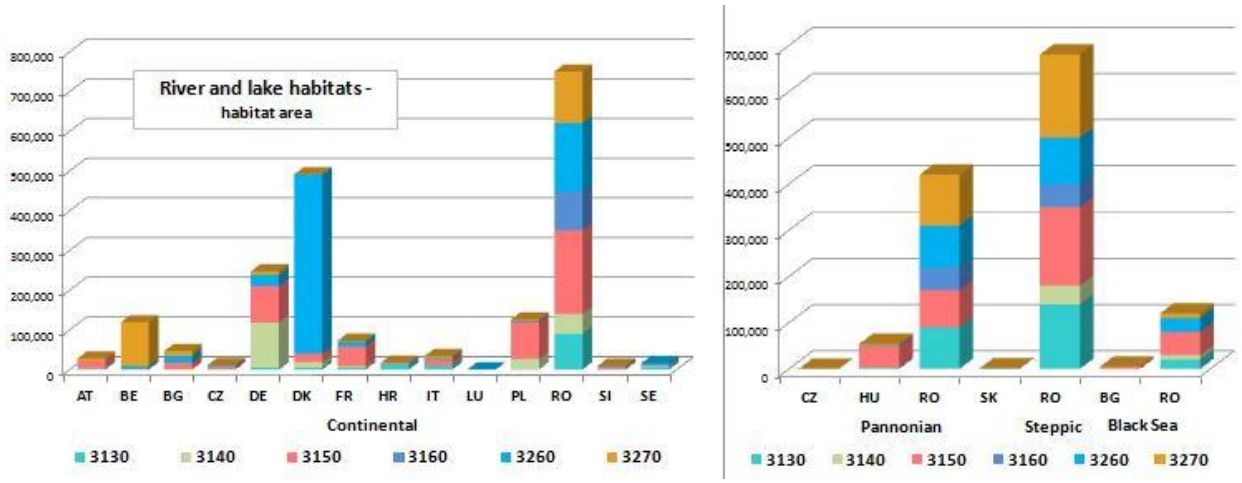


Figure 67 Area (in hectares) of river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region. Data are presented in Table 33

Table 33 Area (in hectares) of river and lake habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BG**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
3130	1,400	297	31	767	4,395	5,030	4,600	14,171	9,675		800	90,000	262	6,500
3140	1,000	46	886	27	113,659	13,340	3,000		503	1	26,000	50,000	*638	2,100
3150	20,000	1,430	16,147	7,310	91,751	22,160	50,000	2,867	14,153	89	*91,148	210,000	6,049	2,600
3160	100	30	5	27	1,171	140	1,850				3,700	100,000		700
3260	150	6,735	17,282	2,625	26,896	450,500	10,000	8	3,903	248	*106	170,000	1,958	3,500
3270	5,000	110,000	11,997	62	*9,028	300	2,800	330	5,021		*4,000	130,000	518	

	Pannonian				**Steppic**	**Black Sea**			**Biogeographical Region**				**Total**
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		**CON**	**PAN**	**STE**	**BLS**	
3130	14	2,500	90,000	50	140,000		20,000		137,928	92,564	140,000	20,000	390,492
3140	*1	*5		5	40,000		10,000		211,200	11	40,000	10,000	261,211
3150	358	46,000	80,000	400	170,000	4,694	50,000		535,704	126,758	170,000	54,694	887,156
3160		2,800	50,000	1	50,000				107,723	52,801	50,000	0	210,524
3260	68	100	90,000	275	100,000	222	30,000		693,911	90,443	100,000	30,222	914,576
3270	18	2,500	110,000	335	180,000	13	10,000		279,056	112,853	180,000	10,013	581,922

* only area in SCI, because the area was not reported in the Article 17 report

5.7.2 References

Reports and scientific papers

Agri-environmental schemes: http://www.stmelf.bayern.de/mam/cms01/agrarpolitik/dateien/massnahmenuebersicht_vnp.pdf.

Alegro, A, L.J. Markovic, O. Antonic, S. Bogdanovic. 2006. Historical and functional aspects of plant biodiversity-an example on the flora of the Vukova Gorica region (Central Croatia). Candollea 61: 135-166. PAPP, B.

Alegro, A. 2009. Mahovi tresetari u Hrvatskoj. Državi zavod za zaštitu prirode, Zagreb.

Alegro, A. 2009. Travnjaci primorskih padina sjevernog Velebita – Tipologija i sukcesije. Hrvatsko botaničko društvo, Zagreb.

Alegro, A. 2010. Travnjaci Parka prirode Medvednica – Tipologija i sukcesije. BIOM – Udruga za biološka istraživanja, Zagreb.

Alegro, A. 2010. Travnjaci vršnih dijelova sjevernog Velebita – Tiplogije i sukcesije. Hrvatsko botaničko društvo, Zagreb.

Alegro, A. 2011. Analiza potencijalne i stvarne rasprostranjenosti vrsta Mannia triandra, Dicranum viride, Buxbaumia viridis i Drepanocladus vernicosus na području Hrvatske. Stručna studija. Državni zavod za zaštitu prirode, Zagreb.

Alegro, A. 2011. Makrofita. U: Mihaljević, Z., (voditelj projekta), Studija – Testiranje bioloških metoda ocjene ekološkog stanja (Okvirna direktiva o vodama, 2000/60/EC) u reprezentativnim slivovima Panonske i Dinaridske ekoregije. Biološki odsjek PMF-a. pp. 227-261.

Alegro, A., Bogdanovic, S., Brana, S., Jasprica, N., Katalinic, A., Kovacic, S., Nikolic, T., Milovic, M., Pandza, M., Posavec-Vukelic, V., Randic, M., Ruscic, M., Šegota, V., Šincek, D., Topic, J., Vrbek, M., Vukovic, N. 2010. Botanički važna područja Hrvatske. Školska knjiga i Priridislovno-matematički fakultet Sveučilišta u Zagrebu, Zagreb.

Alegro, A., Bogdanovic, S., Resetnik, I., Borsic, I., Cigic, P., Nikolic, T. 2013. Flora of the seminatural marshland Savica, part of the (sub)urban flora of the city of Zagreb (Croatia). Nat. Croat. 22, 111-134.

Alegro, A., Šegota, V., Šapic, I., Vukelic, J. 2013a. Contribution to the bryophyte flora of Croatia I. Gorski kotar Region (W Croatia). Studia botanica hungarica 44: 193-211.

Allan, M., Le Roux, G., De Vleeschouwer, F., Bindler, R., Blaauw, M., Piotrowska, N., Sikorski, J. and Fagel, N. 2013b. High-resolution reconstruction of atmospheric deposition of trace metals and metalloids since AD 1400 recorded by ombrotrophic peat cores in Hautes-Fagnes, Belgium. Environmental Pollution 1: 1-14.

Allan, M., Le Roux, G., Sonke, J.E., Piotrowska, N., Streel, M. & Fagel, N. 2013a. Reconstructing historical atmospheric mercury deposition in Western Europe using Misten peat bog cores, Belgium. Science of the Total Environment 442: 290-301.

Ambrus, A. False Ringlet (Coenonympha oedippus Fabr.) in the Hanság (NW- Hungary).

Ambrus, A. Habitat management on wet meadows of Fertőhomok and Hidegség for wetland invertebrates.

Ambrus, A. The case of Orange Eggar (Eriogaster catax) with the agri-environmental schemes in Hungary.

Art 17 Report 2007-2012 for Bavaria: http://www.lfu.bayern.de/natur/natura_2000/ffh/doc/ffhbericht_2013_landtag.pdf.

Art 17 Report 2007-2012 for Germany: http://www.bfn.de/0316_bericht2013.html.

Bagella, S., Caria, M.C., Farris, E., Filigheddu, R. 2007. Issues related to the classification of Mediterraneaen temporary wet habitats according with the Europian Union Habitat Directive. In: Fitosociologia vol. 44 (2) suppl. 1: 245 – 249.

BfN Federal Agency for Nature Conservation. Natura 2000: 3150. http://www.bfn.de/0316_typ3150+M52087573ab0.html.

Bhroin, N.N. 2006. Ecological Impact Assessment (EcIA) of the Effects of Statutory Arterial Drainage Maintenance Activities on Water Courses of Plain and Montane Levels with Aquatic Vegetation (Floating River Vegetation). Better Environmental and Engineering Services Ltd. 56 pp. ISSN 1649 – 9840.

Biggs, J. 2007. Pond Conservation for Life in Fresh Waters: Small-scale solutions for big water problems. 9 pp.

BioMonitoring: Makrofitní vegetace oligotrofních jezírek a tuní. http://www.biomonitoring.cz/biotopy.php?stanoviste ID=6&biotopID=160.

Bociąg K. 2011. Ocena stanu, projekt monitoringu i działań ochronnych siedlisk przyrodniczych wód śródlądowych Parku Narodowego „Bory Tucholskie", Gdańsk, mscr.

Boloni J., Molnar Zs., Kun A.(szerk.). 2011. Magyarország élőhelyei: Vegetációtípusok leírása és határozója ÁNÉR 2011 (Habitats of Hungary: Description and guide of vegetation types) 440 pp.

Borsukevych L., Honcharenko V. Rare habitats (NATURA 2000) – 3140. http://gcs.org.ua/habitats/eng/3140-bug/.

Borsukevych, L. Rare habitats (Natura 2000) – 3130 http://gcs.org.ua/habitats/eng/3130-bug/.

Borsukevych, L. Rare habitats (Natura 2000) – 3160 http://gcs.org.ua/habitats/eng/3160-bug/.

Borsukevych, L. Rare habitats (Natura 2000) – 3260 http://gcs.org.ua/habitats/eng/3260-bug/.

Botnariuc, N., Tatole, V. (ed). 2005. Cartea Roşie a vertebratelor României, Ed. Curtea Veche, Bucureşti. Tatole, V., Iftime, A., Stan, M., Iorgu, E.-I., Iorgu, I., Oţel, V., 2009. Speciile de animale Natura 2000 din România. Bucureşti, editat de MNINGA/A.S.A. S.C. Iftime, A., 2010. Reptilia. Amphibia. Pisces. În: Tatole, V. (ed.): Managementul şi monitoringul speciilor de animale Natura 2000 din România. Ghid metodologic. Bucureşti, editat de MNINGA/A.S.A. S.C. Telcean, I. C., Cicort-Lucaciu, A. Ş., Sas, I., Covaciu-Marcov, S. D., 2011. Romanichthys valsanicola is still fighting! How can we help? North-Western Journal of Zoology, 7(2): 334-338.

Bracco, F., Paradisi, S., Sburlino, G., Stoch, F. 2009. Springs and Spring watercourses, Degradation and conservation. Roma : Udine: Ministero dell'Ambiente e della Tutela del Territorio e del Mare [u.a.]. http://www.udinecultura.it/opencms/opencms/release/ComuneUdine/cittavicina/cultura/it/musei/storianaturale/pubblicazioni/quaderni/allegati_en/02_Springs_SpringWatercourses_2.pdf.

Defraiteur, M.P. and Schumacker, R. 1988. Plateau des Hautes-Fagnes ou plateau des Fontaines-salées? Une nouvelle atteinte à la réserve naturelle: les sels de déneigement. Hautes Fagnes 189: 9-13.

Demna. 2014. Évaluation de l'état de conservation des habitats et espèces Natura 2000 Résultats du Rapportage Article 17 au titre de la Directive 92/43/CEE pour la période 2007 Document réalisé par la Direction de la Nature et de l'Eau.

Draft Management Plans for Natura 2000 site PLH200008 Dolina Biebrzy.

Dufrêne, M., Balthus, H., Cors, R., Fichefet, V., Moës, Ph., Warlomont, P., Dierstein, A. & Motte, G. 2011. Bilan du monitoring des libellules dans les sites restaurés par le projet LIFE "tourbières" sur le plateau de Saint-Hubert. Les Naturalistes belges 92 (3-4): 37-54.

Dumont, J.M. 1975. L'homme et la végétation du plateau des Tailles. La pratique de l'écologie. Thèse de Doctorat, Université catholique de Louvain, 278 p.

Dumont, J.M. and Champluvier, D. 1990. La gestion de la réserve naturelle domaniale du plateau des Tailles. Elaboration du plan, essais de mise en oeuvre, coût de la gestion. Région Wallonne, Conservation de la Nature, Travaux 15: 359-382.

Duna-Ipoly National Park Directorate. 2011. Final report of Conservation of Euro-siberian steppic woods and Pannonic sand steppes in "Nagykörösi pusztai tölgyesek" pSCI (LIFE06 NAT/H/000098).

Duna-Ipoly National Park Directorate. 2015. Management plans of Érd-Tétényi-plató (HUDI20017), Debegió-hegy (HUDI20014), Érd-Százhalombattai táblarög (HUDI2005), Felső-Tápió (HUDI20019), Kirvai löszgyepek (HUDI20028), Székek (HUDI20046), Sárrét (HUDI20044), Szigethalmi homokbuckák (HUDI20045), Tápiógyörgye-Újszilvási szikesek (HUDI20024) Natura 2000 sites.

EIONET 2013 Member State Deliveries.
http://bd.eionet.europa.eu/activities/Reporting/Article_17/Reports_2013/Member_State_Deliveries; updated 01.06.2014.

ESB International. 2008. Water Framework Directive Program of Measures High Status Site - Annex IV Protected Areas: Water dependent Habitats and Species and High Status Sites.

European Commission. 2013. International Manual of European Union Habitats. 144 pp.

European Environment Agency – Habitat type 3130 http://eunis.eea.europa.eu/habitats/10065.

European Environment Agency – Habitat type 3140 http://eunis.eea.europa.eu/habitats/10066.

European Environment Agency – Habitat type 3150 http://eunis.eea.europa.eu/habitats/10067.

European Environment Agency – Habitat type 3160 http://eunis.eea.europa.eu/habitats/10068.

Frankard, P. and Doyen, A. 1999. La restauration des tourbières hautes de la réserve naturelle domaniale des Hautes-Fagnes. Les Cahiers des Réserves Naturelles 13: 19-27.

Frankard, P. and Ghiette, P. 2000. La gestion des tourbières des Hautes-Fagnes. Région Wallonne, Conservation de la Nature, Travaux 21: 387-401.

Frankard, P. and Hindryckx, M.N. 1998. Evolution de la végétation du secteur sud de la tourbière haute active de la fagne Wallonne, au cours de ces 60 dernières années (plateau des Hautes-Fagnes, Belgique). Belgian Journal of Botany 131: 28-40.

Frankard, P., Ghiette, P., Hindryckx, M.N., Schumacker, R. and Wastiaux, C. 1998a. Peatlands of Wallony (S-Belgium). Suo 49(2): 33-47.

Frankard, Ph. 2005. Restitution von Hochmooren und nassen Heiden im Hohen Venn (Ost-Belgien): Eine Bilanz 10-jähriger Feldversuche. Telma 35: 207-218.

Frankard, Ph. 2006. Les techniques de gestion des milieux naturels et semi-naturels mises en œuvre depuis 1994 dans la RND des Hautes-Fagnes. 1. Bilan de 12 années de gestion conservatoire des tourbières hautes dans la réserve naturelle domaniale des Hautes-Fagnes (Est de la Belgique). Hautes Fagnes 263: 21-29.

Frankard, Ph. 2012. L'impact des travaux de restauration menés dans le cadre du projet LIFE Hautes-Fagnes sur la flore et les habitats de tourbières et de landes. Les premières tendances. Hautes Fagnes 288: 22-25.

Frankard, Ph. and Janssens, X. 2008. Raised bogs rehabilitation on the Hautes-Fagnes plateau (East Belgium). An assessment after 15 years of management trials. Proceedings of the SER 6th European Conference on Ecological Restoration (8-12 September 2008, Ghent, Belgium) "Towards a sustainable future for European ecosystems providing restoration guidelines for Natura 2000 habitats and species", 4 p.

Froment, A. 1968. L'ancienne économie rurale de l'Ardenne et son incidence sur la végétation des Hautes-Fagnes. Bulletin de la Société géographique de Liège 4: 23-39.

Ghiette, P. 1999. Une expérience de gestion par pâturage de moutons dans la réserve naturelle domaniale des Hautes-Fagnes (Grande-Fange). Les Cahiers des Réserves Naturelles 13: 35-42.

Ghiette, P. and Frankard, P. 1998. Premières données sur l'expérience de gestion par pâturage de moutons dans la réserve naturelle domaniale des Hautes-Fagnes (Grande-Fange). Hautes Fagnes 231: 72-76.

Ghiette, P., Frankard, P. and Schumacker, R. 1995. Le plan de gestion écologique de la réserve naturelle domaniale des Hautes-Fagnes. Hautes Fagnes 217: 11-18.

Goffart, P. 2000. Les libellules, témoins privilégiés de la dégradation des milieux aquatiques en Wallonie. Région Wallonne, Conservation de la Nature, Travaux 21: 83-95.

Grigoriadis, N., Donth, S., Thedoropoulos, K., Eleftheriadou, E. 2005. Establishment of a Habitat Monitoring System in Agra Wetland (Pella, Greece). In: Annali Di Botanica nuova serie. Vol. V.: 21 – 36.

Haraszthy L. (ed.). 2014. Natura 2000 fajok és élőhelyek Magyarországon [Natura 2000 species and habitats in Hungary]. Pro Vértes Közalapítvány Csákvár.

Haraszty L. ed. 2014. Natura 2000 species and habitats in Hungary. pp.955.

Hatton-Ellis, T.W., Grieve, N. 2003. Ecology of Watercourses Characterised by Ranunculion fluitantis and Callitricho-Batrachion Vegetation. Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough. ISBN 1 85716 723 6.

Herremans, J.P. 1990. Gérer la nature? La situation en Wallonie dans le secteur associatif. Région Wallonne, Conservation de la Nature, Travaux 15 (1): 43-60.

Hindryckx, M.N. 1989. Evolution récente de la dégradation de la végétation de la partie centrale de la tourbière de la fagne Wallonne (Hautes-Fagnes, Belgique). Bases de sa sauvegarde et de sa restauration. 97 p. Mémoire de Licence en Sciences botaniques. Liège: Université de Liège.

Hindryckx, M.N. 1990. Dans quelques années, pourra-t-on encore parler des tourbières hautes actives du plateau des Hautes-Fagnes? Hautes Fagnes 199: 69-77.

Hindryckx, M.N. 1999. Evolution régressive récente de la végétation des tourbières hautes à sphaignes en Haute Ardenne (Hautes-Fagnes, Belgique). Thèse de Doctorat en Sciences. 269 p. Liège: Université de Liège.

Hindryckx, M.N. and Streel, M. 2000. L'altération des bords de la tourbière active du Misten par l'exploitation de la tourbe pourrait dater du début du 14e siècle. Hautes Fagnes 240: 95-101.

Hoyois, G. 1981. L'Ardenne et l'Ardennais, 983 p. Bruxelles: Culture et Civilisation, Bruxelles.

http://econat.n2000.fr/sites/econat.n2000.fr/files/files/seminar_2010/Working%20paper_WFD_BHD_final_version.pdf.

Hubert, C. 1990. Gestion des réserves naturelles du bassin de la Sûre. Région Wallonne, Conservation de la Nature, Travaux 15: 443-458.

Hurford, C., Schneider, M., Cowx, I. 2009. Conservation Monitoring in Freshwater Habitats: A Practical Guide and Case Study. Springer Science & Business Media, 430 pp.

Integrated management plans („Gewässerentwicklungskonzepte") for Lakes in Bavaria.

Jones, W., Eldridge, J. 2007. LIFE and Europe´s rivers – Protecting and improving our water resources. European Communities. 52 pp. ISSN 1725-5619.

Jortay, A. and Schumacker, R. 1989. Zustand, Erhaltung und Regeneration der Hochmoore im Hohen Venn (Belgien). Telma 2: 279-293.

Kiskunsági National Park Directorate. 2011. Final report of Conservation of the Pannon endemic Dianthus diutinus (LIFE06 NAT/H/000104).

Kozak A., Kowalczewska-Madura K., Gołdyn R., Czart A. 2014. Phytoplankton composition and physicochemical properties in Lake Swarzędzkie (midwestern Poland) during restoration: Preliminary results. Arch. Pol. Fish. (2014) 22: 17 - 28.

Lamande, N.; Lauwaars, S.; Mainstone, C.; Rehklau, W. "N2000 and water policy / water management / flood risk management - Final conclusions of ECONAT peer exchange 2010".

Life Project LIFE06 NAT/DK/000158 "Restoration of Meadow Bird Habitats" http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3108&docType=pdf.

Life Project LIFE08 NAT/B/000036 – „Ecological restoration of the Pond are M – L" http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=3529&docType=pdf.

Life Project LIFE10 NAT/DE/000010 – "Emericher Ward – River and floodplain improvement Emmericher Ward within the EU Bird Area Unterer Niederrhein" http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=4086.

Management Plan for "Bory Tucholskie" National Park http://isap.sejm.gov.pl/DetailsServlet?id=WDU20082301545.

Management Plan for Natura 2000 site Sandr Brdy PLH220026 http://edziennik.gdansk.uw.gov.pl/WDU_G/2014/4493/akt.pdf.

Management Plan of Natura 2000 site Cieszyńskie Źródła Tufowe. Zarządzenie nr 38/2013 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 31 grudnia 2013 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Cieszyńskie Źródła Tufowe PLH240001 (Dz. Urz. Woj. Śl. z dnia 8 stycznia 2014 r. poz. 118).

Management Plan of Natura 2000 site Graniczny Meander Odry Zarządzenie nr 36/2013 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 23 grudnia 2013 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Graniczny Meander Odry PLH240013 (Dz. Urz. Woj. Śl. z dnia 30 grudnia 2013 r. poz. 7874).

Management Plan of Natura 2000 site Podziemia Tarnogórsko-Bytomskie Zarządzenie Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 kwietnia 2014 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Podziemia Tarnogórsko-Bytomskie (Dz. Urz. Woj. Śl. z dnia 29 kwietnia 2014r. poz. 2576).

Management Plan of Natura 2000 site Suchy Młyn Zarządzenie nr 32/2012 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 grudnia 2012 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Suchy Młyn PLH240016 (Dz. Urz. Woj. Śl. z dnia 24 grudnia 2012 r. poz. 6035).

Management plans of Tisza-tó (HUHN20003), Gőgő-Szenke (HUHN20160), Felső-Tisza (HUHN20001), Marcal (HUBF20015), Rába és Csörnöc-völgy (HUON20008).

National Climate Commission. 2009. Belgium's Fifth National Communication Under the United Nations Framework Convention on Climate Change. 207 p. Brussels: Federal Public Service Health, Food Chain Safety and Environment.

National Prioritised Action Framework (NPAF) for Natura 2000 Bulgaria for the EU Multiannual Financing Period 2014-2020. http://dicon-bg.com/data/ufiles/files/NPAF_Bulgaria_EN.pdf.

Nikolic, T., Antonic, O., Alegro, A. L., Dobrovic, I., Bogdanovic, S., Liber, Z., Resetnik, I. 2008. Plant species diversity of Adriatic islands: an introductory survey. Plant Biosystems 142: 435-445.

Owsianny P. M., Gąbka M. 2007. Zbiorniki ramienicowe i dystroficzne – cechy diagnostyczne w świetle programu Natura 2000 i przykładów z Lasów Pilskich. W: Studia i Materiały Centrum Edukacji Przyrodniczo-Leśnej 9,2/3: 584-600.

Papp, B., Alegro, A., Šegota, V., Šapic, I., Vukelic, J. 2013b. Contribution to the bryophyte flora of Croatia II. The Northern Velebit. Studia botanica hungarica 44: 213-228.

Parkinson, D. 2008. Odonates de la région du plateau des Tailles: observations récentes d'espèces remarquables. Les Naturalistes belges 89 (2-3): 57-64.

Pawlaczyk P. 2012. Wielki Bytyn Lake PKH320011 Natura 2000 site conservation action plan. Mscr for Regional Directorate of Environment, Szczecin.

Pawlaczyk P. 2014. Uroczyska Puszczy Drawskiej PLH320046 Natura 2000 site conservation action plan. Mscr for Regional Directorate of Environment, Szczecin.

Peczula, W., Banach, B. Small Water Bodies and Lakes Protected Under EU Habitats Directive –Resultes of the Pilot Wildlife Monitoring in the Lubelskie Region. 2013. In: Teka Kom. Ochr. Kszt. Śrd. Przyr. – OL PAN. 10.: 306 – 317.

Piotrowicz R., Kraska M., Klimaszyk P. 2011. Changes of vegetation structure in the natural meromictic Czarne lake in the Drawa National Park (NW Poland). Bad. Fizjograf. Pol. Zach. Seria B – Botanika (B60) 2: 137-149.

Piotrowitz, R. Twardowodne oligo- i mezotroficzne zbiorniki z podwodnymi lakami ramienic *Charetea* 3140. 48 – 58. http://natura2000.gdos.gov.pl/uploads/download/190.

Plunus, J., Parkinson, D., Frankard, Ph., Dufrêne, M. 2014. Le dernier maillon de la chaîne des tourbières des hauts-plateaux ardennais: le Projet LIFE+ Restauration des habitats naturels de l'Ardenne liégeoise. Forêt Wallonne 128: 38-49.

Popiela, A. Brzegi lub osuszane dna zbierników wodnych ze zbiorowiskami z *Littorelletea, Isoeto-Nanojuncetea* 3130. 37 – 47. http://natura2000.gdos.gov.pl/uploads/download/189.

Rannow, S., Neubert, M. Managing Protected Areas in Central and Eastern Europe Under Climate Change. 2014. Springer Science & Business Media. 333 pp.

Ruwet, J.-Cl., Houbart, S., Hanon, L. & Fontaine, S. 1986. Ecologie, éthologie, conservation du tétras lyre (Tetrao tetrix) sur le plateau des Hautes Fagnes. Le point de la situation: 1966-1985. Hautes Fagnes 181: 11-20.

Sabovljevic, M., Alegro, A., Sabovljevic, A., Marka, J., Vujcic, M. 2011. An insight into diversity of the Balkan peninsula bryophyte flora in the European backgraund. Rev. Écol. (Terre Vie) 66: 399-413.

Schumacker, R. and De Zuttere, P. 1980. Aperçu de la végétation de la tourbière du Misten (Eupen, province de Liège, Belgique). Réflexions sur les associations des Oxycocco-Sphagnetea en Belgique. Colloques phytosociologiques 7: 437-459.

Schumacker, R., Wastiaux, C. and Hindryckx, M.N. 1996. L'avenir des tourbières hautes à sphaignes en Europe tempérée, l'exemple des Hautes-Fagnes belges. Colloques phytosociologiques 24: 273-284.

Service Public de Wallonie - 2010 - Management Plans for the Water Framework Directive in Belgium (Wallonia) Data for the European reporting.

Spałek K. 2006. Threatened plant communities as an indicator or fishponds value: an example from Silesia (SW Poland). In: D. Gafta, J. Akeroyd (eds), Nature Conservation. Concept and Practice. pp. 195-198. Springer Verlag. Berlin-Heidelberg.

Spałek K. 2009. Endangered vascular plant species of fishponds and oxbow lakes of the Opole Silesia (SW Poland): status, threats and protection. In: Z. Mirek, A. Nikiel (eds), Rare, relict and endangered plants and fungi in Poland. pp. 503-509. Polisch Academy of Sciences, Poland.

Stańko R., Pawlaczyk P. 2014. Water ecosystems. Drawa National Park Management Plan.

Streel, M. 1959. Etude phytosociologique de la fagne Wallonne et de la fagne de Cléfay (Structure et évolution des associations végétales à sphaignes dans les Hautes-Fagnes de Belgique). Académie royale des Sciences de Belgique, Classe des Sciences, Mémoires in 8° 31 (1): 1-109.

Sundseth, K. 2009. Natura 2000 in the Continental Region. European Communities. 12 pp. ISBN 978 92-79-11727-5.

Sundseth, K. 2009. Natura 2000 in the Pannonian Region. European Communities. 12 pp. ISBN 978-92-79-11586-8.

SZIE-VÁTI-ÖBKI-KVVM 2009. Management plans of Izsáki Kolon-tó (HUKN30003), Szigeti homok (HUDI20047), Turjánvidék (HUDI20051), Veresegyházi-medence (HUDI20055), Tengelici-homokvidék (HUDD20040) Natura 2000 sites.

Tanghe, M. and Herremans, J.-P. 1990. La gestion des marais de la Haute-Semois. Région Wallonne, Conservation de la Nature, Travaux 15: 93-112.

Teodorowicz M. 2013. Surface water quality and intensive fish culture. Arch. Pol. Fish. (2013) 21: 65 - 111.

Tzonev, R. in print. 20C3 Muddy and sandy river banks with communities of small, annual hygrophytes. In: Bisserkov, V. et al. /eds/. Red Data Book of Bulgaria. Vol. 3. Natural habitats.

Tzonev, R., Valchev, V. and Georgiev, V. 2012. 04C1 Natural or semi-natural mesotrophic to eutrophic lakes and marshes with macrophytic vegetation. In: Biserkov, V. et al. /eds/. Red Data Book of Bulgaria, Vol. 3. Natural Habitats. in print.

Van den Berg, M.S., M. Scheffer, E. van Nes and H. Coops. 1999. Dynamics and stability of Chara sp. and Potamogeton pectinatus in a shallow lake changing in eutrophication level. Hydrobiologia 408/409: 335-342.

Vassilev V. et al. 2013. National Action Plan for Conservation of Wetlands of High Significance in Bulgaria 2013 - 2022 http://bbf.biodiversity.bg/document-137.

Vukovic, N., Borsic, I., Župan, D., Alegro, A., Nikolic, T. 2013. Vascular flora of Jarun (Zagreb, Croatia). Nat. Croat., 22: 275-294.

Wastiaux, C. 2000. Facteurs hydrologiques de la dégradation des tourbières hautes à sphaignes des Hautes-Fagnes (Belgique). Thèse de Doctorat en Sciences. 223 p. Liège: Université de Liège.

Wastiaux, C., Schumacker, R. and Petit, F. 1991. Quel espoir pour les tourbières hautes assassinées? L'impact du colmatage des drains, depuis 1966, en fagne des Deux-Séries (Réserve naturelle des Hautes-Fagnes, Membach, Belgique). Hautes Fagnes 204: 95-102.

Websites

Ammersee, Starnberger See: http://www.wwa-wm.bayern.de/fluesse_seen/gewaesserentwicklungskonzepte

Chiemsee, Waginger See, Tachinger See. http://www.wwa-ts.bayern.de/fluesse_seen/gewaesserentwicklungskonzepte/index.htm

Dyke relocation: http://www.wwa-deg.bayern.de/doc/publikationen/flyer_hws_natternberg.pdf

http://fhnp.nemzetipark.gov.hu/_user/browser/File/English%20Version/Researches/oedipus_Bosarkany2_eng_DCS.pdf

http://www.biebrza.org.pl/161,protection-of-non-forest-ecosystems.html

http://www.ferto-hansag.hu/_user/browser/File/English%20Version/Researches/Sargagyapjasszovo_ambrus_jav2.pdf

http://www.ferto-hansag.hu/_user/browser/File/English%20Version/Researches/Fertohomok_Ujlak090623_aa_ang21.pdf

http://www.gorna.biebrza.org.pl/664,welcome.html

http://www.renaturyzacja.biebrza.org.pl/407,general-information.html

http://www.wwa-la.bayern.de/hochwasser/hochwasserschutzprojekte/neustadt/irnsing/index.htm

https://www.researchgate.net/profile/Andras_Ambrus3/publications

Projects on wetland/bog restauration: http://www.lfu.bayern.de/natur/moorschutz/index.htm

Realised projects: http://www.wasserwirtschaftsamt-landshut.de/doc/auenmagazin_2013_04_landshuter_modell.pdf

5.8 Wetlands

5.8.1 Short description of the habitats selected for priority consideration

Sphagnum acid bogs and transition mires of this wetland habitats group consist of active raised bogs made of Sphagna hummocks (7110), of their degraded but restorable forms (7120), of peat-forming communities developed at the surface of oligotrophic to mesotrophic waters (7140) and of highly constant pioneer communities of humid exposed peat (or sometimes sand) depressions (7150). Active raised bogs (7110) are poor in mineral nutrients and sustained mainly by rainwater with a water level generally higher than the surrounding water table. They host perennial vegetation dominated by colourful Sphagna hummocks allowing for the active growth of the bog on a significant area (*Erico-Sphagnetalia magellanici, Scheuchzerietalia palustris* p., *Utricularietalia intermedio-minoris* p., *Caricetalia fuscae* p.).

Bogs where active peat formation is temporarily at a standstill are also included. Where there has been a disruption (usually anthropogenic) to the natural hydrology of the peat body, leading to surface desiccation and/or species change or loss (7120), vegetation usually contains species typical of active raised bog as the main component, but the relative abundance of individual species is different. In sites capable of natural regeneration the hydrology can be repaired and with appropriate rehabilitation management there is a reasonable expectation of re-establishing peat-forming within 30 years.

Transition mires and quaking bogs (7140) have characteristics intermediate between the types fed by rainwater and those fed by slope run-off water. In large peaty systems, the most prominent communities are swaying swards, floating carpets or quaking mires formed by medium-sized or small sedges, associated with *Sphagnum* or brown mosses. These mires and bogs belong to the *Scheuchzerietalia palustris* order (oligotrophic floating carpets among others) and to the *Caricetalia fuscae* order (quaking communities). Oligotrophic water–land interfaces with *Carex rostrata* are included. Depressions on peat or sand substrates of the *Rhynchosporion* (7150) with *Rhynchospora alba*, *R. fusca*, *Drosera intermedia*, *D. rotundifolia* and *Lycopodiella inundata* are forming on stripped areas of blanket bogs or raised bogs, but also on naturally seep- or frost-eroded areas of wet heaths and bogs, in flushes and in the fluctuation zone of oligotrophic pools with sandy, slightly peaty substratum. These communities are similar, and closely related, to those of shallow bog hollows (7110) and of transition mires (7140).

Calcareous fens of this wetland habitats group consist of *Cladium mariscus* beds (7210), of petrifying hard water springs (7220) and of alkaline fens (7230). Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210) are found on the emergent-plant zones of lakes, fallow lands or succession stage of extensively farmed wet meadows in contact with the vegetation of the *Caricion davallianae* or other *Phragmition* species. Petrifying springs with active formation of travertine or tufa and vegetation of the *Cratoneurion* alliance (7220) dominated by bryophytes (*Cratoneurion commutati*) are found in such diverse environments as forests and open countryside. They are generally small (point or linear formations).

Alkaline fens (7230) are mostly or largely occupied by peat- or tufa-producing small sedge and brown moss communities. They developed on soils that are permanently waterlogged due to the base-rich (often calcareous) slope run-off or in terrain depressions. In such sites the water table is at, or slightly above or below, the substratum, and peat formation, when it occurs, is infra-aquatic. Calciphile small

sedges and other Cyperaceae usually dominate the mire communities, which belong to the *Caricion davallianae*, characterised by a usually prominent 'brown moss' carpet, a grass-like growth of *Schoenus*, *Eriophorum*, *Carex* and other similar species, and a very rich herbaceous flora (including e.g. orchids). Outside of rich fen systems, fen communities can occur as small areas in other habitat systems.

The surface area of habitats and the number of SCIs which contain these habitats in each Member State are summarised in Figure 68 and Figure 69, collected from the fact sheets for the Pre-Scoping Document for the Natura 2000 Seminar at Continental, Pannonian, Black Sea and Steppic regions.

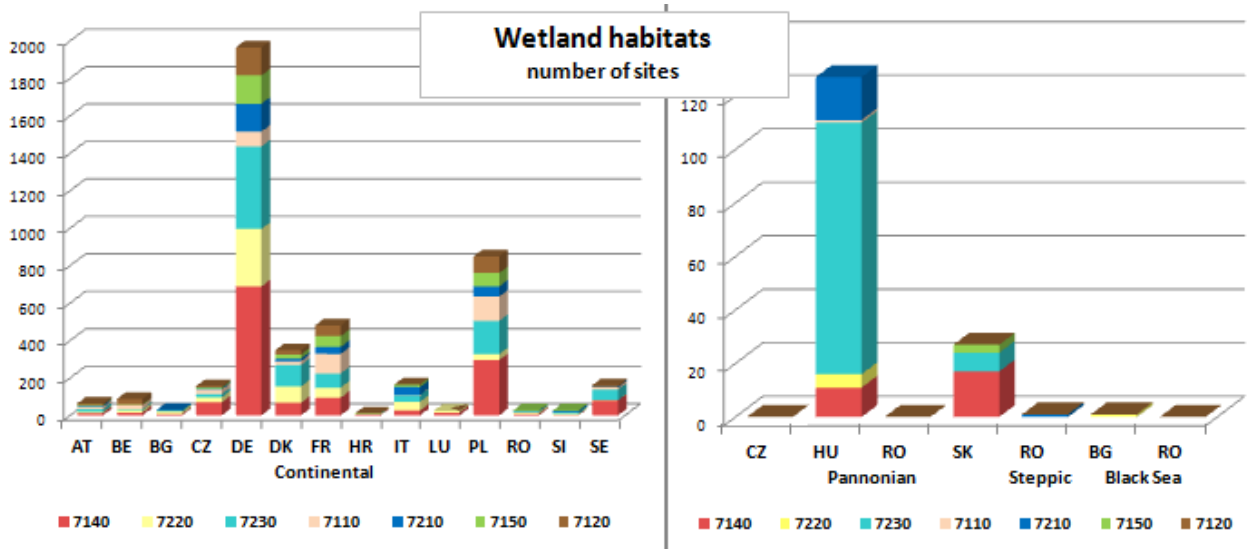


Figure 68 Number of SCIs with wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region. Data are presented in Table 34

Table 34 Number of SCIs with wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BU**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
7140	12	15	7	69	688	67	94	4	25	15	295	7	2	80
7220	6	14	14	28	307	87	54	2	47	9	32	10	6	1
7230	15	5	6	16	441	115	75	1	35	0	177	4	8	56
7110	12	20	0	25	79	20	105	0	2	0	130	0	0	12
7210	6	0	1	4	149	14	37	0	42	0	54	3	8	4
7150	3	3	0	7	151	22	58	2	13	0	72	2	2	0
7120	9	30	0	7	149	23	57	0	0	0	89	0	0	8

	Pannonian				**STE**	**Black Sea**		Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**	CON	PAN	STE	BLS	
7140	0	11	0	17	0	0	0	1380	28	0	0	1,408
7220	0	5	0	0	0	1	0	617	5	0	1	623
7230	0	94	0	7	0	0	0	954	101	0	0	1,055
7110	0	1	0	0	0	0	0	405	1	0	0	406
7210	0	16	0	0	1	0	0	322	16	1	0	339
7150	0	0	0	3	0	0	0	335	3	0	0	338
7120	0	0	0	0	0	0	0	372	0	0	0	372

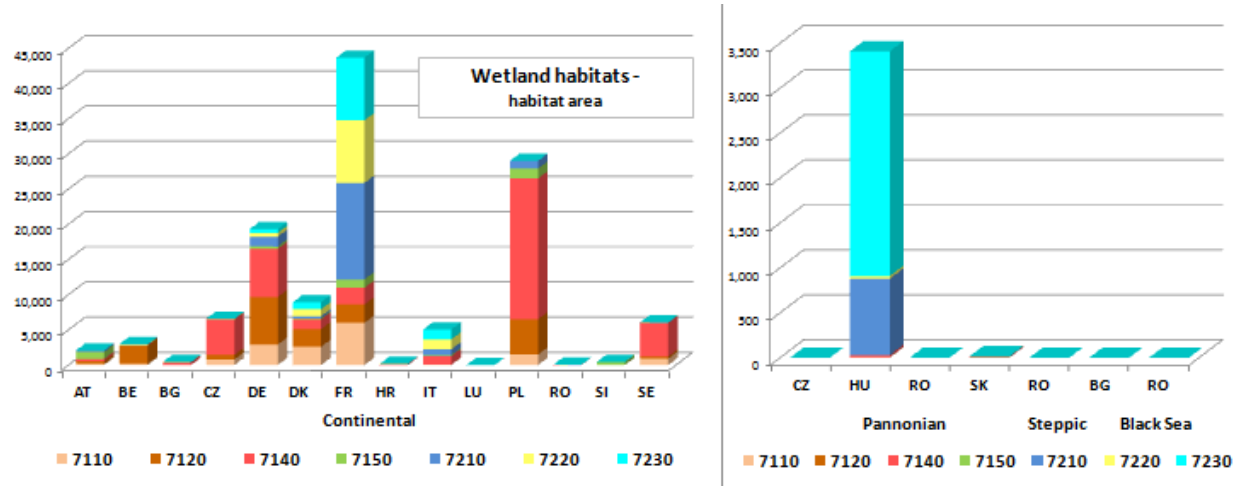


Figure 69 Area (in hectares) of wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region. Data are presented in Table 35

Table 35 Area (in hectares) of wetland habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BG**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
7110	170	161		771	2,887	2,600	6,000		*69		1,500			900
7120	400	2,575		665	6,776	2,500	2,600				5,000			300
7140	300	81	391	5,060	6,830	1,400	2,370	147	1,213	2	20,000	30	15	4,800
7150	1,000	1		16	354	130	1,200	3	131		1,400	1	*387	
7210	200		1	4	1,393	300	13,700		817		1,100	4	13	30
7220	1	84	16	27	528	1,000	8,900	4	1,407	2	4	1	15	10
7230	500	10	220	42	5,292	7,600	18,600	35	1,147		25,000	85	30	250

	Pannonian				Steppic	Black Sea			Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		**CON**	**PAN**	**STE**	**BLS**	
7110		4							15,058	4	0	0	15,062
7120									20,816	0	0	0	20,816
7140		25		11					42,639	36	0	0	42,675
7150				*2					4,623	2	0	0	4,625
7210		850							17,562	850	0	0	18,412
7220		30							11,999	30	0	0	12,029
7230		2,500		2					58,811	2,502	0	0	61,313

* only area in SCI, because the area was not reported in the Article 17 report

5.8.2 References

Reports and scientific papers

Agenția Națională pentru Protecția Mediului (under the Romanian Ministry of Environment, Water and Forests). Habitate Rare din Carpatii Romanesti. http://www.anpm.ro/anpm_resources/migrated_content/uploads/95957_Habitate%20Bioregio.doc.

Alegro, A, LJ. Markovic, O. Antonic, S. Bogdanovic. 2006. Historical and functional aspects of plant biodiversity-an example on the flora of the Vukova Gorica region (Central Croatia). Candollea 61: 135-166.

Alegro, A. 2009. Mahovi tresetari u Hrvatskoj. Državi zavod za zaštitu prirode, Zagreb.

Alegro, A. 2009. Travnjaci primorskih padina sjevernog Velebita – Tipologija i sukcesije. Hrvatsko botaničko društvo, Zagreb.

Alegro, A. 2010. Travnjaci Parka prirode Medvednica – Tipologija i sukcesije. BIOM – Udruga za biološka istraživanja, Zagreb.

Alegro, A. 2010. Travnjaci vršnih dijelova sjevernog Velebita – Tiplogije i sukcesije. Hrvatsko botaničko društvo, Zagreb.

Alegro, A. 2011. Analiza potencijalne i stvarne rasprostranjenosti vrsta Mannia triandra, Dicranum viride, Buxbaumia viridis i Drepanocladus vernicosus na području Hrvatske. Stručna studija. Državni zavod za zaštitu prirode, Zagreb.

Alegro, A. 2011. Makrofita. U: Mihaljević, Z., (voditelj projekta), Studija – Testiranje bioloških metoda ocjene ekološkog stanja (Okvirna direktiva o vodama, 2000/60/EC) u reprezentativnim slivovima Panonske i Dinaridske ekoregije. Biološki odsjek PMF-a. pp. 227-261.

Alegro, A., Bogdanovic, S., Brana, S., Jasprica, N., Katalinic, A., Kovacic, S., Nikolic, T., Milovic, M., Pandza, M., Posavec-Vukelic, V., Randic, M., Ruscic, M., Šegota, V., Šincel, D., Topic, J., Vrbek, M., Vukovic, N. 2010. Botanički važna područja Hrvatske. Školska knjiga i Priridislovno-matematički fakultet Sveučilišta u Zagrebu, Zagreb.

Alegro, A., Bogdanovic, S., Resetnik, I., Borsic, I., Cigic, P., Nikolic, T. 2013. Flora of the seminatural marshland Savica, part of the (sub)urban flora of the city of Zagreb (Croatia). Nat. Croat. 22, 111-134.

Allan, M., Le Roux, G., De Vleeschouwer, F., Bindler, R., Blaauw, M., Piotrowska, N., Sikorski, J. and Fagel, N. 2013b. High-resolution reconstruction of atmospheric deposition of trace metals and metalloids since AD 1400 recorded by ombrotrophic peat cores in Hautes-Fagnes, Belgium. Environmental Pollution 1: 1-14.

Allan, M., Le Roux, G., Sonke, J.E., Piotrowska, N., Streel, M. and Fagel, N. 2013a. Reconstructing historical atmospheric mercury deposition in Western Europe using Misten peat bog cores, Belgium. Science of the Total Environment 442: 290-301.

Ambrus, A. The case of Orange Eggar (Eriogaster catax) with the agri-environmental schemes in Hungary http://www.ferto-hansag.hu/_user/browser/File/English%20Version/Researches/Sargagyapjasszovo_ambrus_jav2.pdf.

Ambrus, A: False Ringlet (Coenonympha oedippus Fabr.) in the Hanság (NW- Hungary) http://fhnp.nemzetipark.gov.hu/_user/browser/File/English%20Version/Researches/oedipus_Bosarkany2_eng_DCS.pdf.

Ambrus, A: Habitat management on wet meadows of Fertőhomok and Hidegség for wetland invertebrates http://www.ferto-hansag.hu/_user/browser/File/English%20Version/Researches/Fertohomok_Ujlak090623_aa_ang21.pdf.

Áner. 2011. Habitats of Hungary: Description and guide of vegetation types 440 pp.

Boloni J., Milnar Zs., Kun A.(szerk.). 2011. Magyarország élőhelyei: Vegetációtípusok leírása és határozója.

Cholet, J., Magnon, G. 2010. Tourbières des montagnes françaises - Nouveaux elements de connaissance, de réflexion et de gestion. Pôle Relais Tourbières / Fédération des Consertoires d'Espaces Naturels, 188p.

Programme LIFE+ Nature “Réhabilitation fonctionnelle des tourbières du massif jurassien franc-comtois”, dossier de candidature - version finale, mars 2014, 305p.

Defraiteur, M.P. and Schumacker, R. 1988. Plateau des Hautes-Fagnes ou plateau des Fontaines-salées? Une nouvelle atteinte à la réserve naturelle: les sels de déneigement. Hautes Fagnes 189: 9-13.

Demna. 2014. Évaluation de l’état de conservation des habitats et espèces Natura 2000 Résultats du Rapportage Article 17 au titre de la Directive 92/43/CEE pour la période 2007 Document réalisé par la Direction de la Nature et de l’Eau.

Draft Management Plan for Natura 2000 site PLH200008 Dolina Biebrzy.

Draft Management Plan of Slowinski National Park and overlapping Natura 2000 sites. http://planyochrony.slowinskipn.pl/.

Drösler, M. et. al. 2011. „Klimaschutz durch Moorschutz in der Praxis“. In: Arbeitsberichte aus dem vTI-Institut für Agrarrelevante Klimaforschung 04/2011, Braunschweig, Berlin, Freising, Jena, Müncheberg, Wien im April 2011.

Dufrêne, M., Balthus, H., Cors, R., Fichefet, V., Moës, Ph., Warlomont, P., Dierstein, A. & Motte, G. 2011. Bilan du monitoring des libellules dans les sites restaurés par le projet LIFE “tourbières” sur le plateau de Saint-Hubert. Les Naturalistes belges 92 (3-4): 37-54.

Dumont, J.M. 1975. L’homme et la végétation du plateau des Tailles. La pratique de l’écologie. Thèse de Doctorat, Université catholique de Louvain, 278 p.

Dumont, J.-M. and Champluvier, D. 1990. La gestion de la réserve naturelle domaniale du plateau des Tailles. Elaboration du plan, essais de mise en oeuvre, coût de la gestion. Région Wallonne, Conservation de la Nature, Travaux 15: 359-382.

EIONET. 2013. Member State Deliveries. http://bd.eionet.europa.eu/activities/Reporting/Article_17/Reports_2013/Member_State_Deliveries updated 01.06.2014.

European Commission, DG Environment, Nature ENV B.3. *Interpretation Manual of European Union Habitats, EUR 28.* 2013. http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf.

European Environment Agency - European Topic Centre on Biological Diversity. EU Reference lists of habitats and species for biogeographical regions. http://bd.eionet.europa.eu/activities/Natura_2000/chapter2.

Feichtinger, V. 2012. „Klimaprogramm Bayern 2020 – Moore (2009 – 2011) in Oberbayern“. In: TELMA – Berichte der Deutschen Gesellschaft für Moor- und Torfkunde Band 42, Seite115 – 120, Hannover, November 2012.

Feichtinger, V. 2012. „Klimaprogramm Bayern 2020 – Moore (2009 – 2011) in Oberbayern“. In: TELMA – Berichte der Deutschen Gesellschaft für Moor- und Torfkunde Band 42, Seite115 – 120, Hannover, November 2012.

Frankard, P. and Doyen, A. 1999. La restauration des tourbières hautes de la réserve naturelle domaniale des Hautes-Fagnes. Les Cahiers des Réserves Naturelles 13: 19-27.

Frankard, P. and Ghiette, P. 2000. La gestion des tourbières des Hautes-Fagnes. Région Wallonne, Conservation de la Nature, Travaux 21: 387-401.

Frankard, P. and Hindryckx, M.-N. 1998. Evolution de la végétation du secteur sud de la tourbière haute active de la fagne Wallonne, au cours de ces 60 dernières années (plateau des Hautes-Fagnes, Belgique). Belgian Journal of Botany 131: 28-40.

Frankard, P., Ghiette, P., Hindryckx, M.-N., Schumacker, R. & Wastiaux, C. 1998a. Peatlands of Wallony (S-Belgium). Suo 49(2): 33-47.

Frankard, Ph. 2005. Restitution von Hochmooren und nassen Heiden im Hohen Venn (Ost-Belgien): Eine Bilanz 10-jähriger Feldversuche. Telma 35: 207-218.

Frankard, Ph. 2006. Les techniques de gestion des milieux naturels et semi-naturels mises en œuvre depuis 1994 dans la RND des Hautes-Fagnes. 1. Bilan de 12 années de gestion conservatoire des tourbières hautes dans la réserve naturelle domaniale des Hautes-Fagnes (Est de la Belgique). Hautes Fagnes 263: 21-29.

Frankard, Ph. 2012. L'impact des travaux de restauration menés dans le cadre du projet LIFE Hautes-Fagnes sur la flore et les habitats de tourbières et de landes. Les premières tendances. Hautes Fagnes 288: 22-25.

Frankard, Ph. and Janssens, X. 2008. Raised bogs rehabilitation on the Hautes-Fagnes plateau (East Belgium). An assessment after 15 years of management trials. Proceedings of the SER 6th European Conference on Ecological Restoration (8-12 September 2008, Ghent, Belgium) "Towards a sustainable future for European ecosystems providing restoration guidelines for Natura 2000 habitats and species", 4 p.

Freibauer, A. et. al. 2009. „Das Potenzial von Wäldern und Mooren für den Klimaschutz in Deutschland und auf globaler Ebene". In: Natur und Landschaft Heft 1, 84. Jahrgang.

Froment, A. 1968. L'ancienne économie rurale de l'Ardenne et son incidence sur la végétation des Hautes-Fagnes. Bulletin de la Société géographique de Liège 4: 23-39.

Ghiette, P. & Frankard, P. 1998. Premières données sur l'expérience de gestion par pâturage de moutons dans la réserve naturelle domaniale des Hautes-Fagnes (Grande-Fange). Hautes Fagnes 231: 72-76.

Ghiette, P. 1999. Une expérience de gestion par pâturage de moutons dans la réserve naturelle domaniale des Hautes-Fagnes (Grande-Fange). Les Cahiers des Réserves Naturelles 13: 35-42.

Ghiette, P., Frankard, P. & Schumacker, R. 1995. Le plan de gestion écologique de la réserve naturelle domaniale des Hautes-Fagnes. Hautes Fagnes 217: 11-18.

Goffart, P. 2000. Les libellules, témoins privilégiés de la dégradation des milieux aquatiques en Wallonie. Région Wallonne, Conservation de la Nature, Travaux 21: 83-95.

Grosvernier, P.; Staublil, P. 2009. Régénération des hauts-marais. Bases et mesures techniques. L'environnement pratique, Office Fédéral de l'Environnement, n°0918, 96p.

Grygoruk et al. 2013. Climate-Adapted Management Plan for the Biebrza National Park. http://www2.ioer.de/download/habit-change/HABIT-CHANGE_5_3_1e_BNP_CAMP_for_Biebrza_NP.pdf.

Haraszthy L. (ed.). 2014. Natura 2000 fajok és élőhelyek Magyarországon [Natura 2000 species and habitats in Hungary]. Pro Vértes Közalapítvány Csákvár.

Haraszty L. ed. 2014. Natura 2000 species and habitats in Hungary. pp. 955

Herbichowa M. 2014. Renaturalisation of habitats and vegetation on degraded raised bogs of Pomerania. Implementation and results of the project POIS.05.01.00-00-327 / 10 and 356/2011 / GE-11 / OP-WK-PS / D. Ed: Foundation for the Development of the University of Gdansk.

Herbichowa M., Pawlaczyk P., Stańko R. 2007. Conservation of Baltic raised bogs in Pomerania, Poland. Experience and Results of the LIFE04NAT/PL/000208 PLBALTBOGS Project. Wydawnictwo Klubu Przyrodników, Świebodzin, 149 pp.

Herremans, J.P. 1990. Gérer la nature? La situation en Wallonie dans le secteur associatif. Région Wallonne, Conservation de la Nature, Travaux 15 (1): 43-60.

Hindryckx, M.N. 1989. Evolution récente de la dégradation de la végétation de la partie centrale de la tourbière de la fagne Wallonne (Hautes-Fagnes, Belgique). Bases de sa sauvegarde et de sa restauration. 97 p. Mémoire de Licence en Sciences botaniques. Liège: Université de Liège.

Hindryckx, M.N. 1990. Dans quelques années, pourra-t-on encore parler des tourbières hautes actives du plateau des Hautes-Fagnes? Hautes Fagnes 199: 69-77.

Hindryckx, M.N. 1999. Evolution régressive récente de la végétation des tourbières hautes à sphaignes en Haute Ardenne (Hautes-Fagnes, Belgique). Thèse de Doctorat en Sciences. 269 p. Liège: Université de Liège.

Hindryckx, M.N. and Streel, M. 2000. L'altération des bords de la tourbière active du Misten par l'exploitation de la tourbe pourrait dater du début du 14e siècle. Hautes Fagnes 240: 95-101.

Hoyois, G. 1981. L'Ardenne et l'Ardennais, 983 p. Bruxelles: Culture et Civilisation, Bruxelles.

Hubert, C. 1990. Gestion des réserves naturelles du bassin de la Sûre. Région Wallonne, Conservation de la Nature, Travaux 15: 443-458.

Jortay, A. & Schumacker, R. 1989. Zustand, Erhaltung und Regeneration der Hochmoore im Hohen Venn (Belgien). Telma 2: 279-293.

Książkiewicz, Bierężnoj-Bazille, Krajewski, Gołdyn. 2014. New records or vertigo geyeri (Lindholm 1925), vertigo moulinsiana (Dupuy 1849) and vertigo angustior (Jeffreys 1830) in Poland. Folia Malacologica (in prep.).

Kujawa-Pawlaczyk J., Pawlaczyk P. 2014. Peatbogs of Drawa Forest, NW Poland: resources - status - conservation. Naturalists Club Poland, 112 pp.

M. Herbichowa. 2014: Renaturalizacja siedlisk i roślinności na zdegradowanych torfowiskach wysokich województwa pomorskiego. Realizacja i wyniki projektu POIS.05.01.00-00-327/10 oraz 356/2011/Wn-11/OP-WK-PS/D. Wyd: Fundacja Rozwoju Uniwersytetu Gdańskiego.

Mälson K., Backéus I., Rydin H. 2008. Long-term effects of drainage and initial effects of hydrological restoration on rich fen vegetation. Applied Vegetation Science 11, 1: 99-106.

Management Plan for Slowinski National Park.
http://dziennikurzedowy.mos.gov.pl/attachments/article/350/zarz%C4%85dzenie%20nr%2031.pdf.

Management Plan of Natura 2000 site Cieszyńskie Źródła Tufowe. Zarządzenie nr 38/2013 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 31 grudnia 2013 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Cieszyńskie Źródła Tufowe PLH240001 (Dz. Urz. Woj. Śl. z dnia 8 stycznia 2014 r. poz. 118).

Management Plan of the Natura 2000 site Graniczny Meander Odry. Zarządzenie nr 36/2013 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 23 grudnia 2013 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Graniczny Meander Odry PLH240013 (Dz. Urz. Woj. Śl. z dnia 30 grudnia 2013 r. poz. 7874).

Management Plan of the Natura 2000 site Podziemia Tarnogórsko-Bytomskie. Zarządzenie Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 kwietnia 2014 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Podziemia Tarnogórsko-Bytomskie (Dz. Urz. Woj. Śl. z dnia 29 kwietnia 2014r. poz. 2576).

Management Plan of the Natura 2000 site Suchy Młyn. Zarządzenie nr 32/2012 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 grudnia 2012 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Suchy Młyn PLH240016 (Dz. Urz. Woj. Śl. z dnia 24 grudnia 2012 r. poz. 6035).

Management Plans of Tisza-tó (HUHN20003), Gőgő-Szenke (HUHN20160), Felső-Tisza (HUHN20001), Marcal (HUBF20015), Rába és Csörnöc-völgy (HUON20008).

National Climate Commission. 2009. Belgium's Fifth National Communication Under the United Nations Framework Convention on Climate Change. 207 p. Brussels: Federal Public Service Health, Food Chain Safety and Environment.

National Prioritised Action Framework (NPAF) for Natura 2000 Bulgaria for the EU Multiannual Financing Period 2014-2020. http://dicon-bg.com/data/ufiles/files/NPAF_Bulgaria_EN.pdf.

Natura 2000 Action Plans for Habitat Groups 7210* and 7230 (INTERREG SEE project BE-NATUR).

Nikolic, T., Antonic, O., Alegto, A. L., Dobraovic, I., Bogdanovic, S., Liber, Z., Resetnik, I. 2008. Plant species diversity of Adriatic islands: an introductory survey. Plant Biosystems 142: 435-445.

Papp, B., Alegro, A., Šegota, V., Šapic, I., Vukelic, J. 2013a. Contribution to the bryophyte flora of Croatia I. Gorski kotar Region (W Croatia). Studia botanica hungarica 44: 193-211.

Papp, B., Alegro, A., Šegota, V., Šapic, I., Vukelic, J. 2013b. Contribution to the bryophyte flora of Croatia II. The Northern Velebit. Studia botanica hungarica 44: 213-228.

Parkinson, D. 2008. Odonates de la région du plateau des Tailles: observations récentes d'espèces remarquables. Les Naturalistes belges 89 (2-3): 57-64.

Pawlaczyk P., Herbichowa M., Stańko R. 2005. Ochrona torfowisk bałtyckich. Przewodnik dla praktyków, teoretyków i i urzędników. Wydawnictwo Klubu Przyrodników, Świebodzin, 192 pp.

Plunus, J., Parkinson, D., Frankard, Ph., Dufrêne, M. 2014. Le dernier maillon de la chaîne des tourbières des hauts-plateaux ardennais: le Projet LIFE+ «Restauration des habitats naturels de l'Ardenne liégeoise». Forêt Wallonne 128: 38-49.

Ruwet, J.-Cl., Houbart, S., Hanon, L. and Fontaine, S. 1986. Ecologie, éthologie, conservation du tétras lyre (Tetrao tetrix) sur le plateau des Hautes Fagnes. Le point de la situation: 1966-1985. Hautes Fagnes 181: 11-20.

Sabovljevic, M., Alegro, A., Sabovljevic, A., Marka, J., Vujcic, M. 2011. An insight into diversity of the Balkan peninsula bryophyte flora in the European backgraund. Rev. Écol. (Terre Vie) 66: 399-413.

Schumacker, R. & De Zuttere, P. 1980. Aperçu de la végétation de la tourbière du Misten (Eupen, province de Liège, Belgique). Réflexions sur les associations des Oxycocco-Sphagnetea en Belgique. Colloques phytosociologiques 7: 437-459.

Schumacker, R., Wastiaux, C. and Hindryckx, M.N. 1996. L'avenir des tourbières hautes à sphaignes en Europe tempérée, l'exemple des Hautes-Fagnes belges. Colloques phytosociologiques 24: 273-284.

Šefferova-Stanova V., Šeffer J. and Janak M. 2008. Management of Natura 2000 habitats. 7230 Alkaline fens.

Service Public de Wallonie. 2010. Management Plans for the Water Framework Directive in Belgium (Wallonia) Data for the European reporting.

Siuda, C. et. al. 2010. „Moorrenaturierung kompakt – Handlungsschlüssel für die Praxis". UmweltSpezial, Bayerisches Landesamt für Umwelt, Augsburg.

Stallegger M. 2008. Management of Natura 2000 habitats. 7150 Depressions on peat substrates of the *Rhynchosporion.*

Stenild J., Glerup K., Kjær S. (eds.). 2011. Restoration of raised bogs in Denmark using new methods. – Danish Nature Agency, Copenhagen, 56 pp.

Streel, M. 1959. Etude phytosociologique de la fagne Wallonne et de la fagne de Cléfay (Structure et évolution des associations végétales à sphaignes dans les Hautes-Fagnes de Belgique). Académie royale des Sciences de Belgique, Classe des Sciences, Mémoires in 8° 31 (1): 1-109.

Tanghe, M. and Herremans, J.P. 1990. La gestion des marais de la Haute-Semois. Région Wallonne, Conservation de la Nature, Travaux 15: 93-112.

Vassilev V. et al. 2013. National Action Plan for Conservation of Wetlands of High Significance in Bulgaria 2013 - 2022 http://bbf.biodiversity.bg/document-137.

Vukovic, N., Borsic, I., Župan, D., Alegro, A., Nikolic, T. 2013. Vascular flora of Jarun (Zagreb, Croatia). Nat. Croat., 22: 275-294.

Wastiaux, C. 2000. Facteurs hydrologiques de la dégradation des tourbières hautes à sphaignes des Hautes-Fagnes (Belgique). Thèse de Doctorat en Sciences. 223 p. Liège: Université de Liège.

Wastiaux, C., Schumacker, R. and Petit, F. 1991. Quel espoir pour les tourbières hautes assassinées? L'impact du colmatage des drains, depuis 1966, en fagne des Deux-Séries (Réserve naturelle des Hautes-Fagnes, Membach, Belgique). Hautes Fagnes 204: 95-102.

Wolejko L., Herbichowa M., Potocka H. 2005. Typological differentiation and status of Natura 2000 mire habitats in Poland. – Stapfia 85: 175-219.

Websites

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=RERABOGS_Best_Practices.pdf

http://siedliska.gios.gov.pl/pdf/siedliska/2009-2011/wyniki_monitoringu_siedlisk_4030.pdf

http://www.biebrza.org.pl/161,protection-of-non-forest-ecosystems.html

http://www.frug.ug.edu.pl/?rensiedtorf,86

http://www.frug.ug.edu.pl/?rensiedtorf,86

http://www.gios.gov.pl/siedliska/pdf/metodyka_monitoringu_siedlisk_2011_91F0.pdf

http://www.gorna.biebrza.org.pl/664,welcome.html

http://www.renaturyzacja.biebrza.org.pl/407,general-information.html

https://www.researchgate.net/profile/Andras_Ambrus3/publications -

5.9 Woodland and forest

5.9.1 Short description of the habitats selected for priority consideration

1. *Luzulo-Fagetum* beech forests (9110) are acidophilous beech forests with a species-poor herbaceous layer, of the planar to colline zones (here often with *Quercus petraea*, *Quercus robur* in the tree layer), and into the montane zone (with tall herbaceous plants in the herbaceous layer). Due to the dense shadow cast by beech, the understory of this type of forest is sparse and floral diversity rather poor. It may include *Ilex aquifolium, Taxus baccata* and, in managed beech forests, *Frangula alnus, Sorbus aucuparia* and *Corylus avelana,* which are not sufficiently shade-tolerant to survive in unmanaged beech forests.
2. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0) are riparian alluvial forests and flush woods in valleys or at the foot of a slope. Featuring black alder in planar and colline situations and also grey alder at higher altitudes. This habitat type also includes softwood (*Salicion albae*) riparian alluvial forests which are regularly inundated, often for relatively long periods. A special case included in this habitat type comprises alder forests on percolating mires within an area subject to river inundation.
3. Tilio-Acerion forests of slopes, screes and ravines (9180) in cool and humid locations, as well as forests on scree in fresh to dry-warm locations. These include i.a. Aceri-Fraxinetum ravine forests, linden-hornbeam woodlands on scree, Aceri-Tilietum mixed woodlands on scree, Tilio-Ulmetum woodlands on coarse colluvium, and the peri-alpine Seslerio-Tilietum woodlands. They occur often on steep slopes with unstable substratum, generally with a relatively open canopy and a correspondingly rich herbaceous layer.
4. Bog woodland (91D0) are coniferous and broad-leaved forests on a humid to wet peaty substrate, generally with *Sphagnum* spp. and dwarf vegetation, oligotrophic environments and a high water table. Also, this includes, birch bog woodland in some cases with transitions to birch swamp forest, spruce and mugo pine (*Pinus mugo mugo*), scots pine and mountain pine (*Pinus mugo uncinata*) bog woodland.
5. Riparian mixed forests (91F0) of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*) are forests of hardwood trees on the banks of large rivers, prone to flooding during regular rising of water level. Dominant tree species depending on the water regime include ash (*Fraxinus excelsior*), elm (*Ulmus laevis*, *Ulmus minor*) and oak (*Quercus robur*). 91F0 forests in nitrogen-rich locations consists usually of well-developed undergrowth, rich in trailing plants.
6. Sub-Atlantic and medio-European oak or oak-hornbeam forests (9160) of the *Carpinion betuli* occur on intermittently or continuously damp soils with a high groundwater level (*Stellario-Carpinetum*). These occur in a primary form on sites which are not suited to beech (intermittently wet), and as secondary woodlands, i.e. first degree replacement communities of beech forests resulting from historic site uses. Plant species include *Quercus robur*, *Carpinus betulus*, *Acer campestre*, *Tilia cordata*, *Stellaria holostea*, *Carex brizoides*, *Poa chaixii*, *Potentilla sterilis*, *Dactylis polygama*, *Ranunculus nemorosus* and *Galium sylvaticum*.
7. Galio-Carpinetum oak-hornbeam forests (9170) occur on more clayey-loamy and intermittently dry soils. These are *Quercus petraea* - *Carpinus betulus* forests of regions with sub-continental climate within the Central European range of *Fagus sylvatica*, dominated by *Quercus petraea*.

Also included are related lime-oak forests of eastern and eastern-central European regions with a continental climate, east of the range of *F. sylvatica*.

8. Pannonian woods with *Quercus pubescens (*91H0) occur on the periphery and hills of the Pannonic plain on extremely dry, southern exposed locations on shallow, calcareous soils. Because of these extreme site conditions, the woods are often fragmentary and low-growing, sometimes only shrubby. The herb layer is rich in species and often contains xerothermic species from dry grasslands or forest fringes. Occasionally *Tilia platyphyllos* and *Fraxinus excelsior* can become dominant.
9. *Salix alba* and *Populus* alba galleries (92A0) are riparian forests of the Mediterranean and Black Sea basins dominated by *Salix alba*, *Salix fragilis* or their relatives.
10. Euro-Siberian steppic woods with *Quercus* spp. (91I0) are xero-thermophile oak woods of the plains of south-eastern Europe. The substrate consists of 'Loess' (Chernozem soils). *Quercus robur*, *Quercus cerris*, *Q. pedunculiflora* and *Quercus pubescens* dominate in the treelayer of this habitat type, which is rich in continental steppic vegetation elements and geophytes of the *Aceri tatarici- Quercion*.
11. Pannonic woods with *Quercus petraea* and *Carpinus betulus* (91G0) occur on the plains and low hills of south-eastern Central Europe on varied soil types (both calcareous and siliceous substrates). The shrub- and herb layer are dominated by subcontinental and submediterranean plant species. They occur in shady, humid valleys and slopes, particularly on deep soils but also on hill tops with shallow, oligotrophic substrates. Syntaxa include, *Primulo veris-Carpinetum*, *Fraxino pannonici-Carpinetum*.
12. Pannonian-Balkanic turkey oak –sessile oak forests (91M0) are forests of the Pannonic, hills and plains of western and southern Romania, northern Balcanic hilly regions and in lower mountains with the continental *Acer tataricum*. Species include *Quercus cerris, Q. petraea* or *Q. frainetto* and related deciduous oaks.
13. Eastern white oak woods (91AA) with a submediterranean flora, occupying thermic oases within the sub-continental *Quercion frainetto* and *Carpinion illyricum* zones. Species include *Quercus pubescens*, *Q. virgiliana, Ostrya carpinifolia, Carpinus orientalis, Carpinus betulus, Fraxinus ornus, Galium dasypodium, Paeonia peregrine*.
14. Southern riparian galleries and thickets (92D0) (Nerio-Tamaricetea and Securinegion tinctoriae) concern tamarisk, oleander, and chaste tree galleries and thickets and similar low ligneous formations of permanent or temporary streams and wetlands of the thermo-Mediterranean zone and south-western Iberia. Includes formations of *Tamarix smyrnensis* (syn. *Tamarix ramosissima*) of stream sides and coastal localities of the Pontic and Steppic regions of western Eurasia.

The surface area of habitats and the number of SCIs which contain these habitats in each Member State are summarised in Figure 70 and Figure 71, collected from the fact sheets for the Pre-Scoping Document for the Natura 2000 Seminar at Continental, Pannonian, Black Sea and Steppic regions.

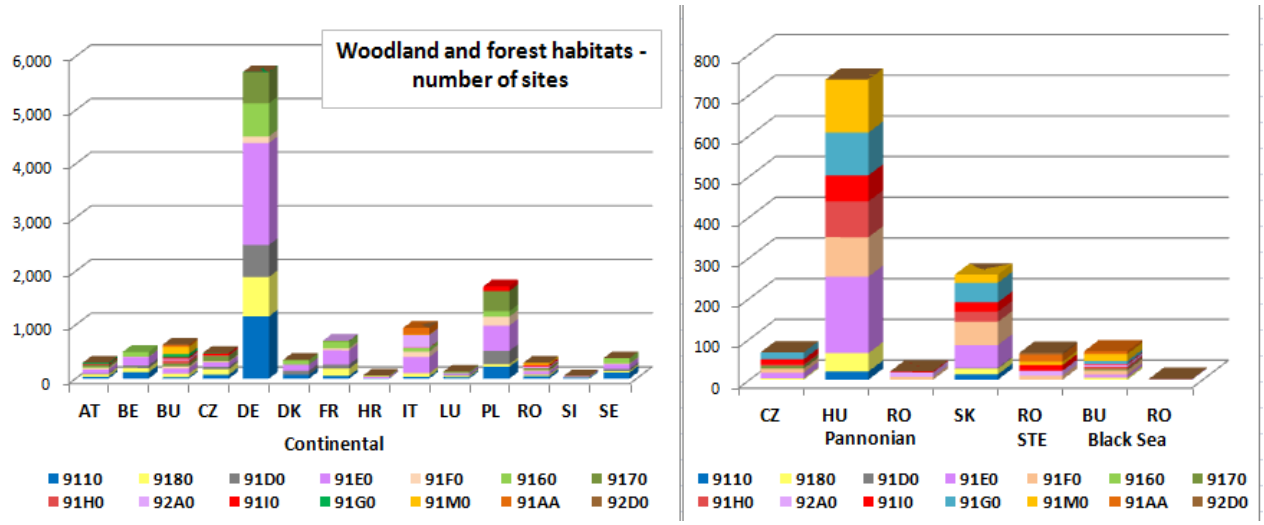


Figure 70 Number of SCIs with woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region. Data are presented in Table 36

Table 36 Number of SCIs with woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process by Member State and biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BU**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
9110	34	117	27	72	1,159	70	51	3	34	29	220	45	20	113
9180	47	80	64	104	733	0	133	4	64	23	48	30	8	30
91D0	11	49	2	43	596	75	78	0	0	11	247	4	0	35
91E0	75	155	96	84	1,900	115	264	26	302	38	471	52	14	89
91F0	36	5	40	16	124	0	39	5	104	0	166	22	2	12
9160	9	91	0	0	618	84	126	14	67	27	102	0	0	100
9170	35	0	52	105	574	3	12	0	0	0	377	42	0	0
91H0	13	0	59	14	0	0	0	3	7	0	0	8	0	0
92A0	0	0	28	0	0	0	4	0	231	0	0	24	0	0
91I0	8	0	29	34	0	0	0	0	0	0	86	26	0	0
91G0	25	0	58	7	6	0	0	0	0	0	0	0	0	0
91M0	2	0	132	0	0	0	0	2	9	0	0	35	0	0
91AA	0	0	41	0	0	0	0	0	127	0	0	6	0	0
92D0	0	0	6	0	0	0	0	0	0	0	0	0	0	0

8	Pannonian				STE	Black Sea			Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		CON	PAN	STE	BLS	
9110	0	20	0	13	0	0	0		1,994	33	0	0	2,027
9180	3	45	0	14	0	5	0		1,368	62	0	5	1,435
91D0	0	0	0	2	0	0	0		1,151	2	0	0	1,153
91E0	14	188	0	56	0	7	0		3,681	258	0	7	3,946
91F0	10	97	7	57	10	11	0		571	171	10	11	763
9160	0	0	0	0	0	0	0		1,238	0	0	0	1,238
9170	7	0	0	0	0	3	0		1,200	7	0	3	1,210
91H0	3	88	0	25	0	6	0		104	116	0	6	226
92A0	0	0	11	0	12	5	1		287	11	12	6	316
91I0	13	64	2	23	14	2	0		183	102	14	2	301
91G0	17	105	0	48	0	7	0		96	170	0	7	273
91M0	0	130	0	20	8	17	0		180	150	8	17	355
91AA	0	0	0	0	18	7	0		174	0	18	7	199

8	Pannonian				STE	Black Sea			Biogeographical Region				Total
Habitat	**CZ**	**HU**	**RO**	**SK**	**RO**	**BU**	**RO**		CON	PAN	STE	BLS	
92D0	0	0	0	0	4	0	1		6	0	4	1	11

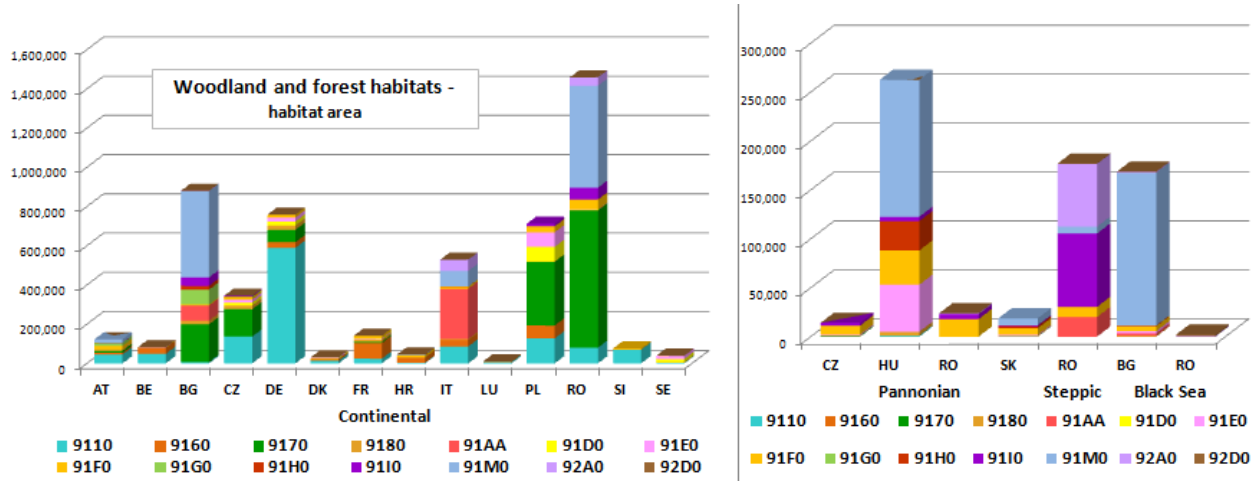


Figure 71 Area (in hectares) of woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region. Data are presented in Table 37

Table 37 Area (in hectares) of woodland and forest habitats selected for priority consideration in the Continental, Pannonian, Black Sea and Steppic Biogeographical Process for each Member State per biogeographical region

	Continental													
Habitat	**AT**	**BE**	**BG**	**CZ**	**DE**	**DK**	**FR**	**HR**	**IT**	**LU**	**PL**	**RO**	**SI**	**SE**
9110	44,800	48,300	6,393	136,519	589,146	13,200	*24,160	3,086	86,121	6,733	127,200	80,000	69,300	2,200
9160	8,800	30,700			28,829	9,200	80,000	25,407	32,380	3,914	66,000			1,600
9170	10,800		192,600	139,393	62,791	100	5,400				325,000	700,000		
9180	6,200	1,300	18,740	19,076	22,071		12,000	1,239	5,202	167	1,400	2,300	870	1,800
91AA			76,741						256,780			550		
91D0	460	700	8	14,954	20,327	4,000	3,000			18	74,500	1,070		16,600
91E0	23,100	3,600	26,692	42,180	64,417	10,500	141,000	19,084	33,097	325	150,000	12,000	5,760	400
91F0	17,500	55	5,353	11,817	14,496		13,300	11,817	10,118		30,000	50,000	5,755	40
91G0	15,700		75,898	2,949	*76									
91H0	230		19,507	781				815	*1,080			750		
91I0	910		42,757	4,197							13,000	60,000		
91M0	17,100		439,320					2,562	79,219			520,000		
92A0			2,312				100		57,717			42,500		
92D0			268											

	Pannonian				Steppic	Black Sea			Biogeographical Region				Total
Habitat	CZ	HU	RO	SK	RO	BU	RO		CON	PAN	STE	BLS	
9110		1,100		200					1,237,158	1,300	0	0	1,238,458
9160									286,830	0	0	0	286,830
9170	761					19			1,436,084	761	0	19	1,436,864
9180	218	4,000		900		780			92,365	5,118	0	780	98,263
91AA					20,000	2,668			334,071	0	20,000	2,668	356,739
91D0	1			*22					135,637	22	0	0	135,659
91E0	1,213	48,000		800		2,137			532,155	50,013	0	2,137	584,305
91F0	9,064	35,000	17,900	6,700	10,400	5,087			170,251	68,664	10,400	5,087	254,402
91G0	4,904	90,000		7,900		10,373			94,623	102,804	0	10,373	207,800
91H0	94	30,000		2,100		581			23,163	32,194	0	581	55,938
91I0	2,729	4,500	5,000	1,000	75,000	7			120,864	13,229	75,000	7	209,100
91M0		140,000		7,000	7,000	156,232			1,058,201	147,000	7,000	156,232	1,368,433
92A0			870		64,200	982	640		102,629	870	64,200	1,622	169,321
92D0					300	139	1,400		268	0	300	1,539	2,107

* Only area in SCI, because the area was not reported in the Article 17 report

5.9.2 References

Reports and scientific papers

Ambrus, A. False Ringlet (Coenonympha oedippus Fabr.) in the Hanság (NW- Hungary) http://fhnp.nemzetipark.gov.hu/_user/browser/File/English%20Version/Researches/oedipus_Bosarkany2_eng_DCS.pdf.

Ambrus, A. Habitat management on wet meadows of Fertőhomok and Hidegség for wetland invertebrates http://www.ferto-hansag.hu/_user/browser/File/English%20Version/Researches/Fertohomok_Ujlak090623_aa_ang21.pdf.

Ambrus, A. The case of Orange Eggar (Eriogaster catax) with the agri-environmental schemes in Hungary http://www.ferto-hansag.hu/_user/browser/File/English%20Version/Researches/Sargagyapjasszovo_ambrus_jav2.pdf.

Arany I. (ed). 2013. Four Highlights from Natura 2000 Forests: NGO recommendations on management. CEWeb for Biodiversity.

Article 17 reporting. 2013.

Bartha, D., Ódor, P., Horváth, T., Tímár, G., Kenderes, K., Standovár, T. Bölöni, J., Szmorad, F., Bodonczi, L. &and Aszalós, R. 2006. Relationship of tree stand heterogeneity and forest naturalness. Acta Silv. Lign. Hung. 2:7-22.

Biserkov V, Ch Gussev, V Popov, G. Hibaum, V Roussakova, I Pandursk, Y Uzunov, M Dimitrov, R Tzonev, S Tsoneva (Eds). 2011. Red Data Book of the Republic of Bulgaria. Volume 3. Natural habitats. IBEI – BAS & MOEW, Sofia, 422 pp.

Cholet, J.; Magnon, G. 2010. Tourbières des montagnes françaises - Nouveaux elements de connaissance, de réflexion et de gestion. Pôle Relais Tourbières / Fédération des Consertoires d'Espaces Naturels, 188p. Programme LIFE+ Nature "Réhabilitation fonctionnelle des tourbières du massif jurassien franc-comtois", dossier de candidature - version finale, mars 2014, 305p.

Christensen, M., Hahn, K., Mountford, E.P., Ódor, P., Standovár, T., Rozenbergar, D., Diaci, J., Wijdeven, S., Meyer, P., Winter, S. & Vrska, T. 2005. Dead wood in European beech (Fagus sylvatica) forest reserves. Forest Ecology and Management 210:267-282.

Cierlik G. (ed.) 2014. The management plan for Niepolomicka Forest Natura 2000 bird Special Protection Area. In Polish language. [example of measures to impelment for the normal forest management for the maintaining the birds populations relevant for the habitat type].

Colling, G. (2005). Red List of the Vascular Plants of Luxembourg, Travaux Scientifiques du Musée national d'histoire naturelle, Ferrantia, 42/2005, ISSN 1682 – 5519.

Czájlik, P. & Standovár, T. 1999. Hungary. In: Parviainen, J., Little, D, Doyle, M., O'Sullivan, A., Kettunen, M. & Korhonen, M. (eds.) Research in Forest Reserves and Natural Forests in European Countries. Country Reports for the COST Action E4> Forest Reserves Research Network. (EFI Proceedings No.16.) European Forest Institute, Joensuu, pp. 133-143.

Dimitrov M, D Dimova. 2014. Forest habitats in Besaparski ridove Special Protection Area (Natura 2000) in Southern Bulgaria: characteristics, status assessment and management recommendations. Acta Zoologica Bulgarica, suppl. 5: 129–136.

Doniţă N., Popescu A, Paucă-Comănescu M, Mihăilescu S., Biriş I. A. 2005(a). Habitatele din România, Editura Tehnică-Silvică, Bucureşti, 496 p -*Comisia Europeană 2007 - Interpretation Manual of European Union Habitats, EUR27. http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf Gafta D., Mountford J.O., (coord.). 2008. Manual de interpretare a habitatelor Natura 2000 din România. Editura RISOPRINT, Cluj – Napoca, 101 p.

Draft Conservation Measures Plans for Natura 2000: PLH200008 Dolina Biebrzy.

Draft Management Plan for Natura 2000 site Dolna Soła.

Draft Management Plan of Slowinski National Park and overlapping Natura 2000 sites. http://planyochrony.slowinskipn.pl/.

Drösler, M. et. al. 2011. „Klimaschutz durch Moorschutz in der Praxis". In: Arbeitsberichte aus dem vTI-Institut für Agrarrelevante Klimaforschung 04/2011, Braunschweig, Berlin, Freising, Jena, Müncheberg, Wien im April 2011.

Duna-Ipoly National Park Directorate (2015): Management plans of Érd-Tétényi-plató (HUDI20017), Debegió-hegy (HUDI20014), Érd-Százhalombattai táblarög (HUDI2005), Felső-Tápió (HUDI20019), Kirvai löszgyepek (HUDI20028), Székek (HUDI20046), Sárrét (HUDI20044), Szigethalmi homokbuckák (HUDI20045), Tápiógyörgye-Újszilvási szikesek (HUDI20024) Natura 2000 sites.

Duna-Ipoly National Park Directorate. 2011. Final report of Conservation of Euro-siberian steppic woods and Pannonic sand steppes in "Nagykörösi pusztai tölgyesek" pSCI (LIFE06 NAT/H/000098).

Ecological Studies in Białowieża Forest. Springer Verl, 537 pp. [ecological monograph of the habitat in Bialowieza forest, incl. relevant ecological processes, with special emphasis for processes under non-intervention approach.

Falinski J. B. 1986. Vegetation Dynamics in Temperate Lowland Primeval Forests.

Feichtinger, V. 2012. „Klimaprogramm Bayern 2020 – Moore (2009 – 2011) in Oberbayern“. In: Telma – Berichte der Deutschen Gesellschaft für Moor- und Torfkunde Band 42, Seite115 – 120, Hannover, November 2012.

Freibauer, A. et. al. 2009. „Das Potenzial von Wäldern und Mooren für den Klimaschutz in Deutschland und auf globaler Ebene“. In: Natur und Landschaft Heft 1, 84. Jahrgang.

Gogushev G. 2009. Floristic classification of oak forests in the West Frontier Mountains. Forestry ideas 37(1) 54–77.

Grosvernier, P.; Staubli, P. 2009. Régénération des hauts-marais. Bases et mesures techniques. L'environnement pratique, Office Fédéral de l'Environnement, n°0918, 96p.

Grygoruk et al. 2013. Climate-Adapted Management Plan for the Biebrza National Park. http://www2.ioer.de/download/habit-change/HABIT-CHANGE_5_3_1e_BNP_CAMP_for_Biebrza_NP.pdf.

Harald V, T Zlatanov, P Trajkov, S Dekanic. 2009. Role of coppice forests in maintaining forest biodiversity. Silva Balcanica, 10: 35–45.

Haraszthy L. (ed.) 2014. Natura 2000 fajok és élőhelyek Magyarországon [Natura 2000 species and habitats in Hungary]. Pro Vértes Közalapítvány Csákvár.

Herbichowa M., Pawlaczyk P., Stanko R. 2007. Ochrona wysokich torfowisk bałtyckich na Pomorzu. Doświadczenia i rezultaty projektu LIFE04NAT/PL/0028 PLBALTBOGS. Naturalists Club Poland.

High plateaus Life projects: http://biodiversite.wallonie.be/fr/meta-projet-life-de-restauration-des-tourbieres-de-haute-ardenne.html?IDC=5778.

Hinkov, G., T. Zlatanov, D. Pandeva. 2005. Processes of the oak forests degradation in the Middle Danube Plain. In: Proceedings of Eight Symposium on the Flora of Southeastern Serbia and Neighboring Regions, Niš, Serbia and Montenegro, June 20–24, 2005, 115–119.

Hinkov, G., T. Zlatanov, N. Stoyanov, 2006. Regeneration potential of stands dominated by Quercus robur L. in Vardim islands. Analele ICAS, 49 (1), 55–65. ISSN: 1842-8991.

Implementation of Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora and Council Directive 79/409/EEC on the Conservation of Wild Birds in Bulgaria through the Biological Diversity Act, edit and founded by the WWF-DCP.

Kavrakova V, D Dimova, M Dimitrov, R Tzonev, T Belev, K Rakovska (eds.). 2009. Manual for Determination of Habitats with European Importance in Bulgaria (Second edition), WWF–DANUBE CARPATHIAN PROGRAMME & GREEN BALKAN FEDERATION, 129 pp.

Kelemen, K., Kriván, A. & Standovár T. 2014. Effects of land-use history and current management on ancient woodland herbs in Western Hungary. Journal of Vegetation Science 25: 172-183.

Kelemen, K., Mihók, B., Gálhidy, L. & Standovár, T. 2012. Dynamic response of herbaceous vegetation to gap opening in a Central European beech stand. Silva Fennica 46(1): 53–65.

Kenderes, K. & Standovár, T. 2003. The impact of forest management on forest floor vegetation evaluated by species traits. Community Ecology 4(1):51-62.

Kiskunsági National Park Directorate. 2011. Final report of Conservation of the Pannon endemic Dianthus diutinus (LIFE06 NAT/H/000104).

Książkiewicz, Bierężnoj-Bazille, Krajewski, Gołdyn, 2014. New Records of vertigo geyeri (Lindholm, 1925), vertigo moulinsiana (Dupuy, 1849) and vertigo angustior (Jeffreys, 1830) in Poland. Folia Malacologica (in prep.).

Kujawa-Pawlaczyk J. Pawlaczyk P. 2014. Peatbogs of the Drawa Forests, NW Poland: resources - status - conservation. Naturalists Club Poland.

Larsson, T.-B., Angelstam, P., Balent, G., Barbati, A., Bijlsma, R.-J., Boncina, A., Bradshaw, R., Bücking, W., Ciancio, O., Corona, P., Diaci, J., Dias, S., Ellenberg, H., Fernandes, F.M., Fernández-Gonzalez, F., Ferris, R., Frank, G., Friis-Moller, P., Giller, P.S., Gustafsson, L., Halbritter, K., Hall, S., Hansson, L., Innes, J., Jactel, H., Keannel-Dobbertin, M., Klein, M., Marchetti, M., Mohren, G.M.J., Niemelä, J., O'Halloran, J., Rametsteiner, E., Rego, F., Scheideger, C., Scotti, R., Sjöberg, K., Spanos, I., Spanos, K., Standovár, T., Svensson, L., TommerÍs, B.A., Trakolis, D., Uuttera, J., VanDenMeersschaut, D., Vandekerkhove, K., Walsh, P.M. & Watt, A. 2001. Biodiversity Evaluation Tools for European forests. Ecological Bulletins, 50: 1-237.

Life 2015-2019 Project LIFE13 NAT / PL / 000018. Protect selected priority habitats and species of the Ostoja Słowińska PLH 2200023 and the Pobrzeże Słowińskie PLB 220003, Phase I - website of the project in preparation. 2015-2019.

Life Project: Assessment of the population of deer in the Slowinski National Park. Phase II. 2014 – 2018.

Luick R. & Schuler H.-K. 2008. Waldweide und forstrechtliche Aspekte. Berichte des Institutes für Landschafts- und Pflanzenökologie der Univ. Hohenheim (17), 149-164, Stuttgart-Hohenheim.

Management Plan for Natura 2000 site Suchy Młyn. Zarządzenie nr 32/2012 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 grudnia 2012 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Suchy Młyn PLH240016 (Dz. Urz. Woj. Śl. z dnia 24 grudnia 2012 r. poz. 6035).

Management Plan for Slowinski National Park.
http://dziennikurzedowy.mos.gov.pl/attachments/article/350/zarz%C4%85dzenie%20nr%2031.pdf.

Management Plan of Natura 2000 site Cieszyńskie Źródła Tufowe. Zarządzenie nr 38/2013 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 31 grudnia 2013 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Cieszyńskie Źródła Tufowe PLH240001 (Dz. Urz. Woj. Śl. z dnia 8 stycznia 2014 r. poz. 118).

Management Plan of Natura 2000 site Graniczny Meander Odry. Zarządzenie nr 36/2013 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 23 grudnia 2013 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Graniczny Meander Odry PLH240013 (Dz. Urz. Woj. Śl. z dnia 30 grudnia 2013 r. poz. 7874).

Management Plan of Natura 2000 site Podziemia Tarnogórsko-Bytomskie Zarządzenie Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 kwietnia 2014 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Podziemia Tarnogórsko-Bytomskie (Dz. Urz. Woj. Śl. z dnia 29 kwietnia 2014r. poz. 2576).

Management Plan of Natura 2000 site Suchy Młyn. Zarządzenie nr 32/2012 Regionalnego Dyrektora Ochrony Środowiska w Katowicach z dnia 24 grudnia 2012 r. w sprawie ustanowienia planu zadań ochronnych dla obszaru Natura 2000 Suchy Młyn PLH240016 (Dz. Urz. Woj. Śl. z dnia 24 grudnia 2012 r. poz. 6035).

Matuszkiewicz J. M. 2007. Geobotanical identification of the development tendencies in forest associations in the regions of Poland. Polish Academy of Siences, Institute of Ggeography ans Spatial Management, 978 pp + CD. In Polish language. [changes in species compostion documented].

Ministère de l'Environnement, Administration des Eaux et Forêts, Service de la Conservation de la Nature. (2000). Mise en œuvre de la directive européenne 92/43/CEE « Habitats ». Cahiers Habitat.

Ministère de l'Environnement. 2006. Vorkommen und Zustand der Moorwälder in Luxemburg. Code Natura 2000: 91D0*, Bog woodland - Tourbières boisées - Moorwälder. Etude par la Fondation "Hëllef fir d&Natur".

Müller J., Bütler R. 2010. A review of habitat thresholds for dead wood: a baseline for management recommendations in European forests. European Journal of Forest Research 129, 6. [comprehensive review of euroepan biodiversity requirements for deadwood - the most common threshold for 9170 habitat is ca 40-50 m3/ha].

Müller-Kroehling, S. & Zollner, A. 2015. Moorschutz im Wald – gestern, heute, morgen. LWF aktuell 104: 21-25.

Müller-Kroehling, S. 2013. Eichenwald-Lebensraumtypen der FFH-Richtlinie in Deutschland – drängende Fragen und mögliche Ansätze für ein Konzept zur Erhalt und Sicherung eines günstigen Erhaltungszustandes. – in: Lehrke, S., Ellwanger, G., Buschmann, A., Frederking, E., Paulsch, C., Schröder, E., Ssymank, A. (Hrsg.): Natura 2000 im Wald. Lebensraumtypen, Erhaltungszustand, Management. Bundesamt für Naturschutz: Naturschutz und Biologische Vielfalt 131, 199-207.

Müller-Kroehling, S. 2014. Eichenwälder in FFH-Gebieten – Kulturwald für den Naturschutz. – LWF Wissen 75 (Beiträge zur Traubeneiche, Baum des Jahres 2014): 65-69.

Multifunctional management of coppice forests: Contributions to rural development, maintenance of biodiversity, and climate change mitigation and adaptation in natural resource management. Assigned by SEE-ERA.NET (Integrating and strengthening the European research area in Southeast Europe). INTAS Ref. № 06–1000031–10648. Period of implementation: 2007–2009. Project manager: Prof. Manfred Lexer (University of Natural Resources and Applied Life Sciences, Vienna).

National Prioritised Action Framework (NPAF) for Natura 2000 Bulgaria for the EU Multiannual Financing Period 2014-2020. http://dicon-bg.com/data/ufiles/files/NPAF_Bulgaria_EN.pdf.

Natura 2000 and forests 'Challenges and opportunities': Interpretation Guide (2003) European Commission.

Natura 2000 sites legal measures.: http://environnement.wallonie.be/legis/consnat/cons045.htm.

Okolow C., Karas M., Bolbot A. 2009. Bialowieza National Park, 237 pp. [national park monograph with the description of habitats changes under non-intervention, the proofs for relevance of the non-interventon approach for this habitat in Bialowieza forests].

P. Pawlaczyk, 2014: The accumulation and carbon emissions by peatlands including alkaline bogs. Naturalists Club. http://alkfens.kp.org.pl/wp-content/uploads/2013/01/2014-09-03_Us%C5%82ugi-ekosystemowe_7230_v-final.pdf.

Paillet, Y., Bergès, L., Hjältén, J., Ódor, P., Avon, C. Bernhardt-Römermann, M., Bijlsma, R-J., De Bruyn, L., Fuhr, M., Grandin, U., Kanka, R., Lundin, L., Luque, S., Magura, T., Matesanz, S., Mészáros, I., Sebastià, M-T., Schmidt, W., Standovár, T., Tóthmérész, B., Uotila, A., Valladares, F., Vellak, K., Virtanen, R. 2010. Biodiversity differeneces between managed and unmanaged forests: Meta-analysis of species richness in Europe. Conservation Biology 24(1): 101-112.

Pavlov, D., Dimitrov, M. 2002. A syntaxonomic analysis of the floodplain forests in the maintained reserves "Dolna Topchiya" and "Balabana. Forest Science (Sofia) Volume: 39 (1) 3–19.

Pawlaczyk P. 2010. 91F0 habitat in Poland - monitoirng report. Mscr for Institute of Nature Conservation in Krakow, Poland.

Pichler V, P Godinho-Ferreira, T Zlatanov, M Pichlerová, J Gregor. 2011. Changes in Forest Cover and its Diversity. In: Bredemeier M, S Cohen, D Godbold, E Lode, V Pichler, P Schleppi (eds.). Forest Management and the Water Cycle: An Ecosystem-Based Approach. Springer, Ecological Studies, Volume 211, Part 2, 209–224, DOI: 10.1007/978-90-481-9834-4-12.

Potential for sustainable management of the forests in Razgradski visochini region. Contract between the Municipality of Razgrad and the Forest Research Institute, Sofia. Period of implementation: 2007–2008. Project manager: Dr. Georgi Hinkov.

Rosenkranz, L.; Wippel, B.; Seintsch, B. 2012. FFH-Impact; Teil 1: Umsetzung der FFH-Richtlinie im Wald in den Bundesländern.

Second Scientific Conference Management in river valleys in Natura 2000 areas. https://natura2000poznan.wordpress.com/.

Siuda, C. et. al. 2010. „Moorrenaturierung kompakt – Handlungsschlüssel für die Praxis“. UmweltSpezial, Bayerisches Landesamt für Umwelt, Augsburg.

Stajic B, T Zlatanov, I Velichkov, T Dubravac, P Trajkov. 2009. Past and recent coppice forests management in some regions of South-Eastern Europe. Silva Balcanica, 10: 9–19.

Standovár, T. & Kenderes, K. 2003. A review on natural stand dynamics in beechwoods of East Central Europe. Applied Ecology and Environmental Research 1(1–2): 19–46.

Standovár, T. 2000. A természetes és a kezelt erdők főbb különbségei. In: Frank, T. (szerk.) Természet-Erdő-Gazdálkodás. Magyar Madártani és Természetvédelmi Egyesület, Pro Silva Hungaria, Eger, pp. 26-37.

Standovár, T., Ódor, P., Aszalós, R. & Gálhidy, L. 2006. Sensitivity of ground layer vegetation diversity descriptors in indicating forest naturalness. Community Ecology 7(2):199-209.

SZIE-VÁTI-ÖBKI-KVVM 2009. Management plans of Izsáki Kolon-tó (HUKN30003), Szigeti homok (HUDI20047), Turjánvidék (HUDI20051), Veresegyházi-medence (HUDI20055), Tengelici-homokvidék (HUDD20040) Natura 2000 sites.

Tamás Frank, Ferenc Szmorad / Duna-Ipoly Nemzeti Park Igazgatóság. 2014. Védett erdők természetességi állapotának fenntartása és fejlesztése. pp: 51-122.

Vassilev V. et al. 2013. National Action Plan for Conservation of Wetlands of High Significance in Bulgaria 2013 - 2022 http://bbf.biodiversity.bg/document-137.

Velichkov I, T Zlatanov, G Hinkov. 2009. Stakeholder analysis for coppice forestry in Bulgaria. Ann. For. Res., 52: 183-190.

Walentowski, H., Bußler, H., Bergmeier, E., Blaschke, M., Finkeldey, R., Gossner, M., Litt, T., Müller-Kroehling, S., Philippi, G., Pop, V.V., Reif, A., Schulze, E.-D., Strätz, C. & Wirth, V. (2010.): Sind die deutschen Waldnaturschutzkonzepte adäquat für die Erhaltung der buchenwaldtypischen Flora und Fauna? Eine kritische Bewertung basierend auf der Herkunft der Waldarten des mitteleuropäischen Tief- und Hügellandes. - Forstarchiv 81, 195-217.

Wibail, L., Goffart, Ph., Smits, Q., Delescaille, L.-M., Couvreur, J.-M., Keulen Chr., Delmarche, C., Gathoye, J.-L., Manet, B. & Derochette, L. (2014). « Évaluation de l'état de conservation des habitats et espèces Natura 2000 en Wallonie. Résultats du Rapportage Article 17 au titre de la Directive 92/43/CEE pour la période 2007-2012. » DGOARNE, Département de l'Étude du Milieu Naturel et Agricole-Direction de la Nature et de l'Eau, Gembloux, 277 p. http://biodiversite.wallonie.be/fr/resultats-du-rapportage-article-17-au-titre-de-la-directive-92-43-cee-pour-la-periode-2007-2012.html?IDD=4237&IDC=5803.

Winter S., Möller G. C. 2008 - Microhabitats in lowland beech forests as monitoring tool for nature conservation. Forest Ecology and Management 255 (2008) 1251–1261.

Winter, S.; Svhumacher, H.; Flade, M.; Moeller, G. 2003. Naturschutzstandards für die Bewirtschaftung von Buchenwäldern im nordostdeutschen Tiefland. Sachbericht der Landesanstalt für Großschutzgebiete über das F+E Vorhaben „Biologische Vielfalt und Forstwirtschaft“.

Zlatanov T, I Velichkov, M Lexer, T Dubravac. 2010. Regeneration dynamics in aging black pine (Pinus nigra Arn.) plantations on the south slopes of the Middle Balkan Range in Bulgaria, New forests, 40: 289–303, DOI: 10.1007/s11056-010-9200-5.

Zlatanov T. 2006. Perspectives for sustainable management of the forests in Lesnovska river basin. Journal of Balkan Ecology, 9: 125–130.

Zlatanov T. 2006. Successional trends in pedunculate oak (Quercus robur L.) dominated forests along the upper reaches of Tundzha river – Southern Bulgaria. Austrian Journal of Forest Science 123: 185–197.

Zlatanov, T., G. Hinkov, T. Stankova. 2007. Structure and dynamics of the black alder (Alnus glutinosa (L.) Gaerth.) population along Glogozka river in Osogovo mountain, Silva Balcanica, 8 (1), 16–24. ISSN: 1311 – 8706.

Zoltán Varga / Szerif Kiadói Kft. 2014. A pannon régió élő öröksége - a natura 2000 hálózat. pp: 43-51.

Zolyomi A. 2014. Integrating the Water Framework Directive and the Nature Directives: implementation in Central and Eastern Europe. CEEweb for Biodiversity.

Websites

Circulaire biodiversité: http://environnement.wallonie.be/publi/dnf/normes.pdf.

Circulaire biodiversité: http://environnement.wallonie.be/publi/dnf/normes.pdf

Code Forestier (legal instrument): http://environnement.wallonie.be/legis/dnf/forets/foret025.htm.

Code Forestier (legal instrument): http://environnement.wallonie.be/legis/dnf/forets/foret025.htm

High plateaus Life projects: http://biodiversite.wallonie.be/fr/meta-projet-life-de-restauration-des-tourbieres-de-haute-ardenne.html?IDC=5778

http://biodiversite.wallonie.be/fr/resultats-du-rapportage-article-17-au-titre-de-la-directive-92-43-cee-pour-la-periode-2007-2012.html?IDD=4237&IDC=5803.

http://ec.europa.eu/agriculture/publi/brochures/forestry/full_en.pdf

http://ec.europa.eu/environment/forests/pdf/ifp_ecologic_report.pdf

http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.getProjects&themeID=86&projectList

http://ec.europa.eu/environment/life/publications/lifepublications/lifefocus/documents/forest_lr.pdf

http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

http://ec.europa.eu/environment/nature/natura2000/financing/index_en.htm

http://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/9110_Luzulo-fagetum_beech_forests.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/documents/mediterranean_seminar_input_document_draft_20140516_en.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/documents/alp-background-document-forests-updated_en.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/documents/atl-background-document-15062012_en.pdf

http://ec.europa.eu/environment/nature/natura2000/platform/index_en.htm

http://environnement.wallonie.be/legis/consnat/natura019.htm

http://eunis.eea.europa.eu/

http://inpn.mnhn.fr/docs/cahab/tome1.pdf

http://siedliska.gios.gov.pl/pdf/siedliska/2009-2011/wyniki_monitoringu_siedlisk_4030.pdf

http://www.bfn.de/0316_natura2000+M52087573ab0.html

http://www.biebrza.org.pl/161,protection-of-non-forest-ecosystems.html

http://www.ceeweb.org/wp-content/uploads/2011/12/four_highlights_Natura_2000_forests.pdf

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/continental_biogeografical_region.pdf

http://www.eea.europa.eu/publications/report_2002_0524_154909/biogeographical-regions-in-europe/blacksea reg.pdf

http://www.eustafor.eu/failid/File/Publications/Eustafor_Natura2000_web.pdf

http://www.financing-natura2000.eu/wp-content/uploads/2014/01/part_1N.pdf

http://www.gios.gov.pl/siedliska/pdf/metodyka_monitoringu_siedlisk_2011_91F0.pdf

http://www.gorna.biebrza.org.pl/664,welcome.html

http://www.icp-forests.org/

http://www.natura2000.hr/UtilPages/GetDBDocument.aspx?id=49

http://www.renaturyzacja.biebrza.org.pl/407,general-information.html

http://www.surf-nature.eu/fileadmin/SURFNATURE/Publications/Thematic_Booklet_Forest_Biodiversity.pdf

https://www.researchgate.net/profile/Andras_Ambrus3/publications

Natura 2000 sites legal measures: http://environnement.wallonie.be/legis/consnat/cons045.htm http://environnement.wallonie.be/legis/consnat/natura019.htm