

## HABIT-CHANGE

# Report about existing management practices in protected areas and climate-change related changes of management practices

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## 1. Introduction, objectives and method

In the application form for the HABIT-CHANGE Project output 3.3.1 is described as a report about

- existing management strategies in protected areas and
- climate-change related changes of management strategies and practices.

Based on the results of the literature review (see output 3.1.1), the report on user requirements (see output 3.1.5) and a survey of management practices in HABIT-CHANGE investigation areas this report is supposed to give:

- a description of existing management strategies and measures in the HABIT-CHANGE investigation areas,
- a description of new climate-change related management strategies and practices that may be used for adaptation of protected area management.

One of the most important outcomes of the HABIT-CHANGE Project is the development of climate-change adapted management plans (CAMPs) in work package 5. Basis for the adapted management plans are the existing management plans with their strategies and measures. Therefore it is necessary to examine existing plans and to identify strategies and measures that aim at the conservation and enhancement of protected habitats according to the EU Habitat-Directive 92/42 and other habitats.

In this report strategies and measures of management authorities in HABIT-CHANGE investigation areas are identified and described. The term “management practices” includes both management strategies and management practices. Definitions for objectives, strategies and measures are given below in chapter 1.5.

Output 3.3.1 focuses on strategies and measures that aim at the maintenance and protection of valuable habitats while other measures that aim at economic and social development inside the areas are only compiled but not analysed in depth. Strategies and measures to reach socio-economic objectives were also identified because they may influence the status of protected habitats and may also offer opportunities to change management practices in favour of nature conservation goals.

During the process of adapting the management plans (CAMPs) all existing strategies and measures for nature conservation as well for socio-economic development have to be evaluated and discussed regarding their possibilities and constraints in supporting the adaptation to climate change. This evaluation of strategies and measures regarding their capabilities to maintain or improve the conservation status of protected habitats under climate change will be subject of output 3.4.1 “Report on impacts of different management practices”.

During the application phase of the HABIT-CHANGE Project it was expected that climate-change related changes of management strategies and practices are already in force in the investigation areas. It was presumed that management authorities of protected areas would have profound awareness of climate change and already plan and implement appropriate reactions to reduce the impacts of climate change on habitats. This assumption did not prove to be true. The participating investigation areas do indeed have a risen awareness of climate change and they already experience the impacts of climate change on the protected areas but they join the HABIT-CHANGE Project

because they seek for advice and support on how to react best to climate-induced changes in protected habitats. Climate-change adapted strategies and measures therefore could not be reported from the investigation areas but had to be identified from literature and other research projects.

In this report we present the status quo of management strategies and measures in HABIT-CHANGE investigation areas (chapter 2 to 4). This information was collected via questionnaires from all investigation areas. In chapter 2 the overall goals and strategies for the protected areas are compiled. For each investigation area that answered the questionnaire “management measures” the respective goals and strategies were first extracted from the questionnaires and then completed and confirmed by the area managers. In chapter 3 the existing strategies and measures are assigned to the respective habitat-types. That way it is possible to relate the management responses (measures) directly to the different habitat-type as they are defined in Annex 1 of the Habitats-Directive 92/42. In chapter 4 possible changes and adaptations of strategies and measures have been extracted from literature.

## 1.1. Objectives

In the process of developing climate-change adapted management plans for selected investigation areas the identification and assessment of existing strategies and measures is an important first step. It is the basis for the evaluation of possible impacts and the effectiveness of strategies and measures in output 3.4.1. In the process of developing climate-change adapted management plans (CAMPs) the identification of strategies and measures typically in power in the investigation areas is the starting point of the process.

Objectives of this output are:

- The identification of existing management **goals** as described in the management plans of HABIT-CHANGE investigation areas
- The identification of existing management **strategies** and **measures** in HABIT-CHANGE investigation areas
- The identification and description of **new**, climate-change related management strategies and measures from literature
- The compilation of a choice of adaptation options for strategies and measures in nature conservation.

## 1.2. Relevance for other work packages and outputs of the HABIT-CHANGE project

Output 3.3.1 is the basis for output 3.4.1 “Report on impacts of different management practices”. The inventory about existing goals, objectives, strategies and measures in this report allows an evaluation of appropriateness to climate-change challenges and is the basis for the development of new, climate-change adapted objectives, strategies and measures. The information in this report is



an important information and input for the evaluation of impacts of different management strategies and practices.

The identification and the evaluation of already implemented or suggested new strategies and measures are the basis for the climate-change related enhancement of existing management plans and strategies (CAMPs) in output 5.3.1.

The information compiled in this report will be also used for the report of climate-change adapted management strategies and practices (output 6.1.1) and output 6.1.2 “List of recommendations for management changes and output 6.1.3 “Draft of management strategy guideline focussing on strategies for climate-change adapted management”.

The compilation of possible management responses in specific habitat-types is also an important basis for the development of the spatial decision support system (SDSS).

### 1.3. Method

The main data for this report was retrieved via questionnaires that were sent to all investigation areas. In these questionnaires we asked the investigation areas to fill in:

- Information about the overall objectives or targets of the area, the conceptual framework and the hierarchy of goals and objectives
- Information about strategies of conservation (if the term “strategy” is used at all)
- Information about measures, practices, actions that are described in the **management plan** aiming at **nature conservation**
- Information about **socially or economically motivated** interventions that are described in the **management plan**
- Information about interventions that are realized in the protected area but are **not mentioned in the management plan**

After receiving the filled questionnaires it became obvious that terms and definitions had to be discussed and standardised. The structure and categories of tables in this report had to be adapted to the needs of the spatial decision support system (SDSS) and the requirements of the process of adapting the management plans (CAMP-process). The data from questionnaires was assorted and a draft version of the report was sent to the investigation areas and the responsible project partner for validation and completion. Information about new and climate-change related management strategies and measures was explored in a literature review. Results of this review are presented in tables in chapter 4.

## 1.4. Discussions on methods and content within the workgroup

During the second project meeting in Illmitz, Austria the responsible project partners for this output came together to define goals and a methodological approach for output 3.3.1. It was agreed that the necessary information about existing management strategies and practices should be retrieved by a questionnaire. The questionnaire was developed and sent to all investigation areas by project partner 6, Berlin Institute of Technology (TUB). The questionnaires were necessary because the management plans for the protected areas are only available in national languages and therefore had to be searched for strategies and measures by native speakers and responsible project partners in the participating member states. During the workshop in Illmitz it was also agreed that as much information as possible should be collected with the questionnaires. Therefore questions about goals and objectives not related directly to nature conservation but to the social and economic development of the areas were inquired, too.

It was also discussed how to estimate the liability of the measures and strategies defined in management plans. Responsible group members from management authorities pointed out, that measures defined in the management plan are not necessarily implemented in the area and on the other hand some measures taken in the investigation areas do not originate from the management plan but from other sector planning or short term needs for intervention. Therefore a separate section for implemented measures that are not based on the management plan was added to the questionnaire.

In the tables in chapter 3 all measures and strategies reported from the investigation areas are summed up. Those are the measures as they are defined in the management plans as well as the measures that are implemented inside the protected area but are not directly defined in the management plan. Because all measures have to be evaluated later in output 3.4.1 and all measures and strategies are options for climate-change adapted management plans a separate presentation of measures regarding their origin did not seem helpful. The compilation of all measures in one list allows also the transfer to the SDSS. Assorting the measures according to the habitat-types of the Habitat-Directive allows the development of a system of transferable information for other protected areas.

Concerning the formerly planned collection of new, climate-change related strategies and measures that would complement the existing strategies and measures the discussion in Illmitz showed, that the involved investigation areas do not have these new strategies and measures yet but are expecting advice and guidelines on how to develop them from the HABIT-CHANGE Project. It was stated, that strategies and measures in force in the investigation areas aim to solve already existing problems and conflicts. Some of these problems and conflicts may be induced by climate change but most of them are responses to land-use changes and land-use pressures. It was expected that new strategies and measures would be mentioned in the section of the questionnaire where measures that don't base on the management plan could be filled in. The latter evaluation of these strategies and measures should allow putting them into context of climate change, or not.

Another question discussed during the project meeting in Illmitz, Austria, was the relation and dependency of different (ecologic, economic and social) goals of the investigation areas. If the HABIT-CHANGE project would consider only the objectives for nature conservation inside the investigation

areas important tasks and challenges of the protected areas and their management authorities would have to be ignored. Conflicting goals and objectives in protected areas are common in all protected areas. The acceptance for measures and objectives of nature conservation may rise in neighbouring communities if social and economic development is also taken into consideration and the needs and interests of land-users and neighbours are taken seriously into account. Goals, objectives and measures for the social and economic development of protected areas may also be a starting-point for adaptation because most habitats are endangered by land-use and land-use changes that are induced by economic interests. Changing economically driven land-use practices may enhance the resilience of habitats and help mitigating the impacts of climate change. Therefore the survey included a section about economic and social goals, objectives and measures.

The questionnaires “management practices” were filled by the following investigation areas:

- Rieserferner-Ahrn Nature Park, Italy,
- Vessertal Thuringian Forest Biosphere Reserve, Germany,
- Balaton Uplands National Park, Hungary,
- Fertő-Hanság and Lake Neusiedl National Park, Hungary/Austria
- Körös-Maros National Park, Hungary,
- Biebrza National Park, Poland,
- Danube Delta Biosphere Reserve, Romania,
- Bucegi Nature Park, Romania,
- Secovlje Salina Nature Park, Slovenia,
- Triglav National Park, Slovenia.

The analysis of the filled questionnaires showed that the results still had to be homogenised and adapted to a uniform terminology. Strategies were not explicitly defined in most management plans. For an easier evaluation of management measures the different measures were assigned to a choice of strategies by the responsible output-leader, TUB. In chapter 2 the answers given by area managers are represented in the way they were given to show how different terms are used in different management plans. In chapter 3 the different management strategies and reported measures are assigned to those strategies.

The use of terms concerning the management is very heterogeneous in all investigation areas. Words like objective, target, aim and goal are used with different meanings and are connected to different strategies. Measures are usually not defined sufficiently: usually no time-line for achieving the goals and no quantified degrees of target achievement can be found in descriptions of measures.

Often it is difficult to distinguish between objectives, strategies and measures because they are closely related to each other. For example: the conservation of a reed belt could be the objective as well as a strategy or even aggregate different measures of conservation. Therefore the following definitions should be used by all partners of the HABIT-CHANGE project to avoid misunderstandings and confusion.

## 1.5. Definitions

Already in the discussion in Illmitz it became clear that the understanding of terms used in different management plans was very heterogeneous and had to be standardized. The answers in the questionnaires made it obvious that more work on standardisation had to be done.

The following definitions are the basis for understanding the outputs in work package 5. In nature conservation as in many other policies many terms and definitions are used in a manifold meaning. The lack of a uniform use of terms and binding standards makes agreements within every project necessary. Different management plans, programmes and documents contain many different terms and definitions that are not compatible. For a successful cooperation and communication an agreement on terms and definitions is essential.

For the scope of aims, goals, targets, concepts, objectives, measures, actions, practices and strategies of nature conservation we suggest to use only the following terms in the defined way. Regarding the management activities in protected areas in the HABIT-CHANGE Project the following terms are defined as:

- **Goal:** Object or status to be achieved, defined on a programmatic and more abstract level, leaving strategy and measure to achieve the goal open; examples could be: restoration of wetlands, protection of biodiversity, sustainable development, reduction of emissions etc. In protected areas goals may be defined for the economic, social and ecological development. “Goals are general statements about desired project outcomes and, as such, a goal is a vision of what you want” (Peters and Clarkson, 2010), 62).
- **Objective:** in contrast to goals objectives are more specific, detailed and concrete. Objectives allow the assignment of strategies and measures. Different objectives can be derived from super ordinate goals. Each objective usually relates to a logically related set of threats and constraints (IUCN and SSC, 2008), p. XII). For example: the goal “restoration of wetlands” may be substantiated by the following objectives: “achievement of good conservation status of habitat xy until year 2015”, “Reduction of number of endangered species in wetlands from now 45 % to 25 % in year 2015” or “Expansion of reed-belt by 30 % until the end of year xy”. In management practices today most objectives are not substantiated by quantified specifications for date and percentage. That makes monitoring activities difficult. Usually objectives in management plans are only defined in a qualitative manner, like: “Enhancement of habitat quality for habitat type XY”. Generally spoken, all objectives should be: specific, measurable, attainable, relevant and time-bound (SMART) (IUCN and SSC, 2008).

- **Strategy:** a strategy is a systematic plan of action to accomplish a specific objective. Concerning the management of protected areas a strategy is an instrumental or methodical approach that stands between specific objectives and the detailed and implementation-orientated management measures (e.g. the mechanical removal of invasive plants in a protected habitat). A management strategy defines a methodical approach on how to reach given objectives. Strategies can be diverse: It could be for example the enforcement of the scientific knowledge base by spending money for biodiversity research, or improvements of the stakeholder dialogue to convince land-users to implement measures that help reaching nature-conservation objectives (and goals). Environmental education, visitor information, policy development, advocacy and fundraising and cooperation between different protected areas could be defined as strategies in nature-conservation, too. Also the decision for an active interference in habitats by resource-intensive measures in contrast to a reluctant management that allows natural development and succession could be defined as different strategies in conservation. "Strategies [...] provide the context for well-coordinated and effective action, and the processes used to develop them should consider, at every step, the most effective ways to facilitate and motivate implementation." (IUCN and SSC, 2008)VIII)
- **Measures:** the term is used synonym to the term "management actions" which need to be performed to achieve the objectives and, ultimately, the goals. Measures describe activities that are mentioned either in the management plans or other programs and plans of the protected area. They are implemented by the management authorities of the protected area or by land-users inside the area. Examples of measures could be: "Mowing pastures twice a year at fixed dates", "Mechanical removal of invasive plants", "Installation of nesting boxes for an endangered bird species" etc.

## 2. Existing management goals and strategies in HABIT-CHANGE investigation areas

In the questionnaire “Management measures” all HABIT-CHANGE investigation areas were asked to name the main goals of the protected area. They were also asked to give information on the conceptual framework for those goals and - if existing - the hierarchy of goals.

It was also asked if the term “strategy” is used in the management plan and is defined as a strategy. The investigation areas were asked to give examples.

In this chapter each investigation areas starts with a short description of the area and its main features and is followed by the goals and strategies as they are defined in the management plans for the area. This shows how differently the terms are used in the respective areas and how the management plan is structured. The goals and strategies reported from the investigation areas partly do not match the definitions given in Chapter 1.5.

### 2.1. Rieserferner-Ahrn Nature Park, Italy

The Rieserferner-Ahrn Nature Park is situated in the north-eastern part of the Autonomous Province Bozen-Südtirol (Italy). It extends over an area of around 313 km<sup>2</sup> belonging to the municipalities of Sand in Taufers, Gais, Percha, Rasen-Antholz, Ahrntal and Prettau. The Park is situated between the bottom of the Tauferer Ahrn Valley in the northwest, the Austrian border at Staller Sattel in the east, Antholztal in the south-east and Pustertal in the south.

The Rieserferner-Ahrn Nature Park was founded in 1988. It borders on the Hohe Tauern National Park (1,786 km<sup>2</sup>). Together with the Zillertaler Hauptkamm Nature Park (372 km<sup>2</sup>), they build up the biggest association of protected areas in Europe, with a total area of 2,471 km<sup>2</sup>. Almost 98 % of the Park consists of protected habitats according to the Habitats-Directive 92/42.

Main habitat types according to Annex 1 of the Habitat Directive are:

		area (ha)	percentage %
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation	45,13	0,14
3220	Alpine rivers and the herbaceous vegetation along their banks	80,48	0,26
4060	Alpine and boreal heaths	1.106,63	3,53
6150	Siliceous alpine and boreal grasslands	2.885,41	9,22
6170	Alpine and sub-alpine calcareous grasslands	930,20	2,97
6230*	Species-rich <i>Nardus</i> grasslands, on siliceous substrates	1.766,14	5,64
6430	Hydrophilous tall herb fringe communities	113,47	0,36
6510	Lowland hay meadows ( <i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i> )	5,44	0,02
6520	Mountain hay meadows	339,30	1,08
7140	Transition mires and quaking bogs	56,60	0,18
7240*	Alpine pioneer formations of <i>Caricion bicoloris-atrofuscae</i>	28,26	0,09

		area (ha)	percentage %
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	5.898,43	18,84
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	592,22	1,89
8210	Calcareous rocky slopes with chasmophytic vegetation	406,15	1,30
8220	Silicolous rocky slopes with chasmophytic vegetation	4.566,72	14,59
8340	Permanent glaciers	1.351,31	4,32
9410	Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)	6.462,96	20,64
9420	Alpine Larix decidua and/or Pinus cembra forests	3.984,9	12,73
Total area of habitats protected by the Habitats-Directive 92/42		30.619,75	97,79

### 2.1.1. Management goals

The goal of nature conservation for the montane (forest) zone is the protection of biodiversity and (landscape) forms and the maintenance of rare forest communities and forest biotopes.

Measures to protect and enhance alpine bogs, measures to maintain current land uses and to prevent an increase of uses, arrangements for the use of water courses under ecological criteria and a moderate control of expansions are all stipulated in the alpine area. Specific commitment goals on both landscape types (forest and alpine zones) are integrated into the management plan.

### 2.1.2. Management strategies

The term "strategy" is not used in the management plan.

## 2.2. Vessertal Thuringian Forest Biosphere Reserve, Germany

The Biosphere Reserve is situated in the middle of Germany in the Thuringian Forest between the towns Suhl, Ilmenau and Schleusingen. It was acknowledged by the UNESCO in 1979 and today has about 17,000 ha differentiated in core-area (3.3 %), buffer-zones (11.4 %) and transition-zones (85.3 %). The Biosphere Reserve covers mainly rural area, only at the edge it is tangent to the densely populated area Suhl-Zella-Mehlis. The Vessertal-Thuringian Forest Biosphere Reserve is dominated by the Thuringian Forest highlands, which are part of the Thuringian-Franconian highlands. Unlike other major natural sections of the Thuringian-Franconian highlands, the Thuringian Forest, a mountain ridge area, is cut by a system of deep valleys.

The landscape, which is dominated by forests, presents itself as a largely contiguous forest system. Small upland meadows are found only in stream valleys and in certain high areas. Runoff from ridge areas has led to the formation of small raised bogs and feeds a dense network of streams.

**Climate:** Atlantic-influenced, moderate, cool-moist central mountain climate, heavy snowfall, 4-7°C annual temperature



**Geomorphology:** mountain range (highest peak 982 m) is cut by numerous valleys (deepest 420 m)

**Human influences:** forestry, tourism (hiking, horseback-riding, winter sports), settlement

Main habitat types according to Annex 1 of the Habitat Directive are:

	area (ha)	percentage %
3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	2,15	0,01
3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	10,08	0,06
4030 European dry heaths	3,95	0,02
6230 Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	27,01	0,16
6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	0,06	0,00
6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	28,27	0,17
6510 Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	24,04	0,14
6520 Mountain hay meadows	339,03	1,98
7110 Active raised bogs	1,75	0,01
7120 Degraded raised bogs still capable of natural regeneration	6,02	0,04
7140 Transition mires and quaking bogs	24,55	0,14
7230 Alkaline fens	0,24	0,00
8150 Medio-European upland siliceous screes	1,50	0,01
8220 Siliceous rocky slopes with chasmophytic vegetation	6,38	0,04
8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii	1,50	0,01
9110 Luzulo-Fagetum beech forests	949,19	5,56
9130 Asperulo-Fagetum beech forests	644,72	3,77
9180 Tilio-Acerion forests of slopes, screes and ravines	13,40	0,08
91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	13,79	0,08
91D0 Bog woodland	75,19	0,44
9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)	69,26	0,41
Total area of habitats protected by the Habitats-Directive 92/42	2.242,08	13,13

### 2.2.1. Management goals

The decree for the biosphere reserve (from April 2006) defines the goal in § 2: "...protection, cultivation and development of the characteristic natural environment of Thuringian Forest ... by a typically regional utilisation." For achievement of this goal measures (§ 3), regulations (§ 4) and exceptions (§ 5) were declared explicitly for core-zones, buffer-zones and transition-zones of the biosphere reserve. A hierarchy of goals and objectives is formulated in the framework concept [Rahmenkonzept] (2006). The framework concept differentiates between:



- strategic goals
- objectives (short-term, quantitative objectives)
- measures (explicit actions).

For **forest** habitats goals are:

- protection of forest habitats
- protection and restoration of best state of conservation
- protect habitats for species of Annex II FFH-directive and Annex I bird-directive
- protect rare habitats and species
- save patrimonial characteristics
- minimize disturbances or interferences.

Furthermore forest stands can be protected by supplementary ordinances, which include additional objectives. (TMLNU, 2005)

### *2.2.2. Management strategies*

In the framework concept (2006) the term "strategic objective" is used in context with the mission statement [Leitbild] of Vessertal Thuringian Forest Biosphere Reserve (see page 22 f.).

Example 1: protecting the development function:

Vessertal Thuringian Forest Biosphere Reserve is part of the regional economic area. Economic development should consider social and ecological aspects. Utilisation in the biosphere reserve especially by forestry, agriculture and tourism should be preserved. Sustainable management of nature recourses is expected ...

Example 2: Protection of the conservation function

With the exception of the not-managed core zone the characteristic cultivated landscape of the biosphere reserve should be conserved permanently by management. Soil, water, atmosphere shall be prevented from impairments ...

## **2.3. Balaton Uplands National Park, Hungary**

The Balaton Uplands National Park is situated in the immediate vicinity of Lake Balaton, a place renowned all over Europe for its hospitable settlements and cosy holiday resorts. The park faces many challenges which are posed mainly by civilisation and development. Current management tasks focus on the need to protect and preserve the natural and cultural treasures of an area of some

56,997 ha. Within this total area 11,282 ha constitute a strictly protected core, and 14,397 ha have been designated a Ramsar Site. The fabulous instances of its extraordinary diverse character include the several thousand hectares of marshlands at Kis-Balaton, the uniquely fluctuating dolomite-limestone surface of the Keszthelyi Hills and Pécselyi Basin, the dense basalt hills with their exceptionally interesting shapes in the Tapolca Basin and the surface of the Káli Basin dotted by volcanic craters, plateaux, stone seas and small lakes. As recognition of its outstanding geological values (spring coves, geyser cones and stratified flint and lime sedimentation) and the work of nature conservation in that region, the Tihany Peninsula was awarded of European Diploma in 2003. The singularly colourful geological picture is the fertile background to a flora and fauna of exceptional diversity. This is the region of the Carpathian Basin where the wildlife typical of the woods and steppes of the plains meet that of the small hill ranges that stretch to the north of Lake Balaton. The National Park, lying as it does at the crossroads of several flora areas, is especially rich in protected plant species.

The different territories of the national park preserve diverse geological heritage, e.g. in the Káli Basin one can find basalt, sandstone, red sandstone, dolomite and limestone. Various geomorphology results in diverse habitats as well.

Main habitat types according to Annex 1 of the Habitat Directive are:

(due to ongoing habitat mapping in Balaton-Uplands National Park no information on habitat size is yet available)

	area (ha)	percentage %
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	
5130	Juniperus communis formations on heaths or calcareous grasslands	
6110	Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi	
6190	Rupicolous pannonic grasslands (Stipo-Festucetalia pallentis)	
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	
6240	Sub-Pannonic steppic grasslands	
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	
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)	
7140	Transition mires and quaking bogs	
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	
7230	Alkaline fens	
8150	Medio-European upland siliceous screes	
8220	Siliceous rocky slopes with chasmophytic vegetation	
8230	Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or	

	area (ha)	percentage %
of the Sedo albi-Veronicion dillenii		
9130 Asperulo-Fagetum beech forests		
9150 Medio-European limestone beech forests of the Cephalanthero-Fagion		
9180 Tilio-Acerion forests of slopes, screes and ravines		
91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)		
91H0 Pannonian woods with <i>Quercus pubescens</i>		
91M0 Pannonian-Balkanic turkey oak – sessile oak forests		
91G0 Pannonic woods with <i>Quercus petraea</i> and <i>Carpinus betulus</i>		

### 2.3.1. Management goals

#### **Priority goals are:**

##### On the Sásdi meadows:

- Preservation of the unique botanical and zoological values
- Maintenance of the naturalness of plant associations in good natural condition and reparation of stands in degraded condition with proper management
- Monitoring the water supply of the area
- Up-keeping the dykes of the ditches

##### On other hayfields and pastures of the Káli Basin:

- Preservation of the naturalness state and reparation of stands in degraded condition with proper management
- Prevention of washing out of pollutants
- Slight grazing on the pastures, avoiding overgrazing
- Keeping the desirable time of mowing on the hayfields, maintaining unmown patches in different areas year by year; slight grazing on the aftermath

##### On the Tihany area:

- Preservation of the unique geological features and, in parallel, its effective demonstration for the public (our sample area, the pasture is not covered by priority)
- Preservation of the basic features of the Tihany landscape as landscape values

##### On the Tapolcai Basin areas:

- Preservation of the naturalness state and helping with proper management in the degraded stands

#### On the Nyirádi Sárálló:

- Implementation of efficient protection, obtaining of ownership of further areas.
- Taking forests surrounding Sárálló out of forestry management
- Elimination of draining canals, isolation of wet grasses from the large canal of Melegvív with geofoil laid in 2.5 m depth (already established in 2003)
- Guarantee of water supply needed for the conservation of valuable fens and marshes
- Improvement of naturalness of forests, implementation of more favourable forest management in the wider surroundings
- Decreasing of game not to endanger to natural values
- Management the habitat of the population of *Gladiolus palustris* being significant even from international aspect, parallel with the salvation of the habitat of *Sparganium minimum*. Valuable, large stands of sedge tussocks other fen communities
- Maintenance of mosaic habitat structure of birch groves and grasses (*Molinia* meadows and heather)

#### *2.3.2. Management strategies*

The term is used in the title "Determination of practical aims, strategies and tasks" of the management plan, but this chapter contains only goals. The chapter "Nature conservation strategies" contains recommendations for the management of each habitat type, plus the following ones:

#### On the Sásdi meadows:

- Maintaining a habitat structure that is characteristic for close-to-natural conditions
- Keeping the desirable time of mowing on the hayfields, maintaining unmown patches in different areas year by year
- Cutback of invasive stands

#### On other hayfields and pastures of the Káli Basin:

- Maintaining a habitat structure that is characteristic for close-to-natural conditions
- Slight grazing on the pastures, avoiding overgrazing
- Keeping the desirable time of mowing on the hayfields, maintaining unmown patches in different areas year by year

- Cutback of invasive stands

On the Tihany area:

- Maintenance of the mosaic-patterns of the habitat complex, both for managed and "untouched" areas
- Avoiding of scrub encroachment
- Grassland reconstruction works may be necessary in case

On the Tapolcai Basin areas:

- Maintenance of the habitat structure showing close-to-natural conditions
- Starting management on weedy, previously mowed grasslands and those that should be mowed
- Keeping the desirable time of mowing on the hayfields, maintaining unmown patches in different areas year by year
- Preservation of the naturalness state and helping with proper management in the degraded stands
- Cutback of invasive stands
- Slight grazing on the pastures, avoiding overgrazing

On the Nyirádi Sáralló:

- Conservation of biocoenosis of grasses being valuable for nature conservation, conservation and maintenance of stands and population sizes of protected and strictly protected plant- and animal species; and their strengthening with nature conservational management
- Cutback of invasive goldenrod (*Solidago gigantea*) from grasses and alien and spreading populations of *Pinus sylvestris* from wet grasses
- Transformation of forests with non-native species to native ones, and maintenance of continuous forest cover
- Conservation of biological diversity of natural forests with the maintenance of continuous forest cover

## **2.4. Fertő-Hanság National Park, Hungary; Lake Neusiedel National Park, Austria**

The transboundary Lake Neusiedl - Fertő-Hanság National Park (LN/FN-NP), which was founded in 1993, lies on the eastern border of Austria and at the western edge of Hungary, including the UNESCO Biosphere Reserve and the Neusiedler See – Seewinkel Ramsar wetland. It is also classified as World Heritage "Fertő / Neusiedlersee Cultural Landscape". The terrestrial National Park area

covers about 330 km<sup>2</sup>. About 90 km<sup>2</sup> of the terrestrial National Park area are on Austrian territory and are still owned by about 1200 local landowners. The lake itself covers approx. another 315 km<sup>2</sup>, of which 220 km<sup>2</sup> is on Austrian territory, and about 75 km<sup>2</sup> on Hungarian territory. The lake's drainage basin comprises an area of about 1,120 km<sup>2</sup>. 50 % of the area (roughly 4500 ha) is a Nature Reserve Zone ("Naturzone"), which remains untouched by human activities, while the Conservation Zones ("Bewahrungszonen") are mainly cultivated landscapes and require landscape conservation measures.

The kidney-shaped Lake Neusiedl (German: Neusiedler See; Hungarian: Fertő tó) is fringed with a reed belt of about 180 km<sup>2</sup>, which is the second largest closed monoculture of Phragmites area in Central-Europe. The reed area covers more than 50 % of the whole lake surface, while in the Hungarian part it covers about 85 % of the local area. In former times the water level had been highly astatic and fluctuating. Historic sources report of the lake area exceeding 500 km<sup>2</sup>, while in the last two centuries the lake experienced periods of nearly, and sometimes completely falling dry. Today the water level is stabilized by means of an outlet sluice. Its operating regime is based on an agreement of the cross-border Hungarian-Austrian Water Commission. Due to the raising and stabilising of the water level the ingression of reed towards the central parts of the lake was stopped.

The lake is one of the most turbid, opaque inland waters in Europe, with very low water transparency. Even light breezes stirred up the sediment, adding to the turbidity caused by suspended particles. The overall trophic situation of the shallow lake is meso-eutrophic, which is not a completely unusual condition for a lowland shallow lake. The lake is the last and most western member of a so-called 'soda- lakes' in Europe, with sodium carbonate as the dominant ionic fraction.

The Fertő / Neusiedler See National Park is appointed UNESCO Biosphere Reserve, European Biogenetic Reserve, IUCN National Park and a World Natural Heritage site.

The main habitats found in the National Park area aside from the lake and its reed belt, are several saline lakes that dry out periodically, hay meadows, pasture land and small sand habitats. Alpine, Pannonic, Asian, Mediterranean and Atlantic influences enrich the extra-ordinary diversity of the flora and fauna, due to the biogeographic transient of the National Park's location.

The main habitat types in according to Annex 1 of the Habitat Directive are:

	area (ha)	percentage %
<b>Fertő (HUFH20002) NATURA 2000 area *</b>		
1530 Pannonic salt steppes and salt marshes	217,38	1,92
3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation	1.078,73	9,53
3160 Natural dystrophic lakes and ponds	910,95	8,05
6190 Rupicolous pannonic grasslands ( <i>Stipo-Festucetalia pallentis</i> )	0,03	0,00
6250 Pannonic loess steppic grasslands	0,17	0,00
6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils ( <i>Molinion caeruleae</i> )	95,49	0,84
6440 Alluvial meadows of river valleys of the <i>Cnidion dubii</i>	252,77	2,23
7210 Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>	275,94	2,44

	area (ha)	percentage %
7230 Alkaline fens	122,23	1,08
91H0 Pannonian woods with <i>Quercus pubescens</i>	13,63	0,12
91M0 Pannonian-Balkan turkey oak – sessile oak forests	3,67	0,03
Pot. habitats, which can be natural habitat types of community interest with suitable maintenance after some years	650	5,74
<b>Total area of habitats protected by the Habitats-Directive 92/42 in Fertő</b>	<b>2.970,99</b>	<b>26,24</b>

#### **Hanság (HUFH30005) NATURA 2000 area \*\***

3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	7,07	0,05
3160 Natural dystrophic lakes and ponds	123,32	0,92
6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates ( <i>Festuco-Brometalia</i> )	114,34	0,85
6410 <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils ( <i>Molinion caeruleae</i> )	504,41	3,75
6510 Lowland hay meadows ( <i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i> )	252,75	1,88
7230 Alkaline fens	33,87	0,25
*91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> ( <i>Alno-Padion</i> , <i>Alnion incanae</i> , <i>Salicion albae</i> )	1.125,54	8,36
91F0 Riparian mixed forests of <i>Quercus robur</i> , <i>Ulmus laevis</i> and <i>Ulmus minor</i> , <i>Fraxinus excelsior</i> or <i>Fraxinus angustifolia</i> , along the great rivers ( <i>Ulmion minoris</i> )	238,96	1,77
Pot. habitats, which can be natural habitat types of community interest with suitable maintenance after some years	1.064,17	7,90
<b>Total area of habitats protected by the Habitats-Directive 92/42 in Hanság</b>	<b>2.400,26</b>	<b>17,83</b>

\* Source: Király G. & Takács G. (2008): A HUFH20002 Fertő-tó Natura 2000 terület élőhely-térképezése, Fertő-Hanság Nemzeti Park Igazgatóság, kutatási jelentés)

\*\* Source: Keszei B. & Takács G. (2008): A HUFH30005 Hanság (Észak-Hanság) Natura 2000 terület élőhely-térképezése, Fertő-Hanság Nemzeti Park Igazgatóság, kutatási jelentés)

#### **Part 1: National Park Neusiedler See – Seewinkel (Austria)**

At National Park Neusiedler See – Seewinkel a great number of management activities is continuously carried out, on seasonal and ‘on demand’ basis. However, these activities are not described in an official Management Plan as such a plan has not been published so far. Every year a new and adapted working programme is approved by the board directors, but it is not open to the public. Only when the water management framework, which is in development at present (it is a trans-boundary issue on different legislative levels), will be finished, the basis for a future stepwise regulation of the management, its compilation in a management plan and the successive publication of this plan are possible.

The publicly available 'UNESCO World Heritage Fertő / Neusiedlersee Cultural Landscape Management Plan' has its only direct enforcement abilities through a separate commission and directives concerning construction projects.

In practise, a highly specific meadows and pastures management is monitored and continuously adjusted year by year. In the context of water balance, the retention project using locks and sluices in the small irrigation canals is a great success. Some other water balance related projects have not found agreement among the relevant stakeholders and policy makers so far.

In total, even without an official management plan at present, efforts of dedicated persons in official and private positions resulted in a functional preservation of protected species, habitats, ecosystems and landscapes and its progressive improvement, while even cultural goods are maintained accordingly. The importance of the investment of resources, time and effort into this area is being transported to the general public and to regional landowners and communities through various informative media, like an installed series of info points, exhibitions at the National Park centre, the National Park homepage or the monthly "Geschnatter"-Journal. On a short time line the effects of climate change can be mitigated by adaptation of the existing measures.

## **Part 2: Fertő-Hanság National Park (Hungary)**

The greatest problem in Lake Neusiedl is the natural aging processes of the lake. Maintenance of these processes, conservation of the good status is available only with mutual Austrian-Hungarian cooperation. The Austrian-Hungarian Water Commission entrusted the two parties working out the "Strategy Study of Lake Neusiedl", which deals with the principles of sustainability, maintenance and improvement of the lake. According to this assignment the catalogue of measures was prepared in 2008 and a common coordination team was established in 2009.

Several measures were set up for harmonizing the river basin management (RBM) too. Their aim is the conservation of the good ecological status of Lake Neusiedl, in accordance with the European Water Framework Directive.

List of foreseen measures according Water Framework Directive (WFD / River Basin Management Plan, RBMP):

- Conservation of the good ecological status of Lake Neusiedl
- Measures for conservation of the present volume and size of Lake Neusiedl (especially the ratio of water / reed areas)
- Raising the water level
- Control of sediment transport in the lake with improvement of flow conditions
- Minimizing sediment and nutrient pollution at the inflow, by a filter-field or a deposition surface
- Decreasing or slowing down the spread of the reed-belt



- Development of new biotopes by the help of deposition surfaces
- Improvement of water supply in the reed-belt, and reconstruction of the channel system
- Management of water quality within the reed-belt, minimizing the internal nutrient pollution
- Reviewing the opportunities of allocating external water resources to the lake with respect to a longer time frame (not realised today)

The planned measures are harmonized with the 'Strategy Study of Lake Neusiedl' (according to Subkommission Prot. No. 3.1.3.3. (enacted at Vorau, 2009) and with the 'Ecodynamic Rehabilitation of Raab – Hansag – Neusiedler See Systems' (according to Subkom. Prot. No. 3.1.3.4.).

We can mention other two management plans, which deal with the whole lake from different aspects:

- Management plan of World Heritage "Fertő Area" Budapest /Bécs (2003)
- Framework plan for maintainable development and preservation of the ecological potential of Hungarian Lake Neusiedl and its environment (2001)

Furthermore the Fertő-Hanság National Park has got two management-plans for his operational area, but one of them is not in force and the other is in process. However they have a 6-years (2009-2014) development plan.

Some of our new projects deal with the impact of climate change, such as the project "Ecodynamic rehabilitation of Lake Neusiedl with respect to the quality of River Raab water", which focuses on opportunities of maintaining the condition of the lake, as well as the new operational regulation of the "Fertőszéli"- sluice gate. We can also mention the long-term Strategy Study of Lake Neusiedl, which is being worked out by Austrian and Hungarian experts, in charge of the Austrian-Hungarian Water Commission.

#### *2.4.1. Management goals*

- Conservation of ecological status of Lake Neusiedl (minimizing sediment- and nutrient pollution)
- Restoration of groundwater-regime and salt marshes
- Raising of the water level of Neusiedler See of approx. 10 cm (\*control water level summer: 115,80 m / winter: 115,70 m above Adriatic sea level)
- Management of the reed belt (Sustainable Nature and Landscape Protection)
- Intensification of Austrian-Hungarian cooperation (water level and quality)
- Characterization and monitoring of changes
- Improvement of the water supply

- Minimizing the internal nutrient pollution
- Restoration of rich fen between Fertőhomok Hidegség
- Decreasing of the stark sedimentation in the south part of the lake
- Conservation of open water and reed belt ratio
- Improvement of diversity
- Preserve rare communities of plants and their quality as a habitat for birds
- Preservation of the variety of richly structured winegrowing landscape, prevention of further overgrowing of abandoned vineyards
- Preservation and networking of habitats
- Preservation of protected species, habitats and landscapes
- Preservation and sustainable use of the historical, cultural landscape
- Preventing the conversion of meadows into intensively cultivated arable land or reversing such developments
- Reduction of amphibian's and reptile's death by the run in spring and autumn
- Conservation of the natural heritage
- Documentation and discussion, reduction and elimination of reeds beneath saline lakesides, maintenance and increase of biodiversity, preservation and restoration of a small-range, species-rich landscape mosaic
- Monitoring of vegetation, invertebrate, fishes, birds and wild animals (stocktaking [semi- / quantitative], population structure of single species, trophic niches, breeding pairs, breeding success, analysis of surroundings, elaborating suitable management measures)
- Mapping (as basis for research, management, measures and planning; documentation)
- Projects (increasing of knowledge, improvement of regional, national and international cooperation; science, development of new concepts and ideas)
- Create public awareness, provide infrastructure, support education, inform

#### 2.4.2. *Management strategies*

- Rewetting of specific areas through locks (gauges) in the drainage channels; agreement with all stakeholders

- Standard water level through main channel lock, international commission, regulation since 1965, adaptation in 2010 (new operational regulation)
- Reed cutting by private companies and total prohibition of burning (since 2011 throughout the whole year)
- International commission (committee) for water quality, measures against siltation of bayous
- Reconstruction and maintenance of channel-system (for improvement of water supply in reed-belt)
- Planning of new measures according to River Basin Management Plan (RBM-plan)
- Grazing with yearly control and adaptation if necessary; converting the areas (Rust – Mörbisch) into pasture land, extensive livestock; farming; private herds and a herd owned by National Park
- Mowing with yearly control and adaptation if necessary; use of the zone of lakeside meadows as haying and pasture land (above); partly by the National Park, partly by private farmers
- Removal of bushes and scrubs (especially shredding of *Elaeagnus angustifolia*) by national park workers
- Compensation payments for fallow grounds in the conservation zone
- Programme of provincial government subsidies (Landscape Maintenance Fund), ÖPUL
- Monitoring projects (constant or periodical; by university working groups, by federal state (province) government, by departed institutions like Biological Station, Directorate or Inspectorate, case studies by the National Park)
- Mapping (by National park, through university (EU-) projects)
- Other studies and research cooperation
- ÖAW-, CENTRAL EUROPE-, INTERREG- FWF- and other projects

Different monitoring programs are under progress on a year-by-year basis, which account for the strategies on which the current short-term management is organised.

An example how unofficial (because without a written declaration), but international agreed management strategies can lead to and are interacting with regular management measures, is the description of following significant strategy. In short, it is the regulation and rising of Neusiedler Lake's water level (approx. 10 cm) by a sluice gate in Fertőszél (see Table 3).

“Keeping a standard water level through main channel lock, supervision by and international commission, regulation since 1965, procedures revised by adaptation in 2010 (new operational regulation): Regulation with main channel lock. Water level control maintains maximum stage. In case of still rising levels, the lock is opened. Water level of Neusiedler See raised by approx. 10 cm

(\*control water level summer: 115.80 m / winter: 115.70 m above Adriatic Sea level). Aims: slowing growth of reed belt towards the central lake area.”

## 2.5. Körös-Maros National Park, Hungary

Körös-Maros National Park in South-Eastern Hungary is located among the rivers Tisza, Körös and Maros. It is characterized by freshwater habitats, marshes and grasslands and by the areas’ agricultural use. Considering the vegetation of the Hungarian Great Plain, the Territory of Békés County belongs to the most diverse landscapes. This various view is determined by the complex effect of several natural factors. Among them, the dominant ones are climatic and edafic characteristics. Investigation areas in the Körös-Maros National Park belong to the deepest-lying areas of the Hungarian Great Plain, being extended wetlands, swamp areas through several millennia. Deeper areas under constant water coverage are covered mainly by clay; meanwhile, slightly higher-lying patches with temporary water coverage give home for different types of sodic (alkali) habitats.

The operational area of the National Park Directorate is 800 000 hectares. Its area includes all the territory of Békés County, the area of Csongrád County located to the East of river Tisza, the Dévaványa-Ecsegi steppes as well as the parts of Körös flood-plains in Jász-Nagykun-Szolnok County. Besides the maintenance and development of the National Park, its task is the supervision and control on its operational area. The magnificent landscape is characterized by diversified and unique natural scenery of the uncontrolled countryside. The Csanádi and Békési plateaus stretch between the rivers Körös and Maros. Owing to the considerable agricultural development, the protection of the still existing natural plant communities, first of all, that of the loess fields is an outstanding challenge of nature protection. On the vast areas of the erstwhile Kis-Sárrét, in the region covered by the meandering branches of river Körös and on the Dévaványai, Békési and Csanádi plains there are spacious sodic steppes, remnants of wooded grasslands and marshlands as well as meadows and groves of extraordinary value. The area of the national park is 50 000 hectares.

Main habitat types according to Annex 1 of the Habitat Directive are:

(due to ongoing habitat mapping in Körös-Maros no information on habitat size is yet available)

	area (ha)	percentage %
1530 Pannonic salt steppes and salt marshes Oligotrophic to mesotrophic standing waters with vegetation of		
3130 the Littorelletea uniflorae and/or of the Isoeto-Nanojuncetea Natural eutrophic lakes with Magnopotamion or Hydrocharition-		
3150 type vegetation Rivers with muddy banks with Chenopodion rubri p.p. and		
3270 Bidention p.p. vegetation		
6250 Pannonic loess steppic graasslands		
6440 Alluvial meadows of river valleys of the Cnidion dubii		

### 2.5.1. Management goals

The Körös-Maros National Park does not have an approved management plan and no Natura 2000 management plan. They have got a draft for it, which is quite general.

The **hierarchy of goals** on our sample areas are:

1. Ensuring water supply, water coverage during the necessarily long time within a year.
2. Ensuring management that preserves natural values.

The economic revenue is not important on these areas.

Management **objectives** on grasslands, including wet ones:

- Grassland habitats have to be maintained with grazing and mowing.
- Avoiding the dominance of reed, Typha species and scrub encroachment by grazing and/or mowing.
- Stopping the spreading of invasive species by cutting back or the use of chemicals.
- Maintaining habitats by prohibiting soil improvement, grassland burning, melioration, irrigation, racking, over-sowing, spreading organic manure or artificial fertilizers, grazing with geese.
- Hayfields and pastures have to be separated and managed suitably, but it does not exclude the possibility for mowing some parts of pastures in certain years or grazing on hayfields after mowing.
- Species to be grazed: sheep, cow, water buffalo, horse and donkey; goat only together with sheep flock, pig only in case of nature conservation cause.
- Under- and overgrazing should be avoided.
- In favour of creating and maintaining conditions for species of high importance, overgrazing is needed in some designated areas.
- Grazing is possible by 0.2–1 animal unit per hectare, between spring drying and autumn rains, usually between 24 April and 30 November. Besides this period, grazing may take place only in case of dry soil condition, without harming the grassland cover.
- Optimal time of mowing is defined by the National Park Directorate for the certain areas. The mowing of big, constant areas in one time has to be avoided.
- During mowing, unmown lines and parcels should be designated.
- Mowing should start from the middle of the parcel, towards the edges and wildlife should be alarmed. Mowed hay should be transported away within 20 days of forming the bales, but the latest until 31 July.

### 2.5.2. Management strategies

Nature conservation strategies (in a broader context than the term 'strategy' is defined) are:

- Creating and maintaining nature conservation management methods that are optimal for the nature and landscape values.
- Habitat reconstruction and rehabilitation with active nature conservation management.
- Cutting back the stands of invasive and not indigenous species.
- Investigations on basic conditions, and monitoring.
- Programs and investments in favour of environmental education and presentation of natural values.

## 2.6. Biebrza National Park, Poland

The Biebrza National Park (BNP) is located in Northeastern Poland, in the Podlaskie Voivodship. The north-eastern boundary of the park runs close to the Belarus border. The Narew River and its confluence with the Biebrza River form its southern boundary. The park was established in 1993, and with a total area of 59.233 ha, or almost 600 km<sup>2</sup>, it is the largest of the Polish national parks. Around the Park a buffer zone of 66.824 ha (ca 668 km<sup>2</sup>) has been established. The Park includes 15.547 ha of forests, 18.182 ha of agricultural land and 25.494 ha of wetlands – the most valuable habitats of the park – the famous Biebrza marshes. The area of 4.504,79 ha (ca 45 km<sup>2</sup>) is under strict protection including the Czerwone Bagno or Red Bog area at the Grzędy Forest District. Unique in Europe for its marshes and peatlands, as well as its highly diversified fauna, especially birds, the Park was designated as a wetland site of global significance, and is under protection of the RAMSAR Convention. Wetlands are main habitat types in the Park. Approximately 28 % of the area of BNP or more than one fourth of its surface takes Natura 2000 habitats, of which the most common types are transition mires and quaking bogs.

Main habitat types according to Annex 1 of the Habitat Directive are:

		area (ha)	percentage %
3150	Natural eutrophic lakes with Magnopotamion	160	0.7
2330	Hydrocharition- type vegetation	261	
6120	Xeric and calcareous grasslands (very small area)	n.d.	-
6430	Hydrophilous tall fringe communities of plains	43	0.1
4030	European dry heaths (very small area)	n.d.	-
6510	Lowland hay meadows with <i>Alopecurus pratensis</i>	161	0.3
7110	Active raised bogs	6	0,0
7140	Transition mires and quaking bogs		
7150	Sedge-moss meadows with <i>Rhynchosporion</i> vegetation	7.000	11.8
7230	Alkaline fens		

		area (ha)	percentage %
91D0	Bog (raised) woodland - Vaccinio-uliginosi-Pinetum	580	0.8
91E0	Bog woodland - Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)	4.141	7.0
91E0	Riparian alder woods of Alno-Padion	91	0.2
9160	Oak-hornbeam woods - Tilio-Carpinetum	1315	2.2
91T0	Central European lichen Scots pine forests	284	0.5
Total area of habitats protected by the Habitats-Directive 92/42		13.411	22,5

n.d. – not determined.

Main habitat types according to AD include transition mires and quaking bogs, sedge-moss meadows with Rhynchosporion vegetation and alkaline fens (about 7.000ha) as well as bog woodlands – which cover both of the Alliances and as well as raised bog woodland of *Vaccinio uliginosi-Pinetum*.

### 2.6.1. Management goals

#### General target:

Designation of a national park in Poland aims at the preservation of all components of biodiversity within a certain area including its abiotic conditions and landscape, and the restoration of a proper state of these natural resources including regeneration of damaged natural habitats of plants, animals and fungi (Nature Protection Act, Art. 8). The main aim of the BNP is to protect specific wetland habitats, which become rarer in Europe, while at the same time to maintain rare and threatened with extinction plant communities, animal species and landscape values of the Biebrza river valley. The region embraces a well preserved longitudinal and transversal zonation of vegetation in the river valley together with important biotopes of avifauna (Management Plan, Proposal, 2001)

Currently, the BNP has no management or protection plan. A project of the document was elaborated in 2001 however it has not so far been approved due to changing legal regulations on nature conservation in Poland. Therefore, since 2001, the Park management proceeds according to the so called “Protection tasks” which are set up and approved by the Ministry of Environment every two years. From the legislative viewpoint, the “Protection tasks” have equal strength as a “Management Plan”, although they are focused rather at the short-time objectives that can be defined for this time interval. Long term strategies in the “Protection tasks” are not indicated. Therefore any aspects concerning long term changes (such as climate change or land use alteration) in the local environment are barely considered. Presently the realisation of the tasks for 2009-2010 has been accomplished, and the tasks for 2011-2012 have been defined. Unfortunately, this solution, being a kind of simplification, applies only to the area of the Park and does not cover its buffer zone. What's more problematic, no guidelines on the spatial management have been incorporated in the “Protection tasks”. Thus, the statements prepared by the Park management for local administration (“gmina”) are based only on the possible forecasting schemes instead of being based on solid Management Plan’s regulations.

The „Protection tasks” for the BNP include the identification and evaluation of existing potential internal and external threats and means of limitation or elimination of the threats and their effects. The most important threats include draining of wetlands, especially in the Park buffer zone, land aridization (due to climate change) and abandonment of traditional land use leading to overgrowing of the Park’s valuable open meadow ecosystems. Further threats include the deterioration of small water reservoirs and water eutrophication due to intensification of agriculture as well as increasing human penetration of sites with valuable species. Urban sprawl and pressure of transportation are also increasing with the construction of new roads and power lines. Human interventions promote the invasion of alien species of flora and fauna. The mosaic of private and Park owned land within the Park makes the management of the area difficult preventing effective implementation of the protection tasks. Of almost equal importance are such threats as game poaching, Illegal fishing, Illegal harvest of fungi and plants within the Park.

### 2.6.1. *Management strategies*

The term “strategy” does not occur in the management plan. However, every planned measures of environmental management stated in “management tasks” aims to reach specific goals. Selected strategies (which are not literally called as “strategies”), that underlay management and environmental conservation measures in the Biebrza National Park are listed below:

- Maintenance of open-meadow landscapes
- Restoration of degraded water bodies
- Promoting the process of developing the spatial management plan in communes located within and in the vicinity of the BNP
- Conservation and monitoring of performance of the protected species, which itself becomes a strategy for monitoring measures
- Buying out private land located within the BNP to make environmental conservation measures more sound (some of the environmental conservation and management measures are not possible impossible to be implemented on private land)
- Maintenance of water resources and forests
- Promoting environmentally sound investments and consultancy of undertakings which can be potentially harmful for respective components of the environment in the Biebrza Valle; the Director of the BNP has a fairly strong influence on any activities (private, state...) that are to be done within the National Park
- Ecological education of youth (primary and secondary schools located in the neighbourhood of the BNP)
- Sustainable management of tourism in certain Park areas which are in need of special protection in view of valuable and fragile ecosystems



- Permanent contact with stakeholders and building a positive perception of the BNP and its strategies and measures

## 2.7. Danube Delta Biosphere Reserve, Romania

At the end of a course of over 2.840 km the Danube has during the last 16.000 years built the Danube Delta at its mouth with the Black Sea. The Danube delta area is estimated at 4.180 km<sup>2</sup>, 84 % of which (3.510 km<sup>2</sup>) lie on Romanian territory, between the three Danube arms: Sfântu Gheorghe, Sulina and Chilia. Geographic location: The Danube Delta Biosphere Reserve (DDBR) is situated in the eastern part of Europe and lies at the intersection of 45°N (latitude) with 29°E (longitude) - 45°24'30" N (latitude) and 28°10'50" E (longitude) on Cotul Pisicii, 45°09'30" N (latitude) 29°42'45" E (longitude) on east of Sulina locality, 44°20'40" N (latitude) and 28°04'30" E (longitude) on Capul Midia, 45°27' N (latitude) and 29°19'20" E (longitude) on Chilia Veche. Referred to the Black Sea "0" level, 20,5 % of the Delta area lies below this point and 79,5 % above it. The total area of DDBR is of about 5.800 km<sup>2</sup> more than half of which (3.510 km<sup>2</sup>) belong to what is commonly called the „Danube Delta”. For this, size of core zone is about 50600 ha (8,72 %), size of economic zone is about 305.100 ha (52,6 %) and size of buffer zone is about 223.300 ha (38,5 %). The greatest extension (54,5 %) has the territory comprised between 0 and 1 meter high. The few marine levees – Letea, Caraorman and Sărăturile, or what has been left of the Bugeac Plain in the south of Basarabia, that is, Chilia and Stipoc which rise up to 1 - 13 m, represent a small percentage of the Danube Delta area. The Romanian Danube Delta Biosphere Reserve was declared s Biosphere Reserve in 1990 and included one year later on the UNESCO World Heritage List and List of RAMSAR Convention on Wetlands of International Importance especially as Waterflow Habitat. This area maintains its enormous biodiversity in a better state than most other deltas in Europe, even in the world. It contains a great range of habitat types, lower and higher plants, invertebrates and vertebrates. Many of the species that live within the delta are unique to it, these include plants and animals. The static freshwater ecosystems provide the base for the food chain in much of the delta. Protozoa, microalgae, algae and macrophytes are the primary producers, on which zooplankton, oligochaetes, molluscs, insects, fish, amphibian, reptiles, birds and mammals feed in ascending order within the food chain. Imbalances in some seasons have allowed some components like blue/green algae to thrive, to the detriment of macrophytes and many of the animals that depend on plant life. Inevitably, the more adaptable fish species (roach, crucian carp and perch) have survived then thrived, at the expense of species like pike, zander and common carp (*Cyprinus carpio*). Terrestrial ecosystems have suffered less than aquatic ones, because they are less easy to pollute and over use. Exploitation by grazing, arable cropping, forestry, reed cutting is limited to areas where this is possible and in much of the delta these potentially damaging activities are impossible. The Danube Delta in Southern Romania maintains its enormous biodiversity in a better state than most other deltas in Europe, even in the world. 28 habitat types are included in Habitat Directive and represents 39,59 % from total area of Danube Delta Biosphere Reserve.

Main habitat types according to Annex 1 of the Habitat Directive are:

	area (ha)	percentage %
1110 Sandbanks which are slightly covered by sea water all the time	3	0,00059

	area (ha)	percentage %
1140 Mudflats and sandflats not covered by seawater at low tide	3	0,00059
1150 Coastal lagoons	1	0,00020
1160 Large shallow inlets and bays	30	0,0058
1210 Annual vegetation of drift lines	1.968,70	0,38
1310 Salicornia and other annuals colonizing mud and sand	8.001,59	1,56
1410 Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )	10	0,00196
1530 Pannonic salt steppes and salt marshes	22.293,82	4,37
2110 Embryonic shifting dunes	11.403,19	2,23
2130 Fixed coastal dunes with herbaceous vegetation ("grey dunes")	3.508,39	0,68
2160 Dunes with <i>Hippophaë rhamnoides</i>	1.018,20	0,19
2190 Humid dune slacks	3	0,00059
3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i>	30	0,0058
3140 Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.	97.876,34	19,19
3150 Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> - type vegetation	29.398,12	5,76
3160 Natural dystrophic lakes and ponds	8.079,18	1,58
3260 Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation	4	0,00078
3270 Rivers with muddy banks with <i>Chenopodium rubri</i> p.p. and <i>Bidention</i> p.p. vegetation	30	0,0058
40C0 Ponto-Sarmatic deciduous thickets	10,03	0,00197
6120 Xeric and calcareous grasslands	3	0,00059
6260 Pannonic sand steppes	20	0,00392
62C0 Ponto-Sarmatic steppes	298,92	0,058
6420 Mediterranean tall humid grasslands of the <i>Molinio-Holoschoenion</i>	10	0,00196
6440 Alluvial meadows of river valleys of the <i>Cnidion dubii</i>	60	0,01177
6510 Lowland hay meadows ( <i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i> )	10	0,00196
91AA Eastern white oak woods	10	0,00196
91F0 Riparian mixed forests of <i>Quercus robur</i> , <i>Ulmus laevis</i> and <i>Ulmus minor</i> , <i>Fraxinus excelsior</i> or <i>Fraxinus angustifolia</i> , along the great rivers ( <i>Ulmenion minoris</i> )	5.127,74	1
92A0 <i>Salix alba</i> and <i>Populus alba</i> galleries	12.500,49	2,45
92D0 Southern riparian galleries and thickets ( <i>Nerio-Tamaricetea</i> and <i>Securinegion tinctoriae</i> )	179,35	0,035
Total area of habitats protected by the Habitats-Directive 92/42	201.891,06	39,53

### 2.7.1. Management goals

The **permanent objectives** are:

- Shaping and improving of hydrological regime
- Enhancing the knowledge of ecosystems' functioning
- Enhancing the knowledge of biodiversity
- Surveillance of coastal morphologic processes
- Sustainable use of renewable natural resources and regulation of the economic activities, especially the traditional ones
- Reconstruction of damaged ecosystems
- Evaluation and limitation of pollution phenomenon and natural and anthropogenic hazards
- Development of a information system and a integrated monitoring
- Information and environmental education of public and local population
- Conservation and capitalization of ethno-cultural specificity of local population
- Cooperation with national and international organizations

It should be noted that there are **three levels of priority**:

1. Improving the institutional organization: these recommendations form the basis for improving the DDBR's status by training the local authorities' capacity to face the demands for respective area.
2. Interventions in the infrastructure: many DDBR's residents have no access to basic services, including here drinking water, wastewater, etc. The improvement of the access to these basic services is necessary for reducing poverty and to strengthen the human development.
3. Strategies for spreading the economic growth and the promotion of the social development.

### **Ecological reconstruction in Danube Delta Biosphere Reserve**

Investment works performed during the period 1990 – 2010

#### Investment objectives

- Improvements for ecological rehabilitation conditions in natural aquatic complexes from Danube Delta;
- Improvements for environment rehabilitation conditions in natural areas of reproduction for indigene fish species;
- Hydro technical works for improvement of water circulation;

- De-clogging works of the main fishing channels;
- Works for clogging prevention of the channels, streams and lakes in order to maintain an optimal hydrologic regime;
- Ecological reconstruction of abandoned agricultural and fishery polders.

General objective:

- Extension of aquatic habitats for fish and birds by wetlands rehabilitation
- Developing new strategies of ecological agriculture and sustainable grazing

Subsidiary objectives:

- Protection of species population and habitats
- Reintegration of former agricultural and fish polders in the natural hydrological cycle
- Specific function restoration of the wetlands
- Rehabilitation of hydrological and ecological equilibrium
- Achievement of new habitats for fish and birds
- Restoration of traditional economic activities
- Tourism development in accordance with E.U. environmental legislation

Actions:

1. Rehabilitation of channels network in order to improve the water circulation

Aim: Reactivation of water circulation in the channels network

- Reshaping of the main (218 km) and secondary (240 km) channels by dredging
- Calibration of Uzlina and Caraorman channels
- Banks consolidation and fortification 7600 mp

2. Restoration of the areas used for agriculture and fisheries arrangements

Aim: Reactivation of the managed areas in economic purpose in the natural hydrological cycle

- Opening breaches in embankments of defences in fixed places for connecting hydraulic modelling of agricultural and fish enclosures in the natural hydrological regime. Total surface 15.712 ha.

### 2.7.2. Management strategies

Yes, the term “strategy” is used. The strategy is part of the management plan that deals with the problems of preparation, planning and development of the operations set to achieve the proposed goals. For example: development strategies for integrating the objectives of the biodiversity’s conservation with the implementation of the policies regarding socio-economic systems (SES).

The Master Plan regards the integration of the actions for each problem identified in a global strategy that ensure the synergic realization of all the actions to achieve the proposed objectives and goals. The Master Plan’s measure of success is given by the implementation degree of the proposed actions. We can, also, speak about a strategy of environment’s protection.

## 2.8. Natural Park Bucegi, Romania

Natural Park Bucegi is located in the Alpine bio-geographical zone on the most eastern part of the Carpathian Mountains in Romania. The protected areas cover 32.663 ha and include 14 strict protected sites. The area hosts a variety of habitats as peat bogs, grasslands, scrubs, deciduous forests, coniferous forests, scree, communities of hydrophytes along the waterways and chasmophyte vegetation. Bucegi Natural Park (32497,6 ha; 800-2507 m altitude), area which was designated for protection in 1990 and was included in the Romanian Network of Natura 2000 candidate sites in 2007. The site host 23 Natura 2000 habitat types, 25% of the cormophytes from the Romanian Flora, 259 bryophytes, 835 fungi and 485 lichens, many of them of a significant conservation importance. Inside the Natural Park, two are as were selected for investigation: one of 2506ha, located on the mountain plateau and the other one of 2646ha, located along the Ialomita river.

According to the available information 17 of the existing habitat types are nominated for protection and conservation in the Habitat Directive: peat bog, grasslands, scrubs, deciduous forests, coniferous forests, screes, communities of hydrophytes along the waterways and chasmophyte vegetation.

Main habitat types according to Annex 1 of the Habitat Directive are:

(due to an ongoing habitat-mapping no precise numbers for area were available yet)

	area (ha)	percentage %
3220	Alpine rivers and the herbaceous vegetation along their banks	
3230	Alpine rivers and their ligneous vegetation with <i>Myricaria germanica</i>	
3240	Alpine rivers and their ligneous vegetation with <i>Salix elaeagnos</i>	
4060	Alpine and Boreal heaths	
	Bushes with <i>Pinus mugo</i> and <i>Rhododendron hirsutum</i>	
4070	( <i>Mugo-Rhododendretum hirsuti</i> )	
4080	Sub-Arctic <i>Salix</i> spp. scrub	

	Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion
6110	albi
6150	Siliceous alpine and boreal grasslands
6170	Alpine and subalpine calcareous grasslands Species-rich Nardus grasslands, on silicious substrates in mountain
6230	areas (and submountain areas in Continental Europe) Hydrophilous tall herb fringe communities of plains and of the
6430	montane to alpine levels
6520	Mountain hay meadows
7140	Transition mires and quaking bogs Siliceous scree of the montane to snow levels (Androsacetalia
8110	alpinae and Galeopsietalia ladani) Calcareous and calcshist screes of the montane to alpine levels
8120	(Thlaspietea rotundifolii)
8210	Calcareous rocky slopes with chasmophytic vegetation
8310	Caves not open to the public
9110	Luzulo-Fagetum beech forests Medio-European limestone beech forests of the Cephalanthero-
9150	Fagion
9180	Tilio-Acerion forests of slopes, screes and ravines Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-
91E0	Padion, Alnion incanae, Salicion albae)
91V0	Dacian Beech forests (Symphyto-Fagion) Acidophilous Picea forests of the montane to alpine levels (Vaccinio-
9410	Piceetea)
9420	Alpine Larix decidua and/or Pinus cembra forests
	Total area of habitats protected by the Habitats-Directive 92/42

### 2.8.1. Management goals

The management targets, objectives and aims are included in the management plan of the protected area. The Management Plan of Bucegi Natural Park was elaborated by the Administration of the Park in 2005-2007 according to the **specific legislation** of protected natural areas, of the conservation of natural habitats, savage flora and fauna, and was updated according to OUG 57/2007. Because the park is included in Natura 2000 Bucegi ROSCI0013 there have been elaborated and adopted several management measures in order to conserve the natural habitats and savage species of communitary interest identified in the perimeter of the protected area.

The management plan has only TARGETS/ MAIN DOMAINS of addressability and OBJECTIVES, divided on two hierarchical categories: main objectives which are more general and secondary objectives.

The plan is made for a period of 5 years. Other amendments will be made just in case. We don't know for which reasons, in 2010 another management plan was developed and it is in the process of approval.

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### **Management targets:**

- Species conservation, genetic diversity, landscape and physio-geographic diversity
- Sustainable use of all resources of natural ecosystems
- Tourism and recreation activities
- Scientific research
- Education and public consciousness
- Local communities
- Management and administration

### **Objectives of the management plan**

#### **Main objectives (goals)**

The protection of the mountain landscape in a sustainable way – harmonic interaction between the natural capital of the Park and the socio-economic system - judicious use of natural resources, keeping the socio-cultural traditions actual and the traditional customs in constructions,

Conserving the landscaping value of the park's natural capital as well as the habitats/ecosystems and all the integrated species, by optimizing structure and functionality,

A new inventory of all flora and fauna species, estimating their structural and functional parameters, identifying and monitoring the species from The Red List as well as the species from the Annexes of the Habitat Directive,

Studying ecosystem diversity, identifying habitats, the type of ecosystems (including the ecotone areas), establishing spatial limits and their conservation state,

Supporting the local communities and traditional activities for a sustainable development and for keeping the socio-cultural specific in perfect harmony with nature to straighten the ecologic equilibrium,

Touristic activities according to the purpose of the Park, mainly eco-touristic, thematic or agro-touristic, without intensive exploitation that may overpass the ecological tolerance of Bucegi National Park,

To re-establish the ecologic equilibrium, the elimination of all improper activities, rational use of the land and ecologic reconstruction,

Creating benefits and stimulating the local community growth, by respecting the actual legislation and providing new facilities like: the supply with wood for fire and construction or other products

(forest fruits, champignons, branches of fir trees, hay, fish, stone pit, hunted animals etc.) and putting as priority the services with agro-pastoral, forest, touristic and educational specific.

### **Secondary objectives**

Identifying and studying some area of scientific and landscaping interest for absolute protection and full preservation of biodiversity (genetic, specific and eco-systematic) and elaborating all the documents needed for declaring a new protected area.

To facilitate the non-destructive scientific research, respecting the legislation and the Park's rules and regulations.

Sustainable use of natural resources, adopting an integrated management for each area/ reservation in the Park,

Assuring ecological reconstruction of damaged ecosystems: Ecological reconstruction of damages ecosystems is done, mainly, through planting all degraded lands with local species, ecological arrangements of grasslands and temporary prohibition of some traditional activities in the perimeters that are about to degrade. Taking into account the nature of the ecosystems and their framing in the internal area delimitation the following policies will be applied:

- Complete preservation regime for the special protection area: prohibition of any activities of exploitation of natural resources, under any form (grazing, hay making, picking up wood, stones etc.);
- Special conservation regime for the ecosystems part of the full protected area, specialized minor volume interventions for correcting some landscape deficiencies, for protecting against everything that provokes damage etc.
- Regimentation regime for mass wood production in the sustainable management area especially for the trees of which the wood is taken, intensive treatments (gardening, cvasi-gardening, progressive and successive) with a long regeneration period, as well as the ecological and sustainable utilisation of all the other natural resources through grazing, cropping of non-wooden products, hunting, fishing etc.;

Promoting national cooperation, through partnerships and sharing of experience, with other national natural parks, research institutes, environmental protection agencies, NGOs environmental foundations and individuals, in order to achieve results through research programs and common activities to implement some strategies for biodiversity conservation and public sensitizing and education,

Promoting international cooperation, through partnerships with other parks, implementing European and mondial [global] strategies;



## 2.8.2. Management strategies

The term “strategy” it is not used in the management plan. The management plan has only TARGETS/ MAIN DOMAINS of addressability and OBJECTIVES, divided on 2 hierarchical categories: main objectives which are more general and secondary objectives (see Management targets).

## 2.9. Secovlje Salina Nature Park, Slovenia

Secovlje salina (650 ha) is located in the southernmost stretch of the coastline, in the Piran Bay (Piranski zaliv) along the estuary of the Dragonja River, SW Slovenia. The coastal alluvial plain has developed over the centuries by the continuous deposition of sediments in the Dragonja river estuary. At least 700 years ago (but perhaps even before), man has created basins for evaporation of sea water and since then nothing much has been changed in the landscape and ecosystem. Over the centuries, several different habitat types have evolved, all of them dependent on the salty environment but also to the presence of humans.

Secovlje Salina is considered as one of the most important biodiversity and nature protection areas at the national level. Unique and very rare environmental conditions, influenced highly by the Adriatic sea, its climate, shallow waters and “salty” environment, provide conditions for several habitat types and many flora and fauna species that are rare or even not found elsewhere in Slovenia. This is especially true for halophytes which have here the biggest and best preserved conditions on the Slovenian coast (*Salicornia europaea*, *Arthrocnemum macrostachyllum*, *Sarcocornia fruticosa*, *Salsola soda*, *Suaeda maritime*, *Atriplex portulacoides*, *Limonium angustifolium*, *Aster tripolium*, *Atrémisia caerulescens*). Some localities in the salina’s wetlands are unique habitats for certain species present in Slovenia. For the facultative halophyte, *Bolboschoenus maritimus* and *Samolus valerandi*, the lower reaches and estuary of the Dragonja river are the only habitats in Slovenia. At the Sv. Jernej channel estuary a unique location of an orache association, *Atriplicetum tatarici*, in Slovenia was discovered (Kaligarić, 1990, 1993). *Plantago cornuti*, is the only halophyte species of the genus growing in Slovenia. The Secovlje Salina is one of only two locations of *Spartina maritima*, a northern European species with a disjunct range in the northern Adriatic Sea. Project area is at the northernmost range of some Mediterranean plant species, including *Tragopogon porrifolius*, *Pallenis spinosa*, *Aristolochia rotunda*, *Coronilla cretica*, *Coronilla scorpioides*, *Securigera securidaca*, *Scorpiurus subvillosus*, *Hordeum bulbosum*, *Bellevalia romana*.

The park consists of a habitat mosaic (and vegetation) of valuable coastal habitats. In the Secovlje Saline Park (Natura 2000 and Ramsar-Site) different Natura 2000 habitat types exist.

Main habitat types according to Annex 1 of the Habitat Directive are:

	area (ha)	percentage %
1130 Estuaries	11	1,7
1140 Mudflats and sandflats not covered by seawater at low tide	20	3,1
1310 <i>Salicornia</i> and other annuals colonizing mud and sand	11	1,7
1320 <i>Spartina</i> swards ( <i>Spartinion maritimae</i> )	16	2,5
1410 Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )	60	9,2
1420 Mediterranean and thermo-Atlantic halophilous scrubs	12	1,8

(Sarcocornetea fruticosi)

Total area of habitats protected by the Habitats-Directive 92/42 130 20,0

### 2.9.1. Management goals

The **goals** of management are as follows:

- Protection of species, habitats, ecosystems and landscape
- Enabling visitation, experience of nature, provision of information and raising awareness
- Contribution to the goals of other sectors of public policies (public services of protection of cultural heritage and of water management)
- Contribution to the development of local communities with activities those are compatible with goals of nature protection and within the limits of public service of protection of nature.

These goals are shown in **hierarchy** and are further elaborated through the series of activities (measures). **Indicators** are developed for the main goals.

### 2.9.2. Management strategies

The framework for the park management is designed in a hierarchy: vision - objectives - activities. The term strategy is not used. However, all of the long-term goals in the management plan are supported by a line of tasks, which are further divided into activities. For most of the activities, time frame, indicators, participants and costs can be defined. Tasks and activities that are related to the goals are outnumbered below:

- GOAL 1: Protection of species, habitats, ecosystems and landscape:

SUB-GOAL: Activities for protection of species and habitats (7 tasks and 18 activities). Tasks are:

- Management of reed beds, water habitats, grasslands and other habitats,
- Control over invasive alien species and mammalian and avian predators,
- Shaping and maintenance of the secondary and artificial breeding areas and substitute habitats,
- Ecological restoration of degraded habitats and their maintenance,
- Activities to mitigate consequences of changes in ecological conditions which negatively affect favourable ecological status of species and habitats,
- Purchase of the needed equipment,
- Maintenance of equipment and machinery.

SUB-GOAL: Implementation of salt-making process in order to support the needs of biodiversity in the area (18 tasks and 14 activities). Tasks are:

- Maintenance of the water regimes of the interior waters,
- Pumping the waters from the areas in depressions,
- Preparation of the technical documentation and guidance for implementation works,
- Reconstruction of the main inland channels,
- Reconstruction and maintenance of the internal dykes and embankments,
- Reconstruction and maintenance of internal water control mechanisms,
- Reconstruction and maintenance of internal wooden structures along the salt fields,
- Reconstruction and maintenance of salt fields with the substratum (petola),
- Setting up the main water transport channels and water reservoirs,
- Maintenance of the salt storage areas,
- Setting up wooden infrastructure for workers on salt fields (barracks),
- Construction of water pumping station (Lera),
- Construction of water pumping station (Fontanigge),
- Maintenance of the main storage area,
- Reconstruction of the secondary infrastructure objects (heating station etc.),
- Prevention on the damages on the dykes and infrastructure (and regular inspection),
- Purchase of equipment and machinery.

SUB-GOAL: Provision of information on the biological and environmental parameters in the area (5 tasks and 9 activities). Tasks are:

- Monitoring of the biological parameters and reporting,
- Implementation of field research,
- cooperation with research and study associations and individuals,
- maintenance of databases,
- Purchase of monitoring and research equipment.

SUB-GOAL: Cooperation with the stakeholders, related to the management and use of natural resources (3 tasks and 3 activities). Tasks are:

- Cooperation with farmers and their organisation,
  - Cooperation with sea food producers,
  - Cooperation with local hunting association.
- 
- GOAL 2: Enabling visitation, experience of nature, provision of information and raising awareness

SUB-GOAL: Provision of information on the park (5 tasks and 10 activities). Tasks are:

- Preparation and distribution of printed, electronic and other materials,
- Preparation of different presentations, workshops, exhibitions and other public events,
- Participation in preparation of media products, done by external teams,
- Preparation and promotion of events that are of cultural values,
- Other promotional activities.

SUB-GOAL : provision of visitation that is friendly towards visitors and environment (13 tasks and 29 activities). Tasks are:

- Visitor management (management of group visitation in advance),
- Interpretation of natural heritage,
- Efforts for shifting visitation peaks to the “off” seasonal periods,
- Maintenance of information signs,
- Setting up new visitors infrastructure,
- Coordination of the visitation with environmentally friendly transportation,
- Setting up infrastructure for railway (for transport of visitors),
- Maintenance of entrance points and pears,
- Maintenance of parking lots,
- Maintenance of other infrastructure for visitors (toilets, rubbish...),
- Activities for raising visitors’ environmental awareness,
- Construction of observation tower,
- Maintenance of other infrastructure for visitation.

SUB-GOAL: Contribution to the prevention of high water level damage (4 tasks and 6 activities).

Tasks are:

- Cooperation with the authority, responsible for public service of water management,
  - Cooperation in the preparation of the yearly programmes,
  - Setting up new water control mechanisms,
  - Reconstruction of the channel Giassi.
- 
- GOAL 3: Contribution to the goals of other sectors of public policies (public services of protection of cultural heritage and of water management)

SUB-GOAL: Contribution to the effective protection of cultural heritage (10 tasks and 4 activities).

Tasks are:

- Provision of water to enable traditional salt making process,
- Maintenance of the dykes within the salt Museum area,
- Enabling access to the Museum,
- Maintenance of the Museum salt field,
- Maintenance of the cultural values of the salt fields at Lera,
- Interpretation of cultural heritage for visitors,
- Interpretation of the medieval process of salt making,
- Joint promotion of the Park and Museum,
- Reconstruction of the old alters house,
- Reconstruction of the old water pumping object,
- Cooperation at the salt making camp sites.

SUB-GOAL: Contribution to the prevention of high water level damage (4 tasks and 6 activities).

Tasks are:

- Cooperation with the authority, responsible for public service of water management,
- Cooperation in the preparation of the yearly programmes,
- Setting up new water control mechanisms,
- Reconstruction of the channel Giassi.

SUB-GOAL 3: Contribution towards effective protection against natural hazards (1 task and 1 activity). The task is:

- Contribution to the elimination of the effects of natural hazards and epidemic situations (bird-flu, for example)
- GOAL 4: Contribution to the development of local communities with activities those are compatible with goals of nature protection and within the limits of public service of protection of nature.

SUB-GOAL: Enabling linkages between local population and park (3 tasks and 3 activities). Tasks are:

- Cooperation with local community and provision of advisory services in different environmental and land-use matters,
- Cooperation with local educational institutions,
- Enabling access for local people with boats through the park.

In addition, the tasks of surveillance and control over the park area (“rangers”) are also entrusted to the park management unit.

## 2.10. Triglav National Park, Slovenia

The Triglav National Park (TNP) is the only Slovenian national park. The park was named after Triglav, the highest mountain in the heart of the park, which is also the highest summit in Slovenia (2864 m). The Triglav National Park extends along the Italian border and close to the Austrian border in the north-west of Slovenia, that is, in the south-eastern section of the Alps. Its territory is nearly identical with that occupied by the Eastern Julian Alps. The park covers 880 square kilometres, or 3% of the territory of Slovenia. The Triglav National Park prides itself on pure waters, deep-cut gorges, remains of virgin forests, richness of biodiversity, and an Eldorado of mountain flowers including a number of endemic plants such as Triglav Hawksbeard, Julian Poppy and Silver-leaved Cranesbill. Typical park animals are the chamois, ibex, red deer, brown bear, lynx, eagle, numerous bird and reptile species, and the endemic Marble trout.

Main habitat types according to Annex 1 of the Habitat Directive are:

(due to an ongoing habitat-mapping no precise numbers for area were available yet)

area (ha) percentage %

- |      |   |
|------|---|
| 3140 | Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. |
| 3220 | Alpine rivers and the herbaceous vegetation along their banks       |

area (ha) percentage %

3230	Alpine rivers and their ligneous vegetation with <i>Myricaria germanica</i>
3240	Alpine rivers and their ligneous vegetation with <i>Salix elaeagnos</i>
4060	Alpine and Boreal heaths
4070*	Bushes with <i>Pinus mugo</i> and <i>Rhododendron hirsutum</i> (Mugo-Rhododendretum hirsuti)
6110*	Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi
6150	Siliceous alpine and boreal grasslands
6170	Alpine and subalpine calcareous grasslands
6210*	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
6230	Species-rich <i>Nardus</i> grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
6510	Lowland hay meadows ( <i>Alopecurus pratensis</i> , <i>Sanguisorba officinalis</i> )
6520	Mountain hay meadows
7110*	Active raised bogs
7140	Transition mires and quaking bogs
7230	Alkaline fens
8120	Calcareous and calcshist screes of the montane to alpine levels ( <i>Thlaspietea rotundifolii</i> )
8130	Western Mediterranean and thermophilous screes
8160	Medio-European calcareous scree of hill and montane levels
8210	Calcareous rocky slopes with chasmophytic vegetation
8220	Siliceous rocky slopes with chasmophytic vegetation
8240	Limestone pavements
8310	Caves not open to the public
91K0	Illyrian <i>Fagus sylvatica</i> forests (Aremonio-Fagion)
9530*	(Sub-) Mediterranean pine forests with endemic black pines
Total area of habitats protected by the Habitats-Directive 92/42	

### 2.10.1. Management goals

#### Goals:

- Conservation of biodiversity and viable populations in bogs, alpine swards, mountain pastures.
- Sustainable use of resources.

#### Aims (Objectives):

- To monitor indicators,

- To adjust the delimitation of core conservation areas and buffer zones to natural habitats and core distribution areas
- To research habitat requirements of endangered species and populations in order to enable key species and core populations to adapt to climate change.

There have been made a conceptual framework and a **hierarchy of goals**.

### 2.10.2. *Management strategies*

A plan of actions designed to achieve particular goals; e.g. to enhance the conservation status of habitats/species or to restore ecological processes.

- base-line documentation of the current distribution, abundances and conservation status of key habitat types/ species/ core populations in the park (and in its surroundings)
- base-line documentation of current land-use, infrastructure and the area's cultural heritage
- long-term monitoring of indicators
- identification of short-term/long-term conservation goals and of the park's social and economic values
- cooperation with other institutions and international experts
- communication with public, stakeholders
- preparation of management plans for Natura 2000 sites

Management measures and practices in next pages are applied to Management plan for peat bog Goreljek in Triglav national park and Cross border cooperation and cross border Management plans for the sites of nature conservation importance in the south part of Julian Alps (Slovenia - Italia).

## 3. Existing management measures

The following tables contain a compilation of management measures that are described in the management plan and of measures that are implemented inside the protected area but are not directly described in the management plan. These measures represent all activities inside the investigation areas that aim at nature conservation. If possible the measures are assigned to different strategies of protected area management. They are also assigned to the different habitat-types which they shall help to maintain and improve.

Although the HABIT-CHANGE project focuses on protected habitats a table with management measures to maintain and protect species is included in the chapter (table 10). Since protected species sometimes live in protected habitats the measures for species preservation may also



influence the conservation status of the habitat. And even if a protected habitat is in a favourable conservation status additional management measures may be necessary to maintain protected species.

In most management plans the measures and strategies are described without binding deadlines for implementation or quantitative descriptions of targeted status. If possible, that kind of information should be added to the measure description in the tables below.

The structure of the tables matches the habitat groups of Annex I of the Habitats Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC). That structure allows checking all topically implemented measures for the conservation of specific habitat-types. It also allows an easy transfer to the SDSS in work package 5.

But not all management measures can be connected directly to a specific habitat-type: some measures may improve the conditions for all habitat-types; others are focussed on the protection of endangered species (fauna and flora). Therefore we added a separate table (table 10) where measures for animal and plant species of community interest (according to Annex II of Habitats Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC) and Birds Directive on the conservation of wild birds (2009/147/EC) are compiled. Those measures are of interest for the habitat-protection because protected species and protected habitats stand in close interrelation and management measures for one of them may influence the other as well. The table should be completed with information about the respective habitat-type where the species-conservation measures are implemented.

Some strategies and measures can not be allocated to a specific habitat-type but they may influence indirectly the quality of a habitat (see tables 11 and 12). In these tables all measures are compiled which we could not allocate to a specific group of strategies or to a specific habitat-type. Please check if the measures in table 11 and 12 can be relocated in other tables.

All measures are assigned to strategies that we extracted from the questionnaires. The five top-groups are defined according to (The Heinz Center, 2008). Below we list the categories of strategies to give an overview about the topical management practice and give some examples of strategies and measures that can be assigned to the respective category:

### **1. Strategies related to land and water protection and management**

- Maintenance / Establishment / Management of ... (e.g. water regime, habitats)
  - Reconstruct sluices to manage water regime of protected habitats
  - Fill up channels to retain water for longer period
- Realization of appropriate conservation management practices:
  - Grazing (Avoiding under-/ overgrazing / avoiding damages due to grazing)
  - Avoiding damages due to livestock (excluding grazing)

- Mowing
- Burning
- Avoiding of scrub encroachment (exclusive grazing, mowing and burning)
- Combat against invasive species
- Other (e.g. minimize fertilization, herbicides, erosion)
- Restoration / Revitalisation / Reconstruction / Renaturation of ... (e.g. habitats)
- Prevention/ reduction of impacts and negative influences (general commandments and prohibitions)

## **2. Strategies related to monitoring and planning**

- Evaluation of ... (management measures and strategies, programmes, other activities for nature conservation)
- Control over... (e.g. pollution, human activities, disturbances)
- Monitoring natural resources (indicators, species, habitats, changes)
- Monitoring human activities (land use)
- Monitoring of touristic activities
  - Monitor, classify and organize the network of touristic routes
- Development and implementation of strategies for ... (e.g. tourism, conservation, handling of natural resources)

## **3. Strategies related to law and policy**

- Support the implementation of law ...

## **4. Strategies related to stakeholder and land user, public relation and awareness**

- Changes in land use management (also regulatory activities and restrictions)
  - Changes in agricultural land use
  - Changes in use of natural resources (hunting, fishing, timber, biomass for energy etc.)
  - Compensation / subvention / support
- Management of tourism and recreation
- Contact to local stakeholders, Stakeholder Dialogue

- Management of tourism and recreation
  - Regulatory activities / restrictions
  - Development of specially tourism activities
  - visitor direction / visitor management
  - Information material like Publications / Internet etc.
  - Educational activities
  - Activities with publicity effect
  - Regulatory activities / Restrictions for tourism
  - Development of infrastructure for tourism / visitors - Ways, pathes, trails, routes etc.
  - Development of infrastructure for tourism / visitors - information and education facilities
  - Development of infrastructure for arrival and departure
  - Development of supply infrastructure for local communities and tourism
- Changing owner / Buyout of privately owned lands




#### **5. Strategies related to knowledge and research, science and technology**

- Mapping
- Models
- Research studies

#### **6. Strategies related to species conservation**

- Protection of ...(e.g. special groups of animals)

Legend for the following tables:

-  Lines marked golden are the **top-categories of strategies** according to (The Heinz Center, 2008). Five different groups of strategies are defined.
-  Lines marked grey are **sub-categories of strategies** as they were reported from our investigation areas.
-  Lines unfilled contain **measures** as they were reported from our investigation area.
- X X stands for: strategy or measure is named by the area, but cannot be related to a specific habitat-type that is represented in the area.
- Y Y stands for: measure is implemented.
- N N stands for: measures is described in the management plan, but not implemented in the area.
- 1340 Habitat-code-number according to the Habitats-Directive.

**Table 1: Strategies and measures in coastal and halophytic habitats in HABIT-CHANGE investigation areas**

1000 Coastal and halophytic habitats that are represented in HABIT-CHANGE investigation areas		HABIT-CHANGE investigation areas									
		Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovije Salina	Triglav
1110	Sandbanks which are slightly covered by sea water all the time										
1130	Estuaries										
1140	Mudflats and sandflats not covered by seawater at low tide										
1150	Coastal lagoons										
1160	Large shallow inlets and bays										
1210	Annual vegetation of drift lines										
1310	Salicornia and other annuals colonizing mud and sand										
1320	Spartina swards ( <i>Spartinion maritimae</i> )				1530	1530				1130, 1140	
1340	Inland salt meadows									1310, 1320	
1410	Mediterranean salt meadows ( <i>Juncetalia maritimi</i> )									1410, 1420	
1420	Mediterranean and thermo-Atlantic halophilous scrubs ( <i>Sarcocornetea fruticosi</i> )										
1530	Pannonic salt steppes and salt marshes										
<b>Strategies related to land and water protection and management</b>											
<b>Maintenance of water regime</b>					1530					1140;1310; 1320;1410; 1420 Y	
	In wet areas: Maintenance of water regime, solving the problem of water supply and excess water because of neglected waterworks - new sluices that can be operated by hand.					1530					
	In wet areas: In extreme dry years (2 times in the past 10 years) water supply from the canal system, only in February (not during vegetation period).					1530					
	Avoiding too high water level during spring (not to threaten nesting birds and private-owned areas) or summer (drying out enabling mowing and cutback of Typha stands) by deflating into canals towards fishponds.					1530					
<b>Realization of appropriate conservation management practices</b>											
<b>Grazing (Avoiding under-/ overgrazing / avoiding damages due to grazing)</b>											
	Sheep and /or cattle grazing depending on wetness.					1530					
	Grazing the Typha stands after July by Hung. Grey Cattle (just half day per day to prevent diarrhoea)					1530					

Grazing with proper cattle breeds (Holstein breeds move in groups and avoid several species, graze selectively).					1530				
Avoiding overgrazing in wet areas; however, overgrazing is desirable on dry salt (sodic) steppes.					1530				
<b>Mowing</b>									
Mowing on wet areas once a year (late summer) if no possibility for cattle grazing.					1530				
Mowing around mid-June and cattle grazing in autumn.					1530				
Mowing as late as possible (late June) by remaining unmowed lines.					1530				
Long-lasting mowing since late spring fractionally in favour of birds.					1530				
<b>Combat against invasive species</b>									
Removal of selected invasive plants by hand or by cutting (e.g. Arundo sp.)								1310 Y	
Prevention against appearance of invasives: shredding drier edges in some years early September.					1530				
<b>Restoration of 600 ha salt marshes (1989, extended in 1998)</b>									
installation of 5 locks in the drainage channels					1530				
<b>Strategies related to monitoring and planning</b>									
Control over anchoring of boats and pollution								1130 Y	
Monitoring of water quality by Park Management and in addition, regular field observations and water sampling by Park rangers; Park manager informs the appropriate inspection in the signs of potential contamination of waters.								1320 Y	
Monitoring water level (esp. during winter) to avoid high level during spring (not to threaten nesting birds and private-owned areas) or summer (enabling mowing and cutback of Typha stands).					1530				
Control over human behaviour by Park Management; Install physical barriers to prevent uncontrolled and dispersed access by humans.								1140;1310; 1410; 1420 Y	
Strictly forbid driving across the area with any kind of machine under wet circumstances.					1530				

Evaluation of biodiversity in the coastal zone of the Black Sea							XY			
Strategies related to law and policy										
Stating in the contract when state-owned NP areas are lent for farmers: Management in line with aims of nature conservation.					1530					
Strategies related to Stakeholder and Land user, public relation and awareness										
Create public awareness, provide infrastructure, support education, inform				1530						
Strategies related to knowledge and research, science and technology										
Research studies for understanding of functions and services assured by freshwater, brackish and marine deltaic ecosystems (production, regulation, support).							XY			

**Table 2: Strategies and measures in coastal sand dunes and inland dunes in HABIT-CHANGE investigation areas**

2000 Coastal sand dunes and inland dunes that are represented in HABIT-CHANGE investigation areas	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina	Triglav
2110 Embryonic shifting dunes										
2130 Fixed coastal dunes with herbaceous vegetation ("grey dunes")										
2160 Dunes with Hippophaë rhamnoides										
2190 Humid dune slacks										
2330 Spergulo vernalis-Corynephorum						2330	2110, 2130, 2160, 2190			
<b>Strategies related to land and water protection and management</b>										
<b>Strategies related to monitoring and planning</b>										
Monitoring of dune vegetation						2330 Y				
<b>Strategies related to law and policy</b>										
<b>Strategies related to Stakeholder and Land user, public relation and awareness</b>										
Limitation of tourism at dune areas						2330 Y				
<b>Strategies related to knowledge and research, science and technology</b>										



**Table 3: Strategies and measures in freshwater habitats in HABIT-CHANGE investigation areas**

3000 Freshwater habitats that are represented in HABIT-CHANGE investigation areas	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovije Salina	Triglav
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										
3220 Alpine rivers and the herbaceous vegetation along their banks										
3230 Alpine rivers and their ligneous vegetation with Myricaria germanica										
3240 Alpine rivers and their ligneous vegetation with Salix elaeagnos										
3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation	3150 3220	3150 3260	3150	3130,3150 3160,3260 3270	3150	3150 3270	3130, 3140 3150, 3160 3260, 3270	3220 3230 3240		3140, 3220 3230, 3240
3270 Rivers with muddy banks with Chenopodium rubri p.p. and Bidention p.p. vegetation										
<b>Strategies related to land and water protection and management</b>										
Regulation and raising of water level (approx. 10 cm) by sluice gate in Fertőszél (control water level summer: 115,80 m / winter: 115,70 m above Adriatic sea level)				3150, 3160						
Maintenance of the channel system in the reed belt like dredging, sediment transfer, in channels (as a measure to improve the water supply.).				3150,3160						
Maintenance of water regime, solving the problem of water supply and excess water because of neglected waterworks - new sluices that can be operated by hand.					3150					
In extreme dry years (2 times in the past 10 years) water supply from the channel system, only in February (not during vegetation period)					3150					
Maintenance of natural state (natural dynamic and hydrology) of streams and waters	X N									X N
<b>Management of reed / riverine vegetation</b>										
Decreasing spread of the reed-belt towards the central lake area (with raising of water level)				3150,3160 N						

Clearing excess vegetation blocking free outflow in the river and mowing of nuisance vegetation on both river banks, unless protected species are present						XY				
Avoiding reed burning or reduction of controlled burning to small areas and in a mosaic-like strategy.								B1 Y		
Harvesting / cutting in some years during winter								B1 Y		
Removal of vegetation from the river and its tributaries						3270 Y				
cutting back nuisance development of reed stands				XY						
Reed cutting by private companies of approx. 25 % of the reed area					3130, 3150, 3160					
Prohibition of burning since 2011 for the reed belt					3130, 3150, 3160					
Facilitation of harvesting the reed belt inside the constructed channel-system: ~ 304 km channels built in 1930-1950										
Reconstruction of channel-system in the reed-belt to improve the water supply					3150,3160					
Keep streams free of use	3220 N									
Realization of appropriate conservation management practices										
Combat against invasive species										XY
Stands of invasive species along waterfront should be eradicated								B1 Y		
Stop the spreading of invasive species in the bank vegetation (esp. <i>Amorpha fruticosa</i> ), in the first year with heavy shredder, in the following years with lighter machines in every September						3150				
Preservation/ restoration of river habitats and their connectivity with adjoining terrestrial habitats (lateral connectivity)										X N
Prevention/ reduction of impacts and negative influences or uses	3150									
Prohibition to bring not indigenous fish species in the waters Banning the introduction of non-indigenous fish species										XY
Minimize of sediment- and nutrient pollution at inflows										

establishment of filter-fields, deposition area in inflows				3150,3160 N						
control of sediment-transport into the lake with improvement of flow-conditions - decreasing of intensive sedimentation in the south part of the lake				3150,3160 N						
prevent waste water discharge to the lake from the Hungarian catchment to decrease nutrient pollution				3150,3160 Y						
<b>Strategies related to monitoring and planning</b>										
<b>Monitoring</b>										
Monitoring of surface water quality				3130, 3150, 3160						
Monitoring water quality in the canals that serve water supply in dry years.					3150					
Water quantity and meteorological measurements				3150, 3160 Y						
Monitoring the compliance with the regulations regarding the ensuring of a servitude flow downstream of accumulation dams and in the capture stations									XY	
Monitoring of vegetation						XY				
<b>Strategies related to law and policy</b>										
<b>Strategies related to Stakeholder and Land user, public relation and awareness</b>										
Construction of channel system to facilitate of harvesting the reed belt				Y						
Establishment of a reed management plan, a cross border reed cluster (Sustainable Agriculture)				N						
<b>Regulatory activities for fishing / combating fish poaching</b>										
Organization / participation in patrol actions in fishing funds									XY	XY
Control of sport fishing										X N
<b>Changing owner / manager and management point of view (also in nature conservation)</b>										

Changing ownership and considering renting contracts not only on protected areas, but also in the buffer zone.					3150					
Intensification of Austrian-Hungarian cooperation with following tasks: Coordination and decisions for standard water level through main channel lock; investigations on water quality; dynamic flow model; measures against siltation of bayous					3130, 3150, 3160					
Prevention of drainage and illegal restoration of river canal in order to increase river's drainage impact						3170 Y				
<b>Strategies related to knowledge and research, science and technology</b>										
<b>Mapping</b>										
Mapping of lake-bed morphology (open surface water) with hydro-acoustic methods (ADCP – Acoustic Current Doppler Profiler) (2007; 2008)					3150					
macrophyte mapping of lake bays (2002, HU), and of the whole open lake margin (1998, 1999, 2000, 2005, 2006, and of representative parts in 2011, by UniVie)					3150, 3160					
hydrographical map of the lake (1981)					3150					
digital surface model of the lake (1995) (stable lake-bed, sludge surface, depth of sludge, water depth)					3150					
Hydro-acoustic depth-topography of the lake					3150					
Classification of reed belt: reed mapping in 2007 (also 1883, 1920, '61, '84, '99); reed mapping with laser-scan (finished until July 2011)										
<b>Research studies</b>										
Wind-induced hydrodynamics and sediment transport of Lake Neusiedl from lake-wide to bay-wide scale by Hungarian-Austrian-Finnish research cooperation					3150					
Research study about ecodynamical rehabilitation of Lake Neusiedl, in respect of quality of Raab's water					3150,3160 Y					

hydrological study (2010) to support the new operational regulation of sluice gate Fertőszél				3130,3150, 3160						
Research on hydraulic properties of vegetated river channels						3170 Y				
Research on flood extent (measurements and modelling)						3170 Y				

**Table 4: Strategies and measures in temperate heath and scrub in HABIT-CHANGE investigation areas**

4000 Temperate heath and scrub that are represented in HABIT-CHANGE investigation areas	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovije Salina	Triglav
4030 European dry heaths										
4060 Alpine and Boreal heaths										
4070 Bushes with Pinus mugo and Rhododendron hirsutum (Mugo-Rhododendretum hirsuti)										
4080 Sub-Arctic Salix spp. scrub										
40C0 Ponto-Sarmatic deciduous thickets										
40A0 Subcontinental peri-Pannonic scrub										
Strategies related to land and water protection and management	4060	4030		40A0		4030	40C0	4060, 4070, 4080		4060, 4070
Strategies related to monitoring and planning										
Strategies related to law and policy										
Strategies related to Stakeholder and Land user, public relation and awareness										
Strategies related to knowledge and research, science and technology										

**Table 5: Strategies and measures in Sclerophyllous scrub (Matorral) in HABIT-CHANGE investigation areas**

5000 Sclerophyllous scrub (Matorral) that are represented in HABIT-CHANGE investigation areas 5130 Juniperus communis formations on heaths or calcareous grasslands	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina	Triglav
			5130							
Strategies related to land and water protection and management										
Strategies related to monitoring and planning										
Strategies related to law and policy										
Strategies related to Stakeholder and Land user, public relation and awareness										
Strategies related to knowledge and research, science and technology										

**Table 6: Strategies and measures in natural and semi-natural grassland formations in HABIT-CHANGE investigation areas**

6000	Natural and semi-natural grassland formations that are represented in HABIT-CHANGE investigation areas	HABIT-CHANGE investigation areas								
		Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina
6110	Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi									
6120	Xeric sand calcareous grasslands									
6150	Siliceous alpine and boreal grasslands									
6170	Alpine and subalpine calcareous grasslands									
6190	Rupicolous pannonic grasslands (Stipo-Festucetalia pallentis)									
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									
<b>Strategies related to land and water protection and management</b>										
<b>Establish the carrying capacity of the pastures</b>								X Y		
	Maintenance of water regime, solving the problem of water supply and excess water because of neglected waterworks - new sluices that can be operated by hand.					6440				
	In extreme dry years (2 times in the past 10 years) water supply from the channel system, only in February (not during vegetation period)					6440				
<b>Sásdi meadows should be handled as areas close from public</b>				X Y						
	Visit only with permission			X Y						
<b>Establishment of grassland and enhancement of a naturalness state</b>				X						
	grassland creation by oversowing abandoned arable lands			X N						
	transforming hayfield into pasture			X Y						



transforming abandoned grape yard into pasture			X Y							
helping natural succession processes on abandoned arable land			X Y							
Realization of appropriate conservation management practices	6520, 6230									
After cleaning of drier grasses and weedy mesophilous grasses stem cutting, mowing and grazing are also possible			6410, 6440, Y							
Previously not mowed (or just partly, sometimes), regular mowing not necessary if proper water supply as defending against aggressive species mowing is necessary; mowing in dry periods may lead to their drying out and transformation into Molinia meadows (D2)			7230 Y							
Grazing (Avoiding overgrazing / avoiding damages due to grazing)			X							
Grazing				6110,6190 6210,6240 6250,6260 6430						XY
Grazing (partly) to avoid scrub encroachment					6250					
Grazing (temporarily) to avoid scrub encroachment			6190, 6240, Y							
Grazing with cattle on dry, weedy, mesophilous grasses and scrub encroachment of drier grasses. In case of drier grasses only drive through grazing lasting for shorter periods is possible			6410, 6440 Y							
Grazing should be avoided at least on the areas in good condition. Even the aftermath on the degraded stands may be grazed after end-Sep.			6410 Y							
Grazing (yearly controlled and adapted) to convert areas into pastures with extensive livestock				X Y						
Traditional grazing activities				X Y	6250					
Grazing the Typha stands after July by Hung. Grey Cattle (just half day per day to prevent diarrhoea)					6440					
Reduction of grazing on the waterfront	X Y									
Reduction of cattle grazing in wet meadows	X Y									

Cattle grazing in wetlands is to be drastically reduced / completely abandoned	X Y									
Grazing with proper cattle breeds (dairy Holstein breeds move in groups and avoid several species, graze selectively; extensive use of meat-type breeds is needed).	X			X Y	6250 6440					
Extensive, slight grazing on upper, drier areas since spring with keeping the current level of livestock load			X Y		6250					
Maintaining areas without any grazing; especially on the occurrences of the pannon endemic grasshopper specie <i>Isophya costata</i>			6440, 6510 Y							
Regulation and control of grazing pressure in alpine pastures										X Y
Grazing is forbidden			6410 Y							
Avoiding damages due to livestock (excluding grazing)										
Reduction of fertilisation in wet meadows	X Y									
decrease erosion and contamination of groundwater by prevention of pasturing outside pastureland										X N
Avoiding damages made by wild boar						6410 Y, 6430 Y, 6510 Y				
Mowing										
Mowing every year in selected stands; appropriate frequencies of mowing		6510 ,652 0 N		6210, 6410, 6440, 6510						6510 Y
Mowing (yearly controlled and adapted) lakeside meadows (use as haying and pastures)				X Y						
Autumn clearing mowing on the pastures			X Y							
Mowing by hand after the ripening of seeds (from the end of August); mosaically, if it is needed (e.g. because of stated weeding or scrub encroachment)			6410 Y		6440					

Mowing by hand or by machine and removal of biomass – once a year in late summer – to reduce nutrient content of the soil in areas where artificial fertilizer was used before to help regeneration of Orchidaceae stands.					6440	6410Y, 6430Y, 6510Y				
Long-lasting mowing since late Spring fractionally in favour of birds.					6440					
Mowing once a year in altering time and mosaically, removing cut hay from the area			6410, 6440 Y							
Mowing after 20. July, mosaic mowing with maintaining unmowed patches in 25-30% of the area (or mowing them several weeks later)→ especially on the occurrences of the pannon endemic grasshopper specie <i>Isophya costata</i>			6440, 6510 Y							
Mowing by hand or (in dryer periods) by easy machines between mid-August and mid-September, mosaic mowing with maintaining unmowed patches in 25-30% of the area (or mowing them several weeks later)			6410 Y							
Mowing once a year (after mid-July). Mowing should be avoided in extreme dry years, or postponed for autumn. Mosaic-like mowing every time			6440 N		6250 6440					
<b>Burning</b>										
strictly controlled burning of <i>Calluna</i> heaths in Jan-Feb (depending on the weather)			N							
<b>Avoiding of scrub encroachment (exclusive grazing, mowing and burning)</b>										
Removal of trees, bushes and shrubs (every year in selected stands)		6510 6520 N		X		X Y				
Manual removal of shrubs (mainly <i>Pinus sylvestris</i> ), excluding birch groves and willow scrubs			6410, 6440 Y							
Cutback of shrubs			Y							
Localised clearance of shrubs and swath	6520 Y									
Cutback of shrubs: <i>Prunus spinosa</i> with machines (shredding yearly) on <i>Otis tarda</i> mating areas; <i>Eleagnus angustifolia</i> stands by hand .					6250					
<b>Combat against invasive species</b>										

Removal of Solidago stands: cut in the beginning of flowering, mowing or proper grazing by Hungarian Grey Cattles			6410, 6440 Y							
Removal of Reynoutria japonica, Carex brizoides (every year)		6430 N								
Removal of Solidago gigantea (grazed by Hungarian Grey Cattles) and Pinus sylvestris			X							
Cutting invasive forest species every year in designated areas, made by foresters			X				X Y			
<b>Reconstruction of wetland</b>										
Maintenance of water regime, solving the problem of water supply and excess water because of neglected waterworks - new sluices that can be operated by hand.						6440				
In extreme dry years (2 times in the past 10 years) water supply from the canal system, only in February (not during vegetation period).						6440				
restoration of groundwater-regime					6410 N					
restoration of rich fen between Fertőhomok Hidegség					6410 N					
Restoration of hydrographic network and reconstruction of wetlands							X Y			
Revitalisation of seasonal mountain pastures	X									
Reconstruction of grassland may be necessary in case			X Y							
Reconstruction of habitats between Balatonederics and Szigliget			X							
<b>Other</b>										
Control and reduction of fertilisation		X Y								6510 Y
fertilize, chemical weed-control or over-sowing is forbidden			6410, 6440 Y							
Soil fertility may be increased only with bacterial products, but never on valuable stands in good condition			6510 Y							
Prohibition of input of fertilizers in alpine pastures										X Y

Prohibition to store materials on site originating from other than grass management			6410, 6440 Y							
Prevention of erosion on alpine pastures										X N
Use of turf as straw has to be substituted by other materials	XY									
<b>Strategies related to monitoring and planning</b>										
<b>Monitoring</b>										
Vegetation-ecological and invertebrate monitoring for planning and developing maintenance measures (e.g. grazing)				XY						
Monitoring plan to regulate grazing and grassland improvement status - Identify, evaluate and monitor the grasslands with low biodiversity and the measures to improve their quality									XY	
Monitoring the effects of mowing and grazing on some characteristic grassland through at least 10 years to define the livestock-keeping capacity			X							
monitoring studies in grasslands and reed communities			X							
Monitoring water level (esp. during winter) to avoid high level during spring (not to threaten nesting birds and private-owned areas) or summer (enabling mowing and cutback of Typha stands).						6440				
<b>Development and implementation of strategies for conservation</b>										
Creation and adaption of a time table for mowing and grazing				XY		6440 6250				
Identification of pastures that are not included in the strictly protected area									XY	
Preventing the conversion of protected habitats into intensively cultivated arable land or reversing such developments				XY						
Programme of provincial government subsidies (Landscape Maintenance Fund) for habitat- network through fallow areas (ÖPUL-programme until 2013)				XY						
Land consolidation in the National Park: incorporation of ~ 2000-4000 ha ÖPUL-areas in close-up range into the national park; integration of agricultural land, about 2500 ha										X N
<b>Strategies related to law and policy</b>										

Stating in the contract when state-owned NP areas are lent for farmers: Management in line with aims of nature conservation.					6250 6440					
<b>Strategies related to Stakeholder and Land user, public relation and awareness</b>										
<b>Changes in land use management (also regulatory activities and restrictions)</b>										
Amendments of farming practices on seasonal mountain pastures: adjusting the stocking rate to a sustainable amount	X Y									
Resumption of farming on mountain hay meadows	6520 Y									
Amendment of fertilisation intensity on hay meadows and distribution of stocking rate	X Y									
Reduction of the use of fertilisers and gradual adaption to a sustainable use of pastures	X Y									
CC-reference: every herd owner has a reserve area if needed in dry years; extensive grazing with private or NP-owned herds of cattle				X Y						
Restrictions of vehicle traffic besides asphalt roads			X Y							
<b>Compensation / subvention / support</b>										
obtaining revenue for local communities in case of maintaining traditional grazing activities								X Y		
Compensations according to the law offered by the administration of the park for grassland conservation					6250 6440			X Y		
Compensation of wild boar damages, special contracts with farmers, every year							X Y			
<b>Management of tourism and recreation</b>										
Reducing the affluence of hikers at the lakes' shore	X Y									
Standardization and renewing of the information system.			X N							
Limited tourism in the Lake Kornyí area			X N							
Enhancement control. Environmental education, awareness raising in the villages (school programmes, forums etc.).			X N		6250 6440					
PR activities for visiting the study paths.										

Visiting and demonstration of the area (due to the unique natural values) are not offered at all - Keeping away photographers from <i>Gladiolus palustris</i> , who are trampling upon its habitat			X Y							
Buyout of privately owned lands						X Y				
Strategies related to knowledge and research, science and technology										
Mapping										
Dry grassland inventory				X Y						
Establish the carrying capacity of the pastures										

**Table 7: Strategies and measures for raised bogs and mires and fens in HABIT-CHANGE investigation areas**

7000	Raised bogs and mires and fens that are represented in HABIT-CHANGE investigation areas	HABIT-CHANGE investigation areas								
		Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovije Salina
7110	Active raised bogs									
7120	Degraded raised bogs still capable of natural regeneration									
7140	Transition mires and quaking bogs									
7210	Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae									
7230	Alkaline fens									
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae									
		7140, 7240	7110, 7120, 7140, 7230	7140, 7210, 7230	7210, 7230		7110, 7140, 7230	7210	7140	
<b>Strategies related to land and water protection and management</b>										
Maintenance of mosaic landscape structure and extensive agricultural practises										6510; 6520 Y
Realization of appropriate conservation management practices										
Grazing (Avoiding overgrazing / avoiding damages due to grazing)										
	Prevention of grazing and eutrophication in sensitive peat bogs									X Y
	Avoiding grazing			7230 Y						
	traditional grazing activities				7230					
<b>Mowing</b>										
	Mowing and removal of biomass (moss-sedge communities) performed every year, from mid August to mid September, by hand or easy machines						X Y			
	Mowing, if threatened by scrub encroachment or afforestation			Y						
<b>Avoiding of scrub encroachment (exclusive grazing, mowing and burning)</b>										
	Removal of trees, bushes and shrubs				7230					
	Removal of spruce-regeneration		7120, 7140 N							
	Removal of birch ( <i>Sphagnum</i> bogs) by hand every two-three years in selected areas						X Y			



Removal trees (moss-sedge communities) by hand every two-three years in selected areas						XY				
Removal of thinning remnants		7120, 7140 N								
<b>Combat against invasive species</b>										
Cutback of invasive stands			Y							
<b>Renaturation/ restoration of marsh habitats</b>						XY				
restoration of fens habitat				7230 Y						
<b>Revitalisation of bogs by water management</b>		7120, 7140 N								
<b>Prevention/ reduction of impacts and negative influences</b>										
Minimizing disturbances to sensible peat bog habitats										XY
<b>Strategies related to monitoring and planning</b>										
<b>Mapping</b>										
Mapping of bogs (2001-2008) - Preparation of following bog-projects		7110, 7120, 7140, 7230 Y								
Mapping of hydrological parameters and vegetation changes						XY				
Zonation of peat bog vegetation types and species distribution (prioritizing features)										XY
Creation and adaptation of a time table for mowing and grazing				7230 Y						
<b>Strategies related to law and policy</b>										
<b>Strategies related to Stakeholder and Land user, public relation and awareness</b>										
<b>Changes in land use management (also regulatory activities and restrictions)</b>		7140 Y								
Separation of single land uses from small areas of wetlands	7140 Y									
Prevention of using salt on icy roads in the surroundings of peat bog habitats										X N
<b>Management of tourism and recreation</b>										
prevent ski trails across peat bogs and surroundings										XY

Visitor information on the ecological value of the wetlands and the importance of the passage	X Y									
Strict protection and avoiding excess tourism (including illegal quad tours, exploration,...), Construction of visitor infrastructure, education of visitors						X Y				
Strategies related to knowledge and research, science and technology										

**Table 8: Strategies and measures for rocky habitats and caves in HABIT-CHANGE investigation areas**

8000 Rocky habitats and caves that are represented in HABIT-CHANGE investigation areas	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina	Triglav
8110 Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	8110, 8120	8150	8150	8210				8110		8120, 8130
8120 Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	8210, 8220	8220	8220					8120		8160, 8210
8130 Western Mediterranean and thermophilous screes										
8150 Medio-European upland siliceous screes										
8160 Medio-European calcareous scree of hill and montane levels										
8210 Calcareous rocky slopes with chasmophytic vegetation										
8220 Siliceous rocky slopes with chasmophytic vegetation										
8230 Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the Sedo albi-Veronicion dillenii	8340	8230	8230					8210		8220, 8240
8240 Limestone pavements								8310		8310
8310 Caves not open to the public										
8340 Permanent glaciers										
<b>Strategies related to land and water protection and management</b>										
<b>Strategies related to monitoring and planning</b>										
<b>Monitoring natural resources</b>										
Marking safety zones and buffer areas in the karstic system and cave system								X Y		
<b>Monitoring human activities (land use)</b>										
Monitoring the anthropogenic activities in the perimeters of karstic complexes								X Y		
<b>Strategies related to law and policy</b>										
<b>Strategies related to Stakeholder and Land user, public relation and awareness</b>										
<b>Management of tourism and recreation</b>										
conservation measures for the alpine infrastructure (touristic hot spots at the alpine refuges)	X Y									
Clear marking (blazing) of hiking paths and containment of shortcuts	X Y									
Preservation of pathways and ropeway for material transport	X Y									
Restoration of erosion damages										
Prevention / abatement of pollution through litter	X Y									

Strategies related to knowledge and research, science and technology										
Mapping										
	Having a GIS database as indispensable management tool of karstic complex and of the caves								X N	
	Identification of land owners, land-use and status of karstic/ cave elements								X N	
Research studies of meltdown of permanent glaciers										
	Assessment of the implications of glacier meltdown for water balance	X Y								
	Assessment of the implications of glacier meltdown for stability of slopes	X Y								
	Assessment of the potential impacts on fauna and flora	X Y								
Geological and geomorphological caving research studies										
	Continue the exploring and mapping of caves and find new components of the karstic system (chimneys, drains, secondary cavities, etc.)								X Y	
	Measurements, observations and studies of karstic features and elements for understanding the genesis, the structure and the dynamics of the karstic system and its elements								X Y	
	Qualitative and quantitative studies on biodiversity of the karstic system								X N	

**Table 9: Strategies and measures for forests in HABIT-CHANGE investigation areas**

9000 Forests that are represented in HABIT-CHANGE investigation areas	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina	Triglav
9110 Luzulo-Fagetum beech forests	9410	9110	9130	9130	91E0	91D0	91AA	9110		
9130 Asperulo-Fagetum beech forests	9420	9130	9150	9170		91E0	91F0	9150		
9150 Medio-European limestone beech forests of the Cephalanthero-Fagion		9180	9180	9180		9160	92A0	9180		
9160 Tilio-Carpinetum		91E0	91E0	91E0			92D0	91E0		
9170 Galio-Carpinetum oak-hornbeam forests with Galium sylvaticum		91D0	91H0	91F0				91V0		
9180 Tilio-Acerion forests of slopes, screes and ravines		9410	91M0	91G0				9410		
91AA Eastern white oak woods			91G0	91H0				9420		
91D0 Bog woodland				91H0						
91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)				91I0*						
91F0 Riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia, along the great rivers (Ulmenion minoris)				91M0						
91G0 Pannonic woods with Quercus petraea and Carpinus betulus				9260						
91H0 Pannonian woods with Quercus pubescens										
91M0 Pannonian-Balkanic turkey oak – sessile oak forests										
91V0 Dacian Beech forests (Symphyto-Fagion)										
92A0 Salix alba and Populus alba galleries										
92D0 Southern riparian galleries and thickets (Nerio-Tamaricetea and Securinegion tinctoriae)										
9410 Acidophilous Picea forests of the montane to alpine levels (Vaccinio-Piceetea)										
9420 Alpine Larix decidua and/or Pinus cembra forests										
<b>Strategies related to land and water protection and management</b>										
<b>Maintenance / Establishment / Management of forest habitats</b>										
Protection of isolated, scarcely cultivated swiss pine forests	X N									
Fostering and selective thinning of forest habitats outside the core zone Need for protection and regulation of typical tree species and tree species compositions and food plants for explicit birds, possible on all forest-habitat-stands outside the protected core zone, this type of management measure is not explicit suggested but overall positive marked (harmless) (see also the next!)		all N								
Regulation of species composition and tree density in stands (early and late forest fostering and clearing activities) to improve the structure and sanitary state of stands according to Protection tasks for the BNP						X Y				
Maintenance of mosaic patterns in the forest with old trees										X Y
Protection of old-growth forests and old trees with holes in commercial forests				91E0						X Y



Strategies related to knowledge and research, science and technology										

**Table 10: Strategies and measures for animal and plant species of community interest in HABIT-CHANGE investigation areas**

Species of community interest that are represented in HABIT-CHANGE investigation areas Habitats Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC) – Annex II Animals Plants Birds Directive on the conservation of wild birds (2009/147/EC)	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Kőrös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina	Triglav
A1 Capra ibex (Alpine ibex)					A11	P1			A3	A1
A2 Citellus citellus (European souslik)					P7	P3			B2	A4
A3 Emys orbicularis (European Pond Turtle)					B23	P4			B4	A5
A4 Lepus timidus (Mountain Hare)					B32	P5			B8	A6
A5 Lutra lutra (European Otter)					B34	P6			B9	A8
A6 Lynx lynx (Lynx)					B35	B1			B10	A10
A7 Mustela lutreola (European Mink)					B36	B6			B14	B3
A8 Rupicapra rupicapra (Chamois)					B37	B7			B19	B13
A9 Soricidae (Shrews)						B11			B22	B24
A10 Ursus arctos (Brown Bear)						B12			B27	B21
A11 Lycaena dispar rutila						B13			B29	B28
P1 Cypripedium calceolus						B16			B30	
P2 Dicranum viride						B17				
P3 Iris aphylla						B23				
P4 Pulsatilla patens						B25				
P5 Saxifraga hirculus						B31				
P6 Thesium ebracteatum						B32				
P7 Cirsium brachycephalum						B33				
B1 Acrocephalus paludicola (Aquatic Warbler)										
B2 Alcedo atthis (Kingfisher)										
B3 Alectoris graeca (Rock Partridge)										
B4 Anas penelope (Wigeon)										
B5 Aquila chrysaetos (Golden Eagle)										
B6 Aquila clanga (Greater Spotted Eagle)										
B7 Aquila pomarina (Lesser Spotted Eagle)										
B8 Ardea alba (White Egrets)										
B9 Calidris alpina (Dunlins)										
B10 Charadrius alexandrinus (Kentish Plover)										
B11 Ciconia nigra (Black Stork)										
B12 Circus pygargus (Montagu's Harrier)										
B13 Crex crex (Corncrake)										
B14 Egretta garzetta (Little Egrets)										
B15 Falco peregrinus (Peregrine Falcon)										
B16 Gallinago gallinago (Common Snipe)										
B17 Gallinago media (Great Snipe)										
B18 Gypaetus barbatus (Bearded Vulture)										
B19 Himantopus himantopus (Black-winged Stilt)										
B20 Lagopus muta (Rock Ptarmigan)										
B21 Lanius collurio (Red-backed Shrike)										
B22 Larus melanocephalus (Mediterranean Gull)										
B23 Limosa limosa (Black-tailed Godwit)										
B24 Monticola saxatilis (Rufous-tailed Rock-thrush)										
B25 Numenius arquata (Eurasian Curlew)										
B26 Pelecanus crispus (Dalmatian Pelican)										
B27 Philomachus pugnax (Ruffs)										
B28 Saxicola rubetra (Whinchat)										
B29 Sterna albifrons (Little Tern)										
B30 Sterna hirundo (Common Tern)										
B31 Tetrao tetrix (Black Grouse)										
B32 Tringa tetanus (Common Redshank)										
B33 Vanellus vanellus (Northern Lapwing)										
B34 Otis tarda (Great Bustard)										
B35 Chlidonias leucopterus ( )										
B36 Anser anser										
B37 Aythya nyroca										
<b>Strategies related to land and water protection and management</b>										
Preservation of the gopher (Citellus citellus) population			X Y							
Protect and preserve Dalmatian Pelican (Pelecanus crispus);							X Y			
Restore the population of European Mink (Mustela lutreola)							X Y			
Maintenance of current population of European killfish								X Y		



Management of water regime									A3; B2; B4; B8; B9; B10; B14; B19; B22; B27; B29; B30 Y	Soricidae N
Maintenance and creation of breeding rafts and islands									B29; B30 Y	
Creation of edge channels									B10 Y	
Conserve backwaters and flooded sites of rivers										A5 N
Reduction the use of pesticides and fertilizers in particular in the vicinity of water bodies										A5 N
Renovate abandoned waterworks to be able to manage water level (shallow water till end of August) for creating optimal nesting places.					B23, B32, B35, B36, B37					
Conservation of riverine vegetation										A5 Y
<b>Management of grassland, agricultural land</b>										
mowing, removal of shrubs and removal of biomass to actively protect certain species, done in selected areas, according to BNP Protection tasks									7140; P1; P3; P4; P5; P6 Y	



extensive grassland management											B3; B13; B24 Y
maintenance of mosaic landscape structure and extensive agricultural practises (6510, 6520)											B21; B28 Y
<b>Protection against predators</b>											
Restitution and preservation of breeding sites, annual reduction shootings of fox to 50 individuals and Raccoon dog to 25 individuals											B1; B6; B7; B12; B13; B16; B17; B23; B25; B31; B32; B33 Y
Annual reduction of American mink population to o 50 individuals											Charadriiformes birds Y
Setting up fences and obstacles to prevent mammalian predation											B19 Y
<b>Maintenance of gene flow</b>											
Maintenance of migration corridors											A6; A10 Y
<b>Protection of forest habitats</b>											
leave the lower moosy trunk section on forest stand despite thinning and wood deployment			P2 N								
<b>Protection of important habitats / tree stand</b>											
Protection of feeding areas and creation of nesting sites to 10 individuals: Strategy include: Enhancing of site wetness, preventing drainage, measure: construction of nesting platforms in selected areas, according to BNP Protection tasks											B11 Y
Maintenance of vertical and horizontal vegetation stratification in high mountain ranges											A4 Y
Maintaining an appropriate pasture system tor educe conflicts between Ursus arctos and humans											A10 Y
<b>Strategies related to monitoring and planning</b>											
Incorporation into the monitoring programme for protection of the retreating areas											B3; B5; B15; B18; B20; B31 Y
Evaluation (annually) of efficiency of the program of populating the Danube with individually marked sturgeon (Acipenser)											X Y
<b>Monitoring natural resources</b>											
Fish ecological monitoring (CPUE (catch per unit effort), echo sounding): semi-/ quantitative stocktaking, population structure of single species, trophic niches											X Y
Ornithological monitoring: stocktaking, breeding pairs, breeding success											X Y
Ornithological monitoring (Periodical monitoring (CES program) by NP): Waterfowls, song-birds, protected birds...											X Y
Monitoring and management of wild animals: stocktaking, analysis of surroundings, elaborating suitable management measures											X N
Monitoring valuable plant and animal species and plant associations											X
Annual monitoring, counting blooming specimen (according to National Biodiv.- monitoring system).											P7
<b>Strategies related to law and policy</b>											
<b>Strategies related to Stakeholder and Land user, public relation and awareness</b>											
Prohibition of sport fishing in rivers											A5 N
Strictly forbidden any management (e.g. grazing) or any usage of the mateing area till 1 <sup>st</sup> of May											B34
Changing air electric wires into subsurface cables.											B34
Counselling for the redistribution of animals on other pastures if the support limit exceeds											X Y
<b>Management of tourism and recreation</b>											
Control and reduction of recreation activities (i.e. driving with motor vehicles, paragliding)											B13; B3; A1; A8 Y
<b>Strategies related to knowledge and research, science and technology</b>											
Research about population dynamic of species and their connections to humans: Lutra lutra, Lepus timidus, Capra ibex											A1; A4; A5 N

**Table 11: Strategies and measures for habitat-management that are implemented but cannot be related to a specific habitat-type in HABIT-CHANGE investigation areas**

The table contains all strategies and measures that could not be assigned to a specific habitat-type or to a specific species (protected after Habitats-Directive Annex 2-4).

	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina	Triglav
<b>Strategies related to land and water protection and management</b>										
Measures for the development of beneficial infrastructure for the avalanche stripes	X									
Maintenance of the mosaic-patterns ["patchwork of landscapes"] of the habitat complex			X		X					
Maintaining a habitat structure that is characteristic for close-to-natural conditions			X		X					
Establishment of a biotope network beyond the protected area	X									
Enhancement of small structures (hedgerows, riverine vegetation strips and isolated trees)	X									
Realization of appropriate conservation management practices										
Conservation of the green alder tree stands (through cane stroke) and of the grey alder forests, although these stands are not recognised as Natura 2000 areas	X Y									
mowing, removal of spruce and shrubs on non-forest habitat types in small stream valleys		X N								
development of new biotopes by the help of deposition surfaces				X N						
Renaturation / restoration										
Renaturation/ restoration of degraded habitats										X N
Reconstruction of degraded ecosystems: identification of areas, establishment of necessary measures and their application								X N		
Dismantling of infrastructure (a bridge in 2008) in the core-zone		X N								
Removing of unnecessary paths										X Y

Works on driveway construction include: 1. removal of trees (417); 2. removal of bushes (2.36 ha) - Construction of a driveway for needs of renaturation of hydrographic network						X N				
Rewetting of specific area - installation of 5 locks in the drainage channels, with water gauges (for restoration of groundwater-regime)				X Y						
<b>Combat against invasive species</b>					X					
Removal of alien species by the Park management: Acer negundo, Prunus serotina, Quercus rubra, Helianthus tuberosus, Lupinus polyphyllus, Symphoricarpos albus, Robinia pseudoacacia, Caragana arborescens, Impatiens parviflora, Cornus sericea, Epilobium adenocaulon in selected areas, according to BNP Protection tasks						X Y				
Removal of invasive species										X N
Assess the invasive species and elaborate precautionary measures for their management							X Y			
Removal of (invasive) species on small stream valleys		X N								
Cutting back invasive herbaceous plants			X Y		X					
Cutting back invasive arboreal plants			X Y							
<b>Avoiding of scrub encroachment</b>			X							
Removal of bushes and scrubs (especially shredding of Elaeagnus angustifolia): preservation of richly structured winegrowing landscape				X Y						
<b>Management of water retention &amp; supplement</b>										
building sluices on canals and creating system for water retention				X N	X					
creating system for water supplement from canals of fishponds				X N						
in dry years leading water into the marshes				X						
<b>Strategies related to species conservation</b>										
Breeding of Polish Konik (horse) to conserve genetic resources of the horse						X Y				
Protection of elk (Alces alces) refuges: Delaying of bush removal and mowing until the period of 1 Sep.-30. Nov. Limitation of human penetration during the period of mating						X Y				
consider population responses of ground-nesting birds and small mammals on alpine pastures										X Y
Appraisal to determine whether temporary restrictions of uses at the Antolz Lake show positive effects on the lakeshore (e.g. breeding sites)	X Y									

Protection of amphibian and reptile						X					
	safe migration in spring and autumn: determine black spots on the roads and assure corridors for migration				XY						XY
	appropriate maintenance of open areas, in particular grassland ecosystems (extensive agricultural management practices), conserve hedges										XY
	Conservation of backwaters and flooded sites of the rivers										XN
	Conservation of riverine vegetation										XY
	Reducing the use of pesticides and fertilizers in particular in the vicinity of water bodies										XN
	Maintenance of water bodies										XN
Protection of forest-depending species											
	no forest management in forest stands including protected biotopes or nest- and hollow-trees (bats) , need for protection of biotopes and support bats, possible on all forest-habitat-stands			XN							
	leave deadwood on habitat-stand (xylobionts) , possible on all forest-habitat-stands			XN							
	no wood deployment from March up to July (woodpecker) , necessary on forest stands, which include woodpecker			XN							
	maintenance of mosaic patterns in the forest with old trees with holes (Muscardinus avellanarius, Dryomis nitedula)										XY
Strategies related to monitoring and planning											
	Evaluation of tourism infrastructure and its harmonization with EU requirements, elaboration of projects with external funding for their upgrading and developing.									XN	
	Identification of climbing routes and access paths, monitoring and setting up regulations for access									XY	
	Identify, inventory and present the main elements of landscape, flora and fauna, which may be the subject to future tourism activities									XY	
	Identification/development of areas where recreation and tourisms will be possible										XY
	The involvement of the administration in the development and aproval of general urban and regional plans for the areas included in the Park - General urban and regional plans in which we find the delimitation of Bucegi Natural Park									XY	

Implementation of research results in the action plans and management Managing and updating the information on results from research					X			XY		
base-line documentation of the current distribution, abundances and conservation status of key habitat types/ species/ core populations in the park (and in its surroundings)										X
base-line documentation of current land-use, infrastructure and the area's cultural heritage										X
long-term monitoring of indicators										X
<b>Monitoring natural resources</b>					X					
Evaluation of the conservation status of habitat types (prioritizing features)										XY
Selection and formulation of indicators to define the state of ecosystems							XY			
Detailed studies on the interactions between recreational uses and fauna	XY									
water quality survey, water quantity and meteorological measurements for characterization and following of changes in the region				XY	X					
Vegetation-ecological and faunistic pasturing monitoring: Documentation and discussion, reduction and elimination of reeds beneath saline lakesides, maintenance and increase of biodiversity, preservation and restoration of a small-range, species-rich landscape mosaic				XY	X					
Repeating habitat mapping every 5/10 years			X		X					
Monitoring hydrological features, looking at the effects of management and the changes of vegetation in parallel, exploring causes and effects			X							
Monitoring changes in water supply, in parallel with the changes in vegetation, water insects and waterfowl			X							
Groundwater quality monitoring (by federal state government)				XY						
Establishment of a reed management plan (has been allocated for Natura 2000 areas)				XY						
Monitoring the management of the hunting funds to conserve the optimal number and structure of cinegetic fauna								XY		
Establish and monitor a system of full protection for scientific and natural reservations strictly protected by prohibiting grazing and deviating touristic walking trails								XY		
<b>Monitoring of human activities (land use)</b>										

Monitoring the exploitation activities of natural resources (quarries, springs, wood and non-wood products, etc.), identify solutions for limiting or suppressing these activities								XY		
Mapping(?) settlement of activities in various categories of internal areas, specific habitats - Cooperation of specialists in the development and implementation of the biodiversity monitoring plan								XY		
Identifying the remarkable scientific and landscape targets located inside villages and endangered by various activities, highlighting these in the urban plans, planning the settlement, cultural, educational, agricultural, social, economic and environmental policies, under Romanian and European legislation. - Completion of the rules and regulations for all urban plans categories by highlighting the disturbing factors and the protection landscape measures								XY		
Monitoring of mowing – private proprietors get subsidies for mowing some lands of the Biebrza National Park. After every mowing the spatial accuracy and a quality of mowing is examined by field services of BNP.						XY				
<b>Monitoring of touristic activities</b>										
Visitor monitoring on selected areas and points of interest		XY					XY			
monitoring visitors and their impact on the environment Identify and monitor the overcrowded camping sites, analyze the impact on habitats, establishing ecological tolerance of the perimeter, sizing and marking them correspondingly. Disposal of land and water pollution, prevention of illegal cutting, fire								XY		
Monitoring the development and maintenance of ski slopes, compliance with the legislation (scraping, levelling, protective guard rails, snow fences, provisional constructions during ski season)								XY		
Monitoring the impact of touristic activities and touristic flow on auto, touristic and mountaineering routes, camping places and touristic units in the Park, through actions and constant patrol								XY		

Identify and monitor the accommodation and food facilities in the park and surroundings. Promoting the units that offer a high quality service and comply with the environmental legislation and rules of PNB. Sanctioning the units not complying with the environmental legislation									X N		
Identification of sites and construction of simple shelters or refuges for bad weather conditions along tourist routes. Construction of a gate at the entrance in Răței Cave. Ensuring the safety of tourists									X Y		
<b>Monitor, classify and organize the network of touristic routes</b>									X Y		
Identifying, mark or restore the mark in selected areas, as the need arises							X Y		X Y		
Identify the negative impact of tourist routes on biodiversity;									X Y		
Closure of some difficult routes with injury risks;									X Y		
Delimitation a single route (marked with reflective tape) in areas of special protection									X Y		
Identification of climbing routes and access paths, monitoring and setting up regulations for access									X Y		
<b>Development and implementation of strategies for tourism and handling of natural resources</b>											
Develop and implement a tourism strategy, integrated in the local, regional or national development strategies - Harmonisation with the European principles of sustainable tourism in the production of touristic services compatible with the requirements of foreign partners									X N		
Elaborate a strategy for sustainable tourism								X Y			
Implement the eco-touristic certification system to develop the eco-touristic offer (Association for Ecotourism in Romania, EUROPARC)								X Y			
Eco-touristic zoning of DDBR and elaboration of the eco-touristic map								X Y			
Development and implementation of a strategy to promote the principles of biodiversity and conservation and the concrete protection procedures we need to apply in the Park									X N		
Development of wind power production outside the National Park - determining of zones suitable for wind power production and in which it is prohibited				X Y							
<b>Strategies related to law and policy</b>											
Supervision and regulation of activities in the area according to the actual law									X Y		









Stating in the contract when state-owned NP areas are lent for farmers: Management in line with aims of nature conservation.					X					
<b>Development of specially tourism activities</b>										
Promotion and organization of thematic silvocinegetic tourism without weapons, establishing places of observation, photography and filming of the elements of mountain flora and fauna. Organization of speotourism and specialized tourism like (geology, mineralogy, ecology, kiroptere)								X N		
Promoting horse-riding equitation, organizing specialized centers in areas with high touristic afflux						X Y		X N		
Implementation activities for a more even distribution of visits over the year									XY	
<b>Visitor direction / visitor management (Besucherlenkung)</b>								X Y		
Visitor Programme: travelling, exhibitions, events, installation of a series of info points,... mainly for individual tourists ( World Heritage Centre as an active source of information, contact point and organisational hub)				X Y		X Y				
Promoting the rules and regulations of Bucegi Natural Park and the specific rules to protect each touristic objective (natural monument or special Landscape Area) - manufacture and install of billboard signs, posters, leaflets, etc. in / to the main touristic attractions, access roads and information points. Schooling and accreditation of guides, including for karstic complexes								X Y		
Guided tours/ excursions / hikes		X Y		X Y	X	X Y		X N	X Y	X Y
Improve / Elaborate a visitors information system						X Y	X Y			
Promotion of the dense, good preserved network of paths	X N					X Y				
Inform the public about the Reserve status						X Y	X Y			
Elaborate actions and informative materials in connection with Natura 2000 Network						X Y	X Y			
Facilitate the access of local communities to the financing programs for the protected areas							X Y			
Improvement of visitor information and management at touristic hot spots	X Y				X	X Y				
<b>Information material like Publications / Internet etc.</b>										



Implementation and promotion of a manual of the park, include it in the school curricula and the disseminate it to all intrested or involved factors - Sustainable education among school children and communities to form a respect for nature and environment								XY		XN		
Complete the curricula of schools in DDBR with formal and non-formal education activities adapted to the specific ecological education requirements									XY			
Organize celebration of important environment events (international conventions anniversary days, establishment of DDBR day, etc.)								XY	XY			
education of people about amphibians, reptilians, and large carnivores								XY				XY
information and education of the public (visitors) on the impact of alien species								XY				XY
information and education on impacts of human disturbances through recreation and sport activities on wildlife in forests, alpine pastures, rocks (climbing), caves etc								XY				XY
Educating a new generation who will not remain indifferent to environmental issues by developing partnerships with universities, schools, clubs, environmental associations; Strategic Partnership with "Transylvania" and "Wallachia" Universities								XY		XN		
Carrying out surveys and evaluations on the possible damages caused by tourists, etc. - Monitoring and optimization of the educational actions										XN		
environmental education, activities in and demonstration of local nature: organizing open-air school and summer camp					XY			XY				
environmental education, activities in and demonstration of local nature by Nature School and Visitor Centre - Establishment of information / education centre					XY			XY				
Offering programmes for school-classes: UNESCO schools in the region, Educational Resource Kit - Activation of schools in the region for the subject of World Heritage					XY			XY				
Offering guided tours for schools.							X					
Offering programmes for universities and adult education : Excursions, lecture series and articles in media, cooperation with adult education institutions/ summer school					XY			XY				
<b>Activities with publicity effect</b>												
Preparation and organization of events, which are indirectly related to the area (painting exhibitions, cultural performances, etc.)											XY	

Present the role, significance and the place of the area, as well as its specific activities during national and international events								XY			
Preparation and organization of presentations, lectures, demonstrations, exhibitions, workshops							XY			XY	
organizing open days, workshops in the frame of projects - give information about the planned projects for the stakeholders, citizens				XY			XY				
Active participation in preparing and conducting informational and promotional materials (shooting reportage, popular scientific articles)							XY			XY	
Involving the media in promotional conservation activities of landscapes, habitats, flora and special fauna (articles, interviews, reports that reflect the activity of the Park Administration)							XY		XY		
<b>Development of infrastructure for tourism / visitors - Ways, pathes, trails, routes etc.</b>											
Complete the touristic routes marking									XY		
Construction of walking paths										XY	
Analysis of alternatives for the construction of new routes	XY										
Measures for the conservation of the pathways	XY										
Development and maintenance of educational path / Study trail / nature trail				XY	XY	XY					XY
Making and publishing maps for touristic routes of climbing and mountain biking, indicating also the degree of difficulty									XY		
Maintenance of view panoramas by removal of trees and bushes which get in the way of the sight seeing											
<b>Development of infrastructure for tourism / visitors - information and education facilities</b>											
visitor centre (Birdwatchers' Retreat of Bihar)								XY			
accommodation (Birdwatchers' Retreat of Bihar)								XY			
Visitor centre in Fertőújlak, Csapody István Nature School				XY							
Building bird-watching towers.								XY			
Reconstruction of the building on the right bank Drnica for nature observation										XY	
high stands, hides, view towers				XY							
Info tables / info desks				XY				XY		XY	

Development of infrastructure for arrival and departure									
Arranging the transport of visitors by electric train									XY
Increase of public transportation (example Talerbus) as well as development of further measures for the seasonal reduction in recreation traffic	XY								
Construction of parking area in front of the park						XY			XY
establishment of the "Bahnhof Rennsteig", rebuild the not used building with toilet, information centre and so on		XY							
establishment of the "Rennsteigbus"		X							
Development of supply infrastructure for local communities and tourism									
Expansion of household waste water treatment and disposal system - link to the new waste water treatment plant or dispose of waste water via treatment facilities (all waste water sources around the lake are sanitised (since about 15 years))				XY					
flood protection of Hansag - Construction of a polder-dam in 1934				XY					
Support the measures to improve the material infrastructure (water supply, sewage, transport, communication, etc.) and waste management in deltaic localities in order to stimulate the development of the economic activities (Sanitation program of the public domain and touristic routes.)							XY		
Agreements on building, rebuilding, expanding of houses						XY			
Agreements on building, rebuilding, expanding of agricultural buildings						XY			
Inventory, classify and monitor the operating status of the cable transport facilities, motor roads and other categories of roads in PNB, of parking and surrounding camping areas. Providing points (locations) with ecological toilets, waste collection containers - limiting the access to means of transportation with minimal impact, ecological modernization of mountain paths, parking / camping spaces, tourists safety								XY	
Approval of investment projects for hostels and hotels in the area of Padina Cave as well as those from the agro-pastoral enclaves in compliance with the strategy of sustainable development and biodiversity conservation in the park								XY	
Establish and mark the camping sites						XY	XY		

Infrastructure to meet the basic needs of visitors							XY			XY	
<b>Strategies related to knowledge and research, science and technology</b>											
Promotion, linking and supporting of scientific research on natural and human impact.							XY			XY	
Supporting research studies that provide solutions for administration and management										XY	
Enabling and support of different researches, field studies that can contribute to the improvement of efficiency of habitat management results				X							
<b>Research studies</b>											
Periodic analysis of climatic factors and their influence on biodiversity							XY			XY	
Knowledge of specific diversity present in the park							XY			XY	
Research on the diversity of habitats and species						X	XY			XY	
Research on the influence of anthropogenic factors on the biodiversity							XY			XY	
Research on the structure and dynamics of socio-economic and cultural activities							XY			XY	
LAKEPROMO - promote international and multilevel cooperation in the field of water management					XY						
TRANSECONET - Transnational Ecological Networks in Central Europe					XY						
Nature Range / Land Use investigations					XY		XY				
Research and investigation about population dynamic of species and their connections to humans (i.e. amphibians, reptilians, bats, Muscardinus avellanarius, Dryomis nitedula, large carnivores)								XY			XN
<b>Mapping</b>											
Mapping of areas with landscape value - Operative identification of areas with landscape value and establishment of the protective measures (Completing the database system and the optimization of management)								XY		XY	
Mapping of habitat types - Assessment of current protected species by flora and fauna (Development of a monitoring plan and its implementation)						X	XY			XY	
Mapping of vegetation of Lake Neusiedl (1999)					XY		XY				
FFH-Mapping Burgenland (finished end of May 2011)					XY						
Updated maps in GIS, decisions based on their interpretation - Development and updating of GIS databases, using the results in management decisions								XY		XY	



updated digital basic map from 2000/2001 (e.g. land use, reed-harvest, land users ,protected areas)				X Y		X Y				
Operative identification of terrestrial and aquatic habitat types and establishment of urgent measures of protection - hierarchy of habitats and the optimization of their protection						X Y		X Y		
Burgenländisches wetland inventory (excl. Natura 2000 areas)				X Y						
Flood mapping						X Y				
<b>Models</b>										
Ground water model				X Y		X Y				
Hydraulic model						X Y				
Rainfall-runoff model						X Y				
Digital elevation model (laser-scan/ geodetic measurements, topographic map vectorization)				X Y		X Y				
Development of high-precision and high-resolution digital relief model in the area of Austrian-Hungarian Neusiedler See-Seewinkel / Fertő-Hanság National Park (Under construction, the planned project period is 2011-2013)				X N						

**Table 12: Strategies and measures that cannot be related to one of the categories, tables, and habitat-types above**

	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertő-Hanság/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina	Triglav
Diversify the use of landscape resource for leisure							XY			
Establishment of measures, targets and adequate actions, differentiated by ecological categories, continual monitoring of ecosystems. - Respect for the ecosystem support capacity for productive activities, traditional, travel, sports and leisure.								XY		
Maintaining permanent contact with the Mountain RescueTeam. Upgrading the specific infrastructure and creating adequate facilities for monitoring specific tourism activities, accident prevention, tourists information - Frequent monitoring and specialized of tourism in the mountain area, tourists' safety										
Approval of investment projects for sports facilities and cable transport installations in compliance with the safety rules for tourists, users and spectators, to protect the natural environment. Develop a partnership with the “Pestera” Monastery regarding the access and utilities of Ialomita Cave. (electricity, infrastructure) Providing opportunities for tourists, athletes and spectators; Facilitating the access to the area								XY		

**Table 13: Strategies and measures for socially or economically motivated interventions in HABIT-CHANGE investigation (no nature conservation)**

	HABIT-CHANGE investigation areas									
	Rieserferner-Ahrn	Vessertal	Balaton Uplands	Fertö-Hansag/ Lake Neusiedl	Körös-Maros	Biebrza	Danube Delta	Bucegi	Secovlje Salina	Triglav
<b>Consideration of social/cultural aspects</b>										
Support the development of ethno-cultural identity of the local population						X Y	X Y			
Encouraging local communities to maintain and develop traditional economic activities (without negative impacts on environment) including small grant programs, rural development projects and other funding sources (Phare, SAPARD, etc.).								X N		
Promotion of cultural values and services offered by the introduction of different information on communities in the Park's promotional materials which restore a more complete and attractive image of the local communities					X			X N		
Promotion of local products/ conservation of locally products specific for the area										X Y
Encourage and monitor the production of small wood furniture, carpentry, carving and handicraft, cloth, shingles, etc.								X Y		
<b>Preservation of traditions</b>										
Promotion of restoration works and in situ conservation of buildings with historical and cultural value						XY	X Y			
Promotion of traditional practices in the domestic construction field (households)						XY	X Y			
Organizing events and actions to promote and highlight the local traditions. Medicinal & rare plants - Increased stability of communities with rich traditions and a desire to preserve the traditional lifestyle in harmony with nature					X			X Y		
Promotion of local traditions which are specific for the area						X Y				X Y
Preservation of traditions and local architectural elements						X Y		X Y		
Promotion of traditional sustainable activities						X Y		X Y		

Support of local communities in producing and trading of traditional artifacts or food: honey, medicinal plants, etc (Organize exhibition points in the information centers)							XY	XY			
Building traditional fishing shelters for fishermen by identify areas where traditionally fishing shelters existed in the public domain of national interest, in order to restore them								XY			
Increase the life standard of local communities / obtaining revenues								XY			
Valorification of natural resources with short regenerative period, within the limit of the support capacity: berries, mushrooms, fallen needle leaves and Christmas trees, medicinal plants etc.									XY		
Encourage and monitor the production of small wood furniture, carpentry, carving and handicraft, cloth, shingles, etc.									XY		
Promotion of adequate legal framework to guarantee the direct access to the natural resources and services of local communities. (Promote the modified DDBR Law)								XY			
Evaluation study regarding the opportunities of sustainable socio-economic development								XY			
Promotion of economic activities that use in an efficient and sustainable way the whole range of resources and services								XY			
Support and promotion of (ecological) tourism activities where local communities are directly involved						X		XY			
creating additional income in the area by developing ecotourism and education						X					XY
Encouraging to participation in Agriculture-Environmental programmes of EU							XY				

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## 4. New, climate-change related changes of goals, strategies and measures in management

Impacts on species and ecosystems caused by climate change are already known and visible. Therefore immediate action is needed via the adaptation of conservation practice to ensure species' and ecosystems' persistence. The conservation responses shall be anticipatory and systematic. Especially early adaptation is required to minimize climate change impacts. Due to that the refinement of goals, strategies and measures with regard to climate change is essential in protected areas.

The following recommendations and options show what needs to be considered by formulating the new goals, strategy and measures of protected areas. They are a result of a comprehensive literature review. Main sources and findings are presented below.

### 4.1. Overview on analysed literature

In the following compilation of analysed literature a short description of the content and main conclusions or findings are presented.

#### **Heller and Zavaleta 2009: Biodiversity management in the face of climate change: A review of 22 years of recommendations**

Heller and Zavaleta (2009) analysed different scientific papers published from 1975 to March 2007 which provided management recommendations in terms of climate change. They identified in what ways the management should be adapted. Depending on how often the respective strategies were named in different publications Heller and Zavaleta (2009) ranked the recommended adaptation strategies.

Different levels of adaptation were identified, from large scale policy changes to impact assessment methods and needs for research. In addition the required adaptation of goals, strategies and measures can be either formulated as general principles or specific actions. Recommendations for adaptation can be categorized as follows (Heller and Zavaleta, 2009):

- policy reform
- science and technology effort and advances
- changes in conservation sector activity (reserve purchases, management, restoration, regional coordination)
- changes in individual and community behaviour (farmers, ranchers, other private landowners)

For managers and planners three scales for the application of adapted management should be considered (Heller and Zavaleta, 2009):

- regional policy and planning: adaptation for whole landscapes and regions through long-term planning and policy formulation (tools: reserve selection, ecosystem management, land use zoning schemes, land zoning, governance structure, institutional capacity)

- site-scale action: formulate concrete action for management of individual reserves
- evaluation and adaptation of existing conservation plans

### **Lawler 2009: Climate Change Adaptation Strategy for Resource Management and Conservation Planning**

Lawler (2009) distinguishes between general strategies, specific actions and new perspectives for addressing climate change. Most strategies are general concepts which can be “grouped into three basic types of strategies: those promoting resistance, resilience, and change” (Lawler, 2009, in Millar et al. 2007). New perspectives are:

- an effective management which requires a broader spatial and temporal perspective
- new administrative structures such as interagency teams or programs to address climate change
- scenario-based-planning (to evaluate potential scenarios of change for a given system and develop alternative management goals and strategy for those scenarios)
- triage (method of prioritization for systems/ species/ sites in emergency situation)

### **Julius et al. 2008: Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources**

After Julius et al. (2008) the key activities to adapt management strategies to climate change include the development of systematic approaches for triage (a form of prioritizing adaptation actions), and the determination of appropriate geographic and temporal scales of response. Seven different approaches for adaptation are recommended:

- Protection of key ecosystem features
- Reduction of anthropogenic stresses
- Increase representation of different genotypes, species, and communities under protection
- Increase the number of replicate units of each ecosystem type or population under protection
- Restore ecosystems that have been comprised or lost
- Identify and use areas that are “refuges” from climate change
- Relocate organisms to appropriate habitats as conditions change

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## **Edelson et al. 2011: Scanning the Conservation Horizon. A Guide to Climate Change Vulnerability Assessment**

Edelson et al. (2011) concede that vulnerability assessments are essential to meet climate-change challenges. They are a key tool for informing adaptation planning and enabling resource managers to conserve species and ecosystems. Vulnerability assessments help managers and other conservation and resource professionals in the following way: “Identifying which species or systems are likely to be most strongly affected by projected changes; and understanding why these resources are likely to be vulnerable, including the interaction between climate shifts and existing stressors. Determining which resources are most vulnerable enables managers to better set priorities for conservation action, while understanding why they are vulnerable provides a basis for developing appropriate management and conservation responses” (Edelson et al., 2011). The three principle components to determine vulnerability are sensitivity, exposure and adaptive capacity. Summing-up one can say that this guidebook gives lots of recommendations, e.g. through case studies, for what is important in a vulnerability assessment.

## **Campbell et al. 2009: Review of the literature on the links between biodiversity and climate change. Impacts, Adaptation and Mitigation**

Due to observed climate change countries are starting to develop and implement adaptation strategies. But mostly the linkage between adaptation and biodiversity is overlooked. Therefore Campbell et al. (2009) emphasize that biodiversity must be linked to climate-change adaptation strategies and mitigation policies. The paper aims to provide a better understanding of the role of biodiversity in societal and in biodiversity conservation adaptation as well as to highlight the developments in our understanding of the role of biodiversity in climate-change mitigation. The authors want to show the “importance of adopting an integrated approach that incorporates adaptation measures that are based on biodiversity” (Campbell et al., 2009).

## **Dudley et al. 2010: Natural Solutions: Protected areas helping people cope with climate change**

Dudley et al. (2010) show what protected areas can contribute to reduce climate-change impacts through mitigation and adaptation.

### Mitigation

- Store: Prevent the loss of carbon that is already present in vegetation and soils;
- Capture: Sequester further carbon dioxide from the atmosphere in natural ecosystems

### Adaptation

- Protect: Maintain ecosystem integrity, buffer local climate, reduce risks and impacts from extreme events such as storms, droughts and sea-level rise;

- Provide: Maintain essential ecosystem services that help people cope with changes in water supplies, fisheries, disease and agricultural productivity caused by climate change and what solutions are needed to achieve even more.

The text gives several recommendations for the adaptation and mitigation of impacts on different habitat types in protected areas. Strategies for design, management, governance and policy are presented.

## 4.2. Lists of recommended strategies for adaptation to climate change

The listed strategies are sorted under five overall categories according to the relevant target group or field of action they refer to:

- Strategies related to land and water protection and management
- Strategies related to monitoring and planning
- Strategies related to law and policy
- Strategies related to stakeholders and land users, public relation and awareness
- Strategies related to knowledge and research, science and technology

These categories correspond with the structure of existing management measures in chapter 3. If it was possible the listed strategies are related to habitat types. If no assignment to a habitat type is possible, the strategies are addressed as “general strategy”. The correlation of strategies to different habitat types or biomes is mainly based on the reviewed literature: some of the documents focused on specific habitat types and biomes. The strategies suggested in these papers were assigned to that respective habitat type. That does not mean that the listed strategies may not be helpful for adaptation in other habitat types.

Most recommendations are defined as general or conceptual strategies that need to be adapted to the specific conditions in the respective protected area and its requirements. Adaptation measures to climate change shall be more concrete and detailed and sorted under specific strategies for each habitat-type. Recommendations for detailed measures for adaptation were not found in literature. The following lists therefore contain only recommendations for strategies.

The sources of each respective commended strategy can be identified by the numbers in brackets:  
Dudley et al., 2010 **(1)**

Campbell et al., 2009 **(2)**

Lawler, 2009 **(3)**

Julius et al., 2008 **(4)**

Heller and Zavaleta, 2009 **(5)**

Edelson et al., 2011 **(6)**



**Table 14: Strategies related to land and water protection and management**

No.	Habitat type or other specification	Recommended strategies (and sources)
1	General strategy	Step up measures to increase effectiveness and to reduce existing pressures from human use (1)
2	General strategy	Reducing threats not linked to climate change so that resilience of populations can be maximised and ecosystem function can be maintained (2)
3	General strategy	Mitigate other threats, i.e. invasive species, fragmentation, pollution (5)
4	General strategy	Minimize alteration of natural disturbance regimes, for example through protection of natural flow regimes in rivers or removal of infrastructure that prohibits the allowance of wildland fire (4)
5	General strategy	removing non-climate-related threats to a species or system and reducing additional stress (3)
6	General strategy	Reduce anthropogenic stresses (4)
7	General strategy	restoring habitat and system dynamics (3)
8	General strategy	minimize invasive species (3)
9	General strategy	Aggressively prevent establishment of invasive non-native species or diseases where they are documented to threaten native species or current ecosystem function (4)
10	General strategy	Increase number of reserves (5)
11	General strategy	Complete fully representative protected area networks (1)
12	General strategy	expand the number of core, strictly protected areas, which are effectively buffered and linked ecologically (1)
13	General strategy	Increase protected areas in Centres of Crop Diversity: using gap analysis to identify those places with high levels of diversity (1)
14	General strategy	Protect many small reserves rather than single large (5)
15	General strategy	Protect large areas, increase reserve size (5)
16	General strategy	More and larger protected areas in ecosystems where much carbon is stored and/or captured or where important ecosystem services are under threat (1)
17	General strategy	Create and manage buffer zones around reserves; Institute flexible zoning around reserves (5)
18	General strategy	Establishment of buffer zones around protected areas with sustainable land management (extensification, traditional management practices) (1)
19	General strategy	Management of buffer zones around protected areas for maintaining the integrity of protected areas and helping to ensure the continued functionality of their ecosystems and the delivery of ecosystem services, such as water yield regulation (2)
20	General strategy	Tailor protected areas to ecosystem services for disease control: particularly the provision of potable water supplies, prevention of flood damage (1)
21	General strategy	Start strategic zoning of land use to minimize climate related impacts (5)
22	General strategy	Secure boundaries of existing preserves (5)

23	General strategy	Create ecological reserve networks, large reserves connected by small reserves, stepping stones (5)
24	General strategy	Connecting protected areas within landscapes/ seascapes: using management of natural or semi-natural vegetation outside protected areas or intervening waters: buffer zones, biological corridors and ecological stepping stones to increase resilience (1)
25	General strategy	Improved connectivity among natural areas to reduce habitat fragmentation (2)
26	General strategy	Facilitate connectivity to ensure that protected areas are linked both with other protected areas and with land and water (1)
27	General strategy	Reduce fragmentation and maximise large-scale connectivity between protected areas (1)
28	General strategy	Promote connectivity: link protected area systems through buffer zones, biological corridors and stepping stones to facilitate genetic interchange (1)
29	General strategy	Extending and/or strengthening protected area networks (2)
30	General strategy	consider the possibility that ranges will shift out of reserves, necessitating creation of new protection in predicted ranges (1)
31	General strategy	large-scale conservation corridors to allow latitudinal, longitudinal and altitudinal species range shift quickly (1)
32	General strategy	Restore forests in protected areas: for example in logged over areas, abandoned farmland and in places where climate changes make other land uses untenable (1)
33	General strategy	Restore and increase habitat availability and reduce stressors in order to capture the full geographical, geophysical, and ecological ranges of species on as many refuges as possible (4)
34	General strategy	Reduce fragmentation and maintain or restore species migration corridors to facilitate natural flow of genes, species and populations (4)
35	General strategy	increasing connectivity to enhance movement (3)
36	General strategy	Increase connectivity (design corridors, remove barriers for dispersal, locate reserves close to each other, reforestation) (5)
37	General strategy	Ensuring functional connectivity among natural areas in facilitating movement of species and their adaptation to climate change (2)
38	General strategy	Facilitate migration through the establishment and maintenance of wildlife corridors (4)
39	General strategy	expanding reserve networks to allow shifts of species and systems and to have a higher habitat heterogeneity (3)
40	General strategy	Use conservation easements around the refuge to allow species dispersal and maintain ecosystem function (4)
41	General strategy	Extending and redesigning protected area systems to ensure that they include sufficient area to accommodate management practices that both facilitate change and maintain large populations of species of concern (2)
42	General strategy	Locate reserves in areas of high heterogeneity, endemism; Maintain natural disturbance dynamics of ecosystems (5)
43	General strategy	Create linear reserves oriented longitudinally (5)

44	General strategy	Design biological preserves for complex changes in time, not just directional change (5)
45	General strategy	Locate reserves at northern boundary of species' ranges (5)
46	General strategy	Locate reserves so major vegetation transitions are in core (5)
47	General strategy	Locate reserves at core of ranges (5)
48	General strategy	Identify and use areas that are "refuges" from climate change (4)
49	General strategy	Identify climate change refugia and acquire necessary land (4)
50	General strategy	Protect refugia current and predicted future (5)
51	General strategy	Experiment with refugia (5)
52	General strategy	Protect full range of bioclimatic variation (5)
53	General strategy	Retaining and restoring key habitats: applying restoration techniques as necessary to regain or to increase the degree of ecological integrity and to strengthen resilience (1)
54	General strategy	Focus protection on sensitive biomes (5)
55	General strategy	Focus on vulnerable ecosystems and species; climate refugia at all scales, and areas where climate is predicted to be stable (1)
56	General strategy	Restore ecosystems that have been comprised or lost (4)
57	General strategy	Restore vegetation where it confers biophysical protection to increase resilience, including riparian areas that shade streams and coastal wetland vegetation that buffers shorelines (4)
58	General strategy	Minimize soil loss after fire or vegetation dieback using native vegetation and debris (4)
59	General strategy	Relocate organisms to appropriate habitats as conditions change (4)
60	General strategy	Ex-situ conservation of rare or endangered species (1)
61	General strategy	Facilitate interim propagation and sheltering or feeding of mistimed migrants, holding them until suitable habitat becomes available (4)
62	General strategy	Ensuring the continued survival of ecosystems and species under changing climate change conditions (2)
63	General strategy	Seeking to maintain viable ecosystems and populations of species to facilitate rapid, natural adaptation and evolution, and conserving species throughout their range and variability, to reduce the probability of all viable habitats being lost (1)
64	General strategy	Do not implement CO2 emission mitigation projects that negatively impact biodiversity (5)
65	General strategy	Limit CO2 emissions (5)
66	General strategy	Increasing the level of protection for carbon stores within protected areas (1)
67	General strategy	Adopt farming methods that capture carbon as well as producing food and fibre: through legislation, incentives, preferential funding and capacitybuilding in the farming community, organic production, low tillage (1)
68	General strategy	Manage for flexibility, use of portfolio of approaches, maintain options (5)

69	General strategy	Maximising potential conservation gains from predicted climate changes: such as new areas of coastal wetland, new vegetation assemblages, etc. (1)
70	General strategy	Create culturally appropriate adaptation/management options (5)
71	General strategy	Develop best management practices for climate change scenarios (5)
72	General strategy	Practice intensive management to secure populations (5)
73	General strategy	Practice adaptive management (5)
74	General strategy	adaptive management (passive or active) (3)
75	General strategy	Practice proactive management of habitat to mitigate warming (5)
76	General strategy	Action plans must be time-bound and measurable (5)
77	General strategy	Use triage in short-term to prioritize action (5)
78	General strategy	Improving management within protected areas: to ensure that ecosystems and the services that they provide within protected areas are recognised and not degraded or lost through illegal use or unwise management decisions (1)
79	General strategy	Use climate change scenarios to foresee impacts on protected areas and facilitate working with stakeholders (1)
80	General strategy	Increase the number of replicate units of each ecosystem type or population under protection (4)
81	General strategy	Protection of key ecosystem features (4)
82	General strategy	Preserve ecosystem processes such as regeneration and succession (2)
83	General strategy	Manage human-wildlife conflict as change occurs (5)
84	General strategy	Manage for landscape asynchrony (5)
85	General strategy	Manage the matrix (5)
86	General strategy	Increasing permeability for species within landscapes and seascapes dominated by human activity (1)
87	General strategy	Protect urban green space (5)
88	Forests	Increase the area of forest protected areas: both by expanding existing protected areas and creating new protected areas (1)
89	Forests	Cloud forests: a global focus on conservation of remaining cloud forests is urgently required, in particular with a view to securing water supplies (1)
90	Forests	Protect forest catchments: particularly those where environmental degradation of forests and other vegetation is undermining water quality (1)
91	Forest	Forest adaptation to maintain intact natural forests and selecting appropriate mixes of species for afforestation (2)
92	Forests	Establish or strengthen long-term seed banks to create the option of re-establishing extirpated populations in new/more appropriate locations (4)

93	Forests	Where appropriate after large-scale disturbances, reset succession and manage for asynchrony at the landscape scale by promoting diverse age classes and species mixes, a variety of successional stages, and spatially complex and heterogeneous vegetation structure (4)
94	Forests	Spread risks by increasing ecosystem redundancy and buffers in both natural environments and plantations (4)
95	Forests	Facilitate natural (evolutionary) adaptation through management practices (e.g., prescribed fire and other silvicultural treatments) that shorten regeneration times and promote interspecific competition (4)
96	Forests	Increase the efficiency of management in forest protected areas: by further application of assessment drawing on the IUCN-WCPA management effectiveness assessment framework and building management capacities (1)
97	Forests	Promote connected landscapes to facilitate species movements and gene flow, sustain key ecosystem processes (e.g. pollination and dispersal), and protect critical habitats for threatened and endangered species (4)
98	Forests	Identify and take early proactive action against non-native invasive species (e.g., by using early detection and rapid response approaches) (4)
99	Forests	Reduce the impact of current anthropogenic stressors such as fragmentation (e.g., by creating larger management units and migration corridors) and uncharacteristically severe wildfires and insect outbreaks (e.g., by reducing stand densities and abating fuels) (4)
100	Forests	Protect primary forests (5)
101	Forests	wildly spaced thinning and shelterwood cuts to withstand increased insects outbreaks and fires (3)
102	Forests	prescribed burning to reduce fuel loads, and hence the risk of catastrophic fire (3)
103	Forests	Use wildland fire, mechanical thinning, or prescribed burns where it is documented to reduce risk of anomalously severe fires (4)
104	Forests	Manage risk of catastrophic fires through prescribed burns (4)
105	Grasslands	moderate grazing to increase the hydroperiod in vernal pools (3)
106	Grasslands	Expand protected areas in grassland habitats: including both strictly protected areas (IUCN categories I-IV) and protected landscapes (category V and VI) (1)
107	Grasslands	Improve management: including introduction of sustainable grazing practices within protected landscapes and extractive reserves (1)
108	Grasslands	Protection of natural peat: urgent steps are needed to protect standing sources of peat in the boreal, temperate and tropical regions, including where appropriate by expansion of protected areas networks. This will often involve some protection for entire watersheds that feed into the peat areas, as much as the areas themselves (1)
109	Freshwater habitats, Grasslands, Raised bogs, mires and fens	Increase wetland protection (5)

110	Freshwater habitats, Grasslands, Raised bogs, mires and fens	Manage wetlands: to maintain their crucial functions including through the removal of invasive alien species that impair wetland functions (1)
111	Freshwater habitats	Adaptation in the water sector to reduce degradation of watersheds and to maintain and restore water regulating services of wetlands (2)
112	Freshwater habitats	Schedule dam releases to protect stream temperatures (5)
113	Freshwater habitats	riparian restoration (3)
114	Freshwater habitats	protecting headwaters and identifying and protecting existing thermal refugia (3)
115	Freshwater habitats	channel reconstruction (3)
116	Freshwater habitats	dam removal or retrofit (3)
117	Freshwater habitats	floodplain restoration (3)
118	Freshwater habitats	dam-based flow management (3)
119	Freshwater habitats	creating wetlands and off-channel basins for water storage (3)
120	Freshwater habitats	removal of sediment (3)
121	Freshwater habitats	water releases from dams and transporting fish (3)
122	Freshwater habitats	reducing water extraction (3)
123	Freshwater habitats	Maintain the natural flow regime through managing dam flow releases upstream of the wild and scenic river (through option agreements with willing partners) to protect flora and fauna in drier downstream river reaches, or to prevent losses from extreme flooding (4)
124	Freshwater habitats	Remove barriers to upstream migration in rivers and streams (4)
125	Freshwater habitats	Use drought-tolerant plant varieties to help protect riparian buffers (4)
126	Freshwater habitats	Create wetlands or off-channel storage basins to reduce erosion during high flow periods (4)
127	Freshwater habitats	Reduce human water withdrawals to restore natural hydrologic regimes (4)
128	Freshwater habitats	Manage water storage and withdrawals to smooth the supply of available water throughout the year (4)
129	Freshwater habitats	Develop more effective stormwater infrastructure to reduce future occurrences of severe erosion (4)
130	Freshwater habitats	Consider shifting access points or moving existing trails for wildlife or river enthusiasts (4)
131	Freshwater habitats	Increase physical habitat heterogeneity in channels to support diverse biotic assemblages (4)
132	Freshwater habitats	Restore the natural capacity of rivers to buffer climate-change impacts (e.g., through land acquisition around rivers, levee setbacks to free the floodplain of infrastructure, riparian buffer repairs) (4)
133	Freshwater habitats	Conduct river restoration projects to stabilize eroding banks, repair in-stream habitat, or promote fish passages from areas with high temperatures and less precipitation (4)
134	Freshwater habitats	Create or protect refugia for valued aquatic species at risk to the effects of early snowmelt on river flow (4)



135	Freshwater habitats	Plant riparian vegetation to provide fish and other organisms with refugia (4)
136	Freshwater habitats	Acquire additional river reaches for the wild and scenic river where they contain naturally occurring refugia from climate change stressors (4)
137	Freshwater habitats	Reforest riparian boundaries with native species to create shaded thermal refugia for fish species in rivers and streams (4)
138	Freshwater habitats	Freshwaters: the generally under-represented freshwater biome should get special attention in plans to increase protected area coverage (1)
139	Rocky habitats and caves	Protect mountains (5)
140	Rocky habitats and caves	placement of snow fences to increase snow pack (3)
141	Coastal and halophytic habitats	Increase protection for coastal mangrove, salt marsh and seagrass communities: through marine protected areas and integrated coastal management as an excellent way to increase the world's natural carbon sink and develop more effective marine management regimes that integrate the ocean in the larger carbon management scheme (1)
142	Coastal and halophytic habitats	Increase management effectiveness of marine protected areas: retain, maintain and recover ecosystem resilience and hence marine natural carbon sinks by reducing other human induced stressors such as coastal destruction, overfishing or ocean and land-based pollution (1)
143	Coastal and halophytic habitats	Enhance resilience of marine systems and manage marine protected areas as part of a comprehensive adaptive management strategy for addressing the impacts of climate change on fisheries (1)
144	Coastal and halophytic habitats, Freshwater habitats	Recognising the need to accommodate the predicted changes in rivers flows and coastal topography (1)
145	Coastal and halophytic habitats, Freshwater habitats	Plan for marine and freshwater protected areas in light of predicted climate change, so that they are located in optimal conditions and of the best possible size and connectivity (1)
146	Coastal and halophytic habitats	Help protect tidal marshes from erosion with oyster breakwaters and rock sills and thus preserve their water filtration and fisheries enhancement functions (4)
147	Coastal and halophytic habitats	Preserve and restore the structural complexity and biodiversity of vegetation in tidal marshes, seagrass meadows, and mangroves (4)
148	Coastal and halophytic habitats	Adjust protections of important biogeochemical zones and critical habitats as the locations of these areas change with climate (4)
149	Coastal and halophytic habitats	Connect landscapes with corridors to enable migrations to sustain wildlife biodiversity across the landscape (4)
150	Coastal and halophytic habitats	Identify ecological connections among ecosystems and use them to inform the design of marine protected areas and management decisions such as protecting resistant areas to ensure sources of recruitment for recovery of populations in damaged areas (4)

151	Coastal and halophytic habitats	Identify and protect ecologically significant (“critical”) areas such as nursery grounds, spawning grounds, and areas of high species diversity (4)
152	Coastal and halophytic habitats	Remove structures that harden the coastlines, impede natural regeneration of sediments, and prevent natural inland migration of sand and vegetation after disturbances (4)
153	Coastal and halophytic habitats	Conduct integrated management of nutrient sources and wetland treatment of nutrients to limit hypoxia and eutrophication (4)
154	Coastal and halophytic habitats	Manage water resources to ensure sustainable use in the face of changing recharge rates and saltwater infiltration (4)
155	Coastal and halophytic habitats	Prohibit bulkheads and other engineered structures on estuarine shores to preserve or delay the loss of important shallow-water habitats by permitting their inland migration as sea levels rise (4)
156	Coastal and halophytic habitats	Manage human stressors such as overfishing and excessive inputs of nutrients, sediments, and pollutants within marine projected areas (4)
157	Coastal and halophytic habitats	Maintain landscape complexity of salt marsh landscapes, especially preserving marsh edge environments (4)
158	Coastal and halophytic habitats	Maximize habitat heterogeneity within marine projected areas and consider protecting larger areas to preserve biodiversity, biological connections among habitats, and ecological functions (4)
159	Coastal and halophytic habitats	Include entire ecological units (e.g., coral reefs with their associated mangroves and seagrasses) in marine projected area design to maintain ecosystem function and resilience (4)
160	Coastal and halophytic habitats	Ensure that the full breadth of habitat types is protected (e.g., fringing reef, fore reef, back reef, patch reef) (4)
161	Coastal and halophytic habitats	Replicate habitat types in multiple areas to spread risks associated with climate change (4)
162	Coastal and halophytic habitats	Direct estuarine habitat restoration projects to places where the restored ecosystem has room to retreat as sea level rises (4)
163	Coastal and halophytic habitats	Following extreme events, consider whether actions should be taken to enhance natural recovery processes through active restoration (4)
164	Coastal and halophytic habitats	Identify and protect areas observed to be resistant to climate change effects or to recover quickly from climate-induced disturbances (4)
165	Coastal and halophytic habitats	Establish dynamic marine projected areas defined by large-scale oceanographic features such as oceanic fronts where changes in types and abundances of organisms often occur (4)
166	Coastal and halophytic habitats	Coastal adaptation, because resilient coastal ecosystems can play an effective role in coastal protection (2)
167	Coastal and halophytic habitats	Develop practical approaches to apply the principle of rolling easements to prevent engineered barriers from blocking landward retreat of coastal marshes and other shoreline habitats as sea level rises (4)

**Table 15: Recommended strategies related to monitoring and planning**

No	Habitat type or other specification	Recommended strategies in different Literature
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1	General strategy	Integrate climate change into planning exercises (reserve, pest outbreaks, harvest schedules, grazing limits, incentive programs) (5)
2	General strategy	Address scale problems match modelling, management, and experimental spatial scales for improved predictive capacity (5)
3	General strategy	Increase and maintain basic monitoring programs (5)
4	General strategy	Increase interdisciplinary collaboration (5)
5	General strategy	Adopt long-term and regional perspective in planning, modelling, and management (5)
6	General strategy	Re-asses conservation goals (i.e. move away from concepts of natural, embrace processes over patterns) (5)
7	General strategy	Develop adaptation strategy now; early adaptation is encouraged (5)
8	General strategy	Do regional impact assessments (5)
9	General strategy	Monitor ecotones and gradients (5)
10	General strategy	Use predictive models to make decisions on where to situate new reserves (5)
11	General strategy	Anticipate surprises and threshold effects i.e. major extinctions or invasions (5)
12	General strategy	Develop guidelines for climate sensitive restoration and infrastructure development (5)
13	General strategy	Quantify environmental susceptibility versus adaptive capacity to inform conservation planning (5)
14	General strategy	Use simple decision rules for reserve planning (5)
15	General strategy	Review timing of management activities and take advantage of seasonal changes that provide more opportunities to implement beneficial adaptation actions (4)
16	General strategy	Take advantage of flexibility in the planning guidelines and processes to develop management actions that address climate change impacts (4)
17	General strategy	Monitor ecosystems and have rapid-response strategy prepared to assess ecological effects of extreme events as they occur (4)
18	General strategy	Identify existing monitoring programs for management; develop a suite of climate change indicators and incorporate them into existing programs (4)
19	General strategy	Identify and use all available tools/mechanisms currently in place to deal with existing problems to apply to climate-change related impacts (4)
20	General strategy	Use disturbed landscapes as templates for “management experiments” that provide data to improve adaptive management of natural resources (4)
21	General strategy	Do vulnerability assessments: Determine objectives and scope, gather relevant data and expertise, assess components of vulnerability, apply assessment in adaptation planning (6)
	Measures in vulnerability assessments: Determine objectives and scope	Identify audience, user requirements, and needed products; Engage key internal and external stakeholders; Establish and agree on goals and objectives; Identify suitable assessment targets; Determine appropriate spatial and temporal scales; Select assessment approach based on targets, user needs, and available resources (6)

	Measures in vulnerability assessments: Gather relevant data and expertise	Review existing literature on assessment targets and climate impacts; Reach out to subject experts on target species or systems; Obtain or develop climatic projections, focusing on ecologically relevant variables and suitable spatial and temporal scales; Obtain or develop ecological response projections (6)
	Measures in vulnerability assessments: Assess components of vulnerability	Evaluate climate sensitivity of assessment targets; Determine likely exposure of targets to climatic/ecological change; Consider adaptive capacity of targets that can moderate potential impact; Estimate overall vulnerability of targets; Document level of confidence or uncertainty in assessments (6)
	Measures in vulnerability assessments: Apply assessment in adaptation planning	Explore why specific targets are vulnerable to inform possible adaptation responses; Consider how targets might fare under various management and climatic scenarios; Share assessment results with stakeholders and decision-makers; Use results to advance development of adaptation strategy and plans (6)
22	General strategy	Improved planning and management of the wider landscape in adaptive fashion to make the matrix around reserves more attractive to wildlife and therefore more permeable to species movement (2)
23	General strategy	Focusing some management specifically on mitigation and adaptation needs: including modification of management plans, selection tools and management approaches as necessary (1)
24	General strategy	Broadscale planning: at a national and regional/transboundary scale opportunity analyses should be undertaken in partnership with disaster response institutions to identify places where natural ecosystems could prevent and mitigate disasters and to develop associated ecosystem protection strategies, including the establishment of new protected areas in vulnerable areas to safeguard vital ecosystem services that buffer communities. This should be undertaken in the context of broader disaster risk management plans and systems (1)
25	General strategy	Introduce national and local planning: states need National Agrobiodiversity Conservation Strategies, including inventories and gap analyses of agrobiodiversity; and protected areas should identify and address conservation of CWR and landraces needs in their management plans. These should be nested within national adaptation strategies and action plans designed to maintain food security under conditions of climate change (1)
26	General strategy	Methodologies for identifying and managing sites need to be further developed and refined particular in terms of integrating climate change responses into protected area gap analysis (1)
27	General strategy	Assessment of environmental and social impacts: outline of methods used in assessing additional benefits from REDD projects in terms of environmental services, poverty reduction and other social issues relevant to human well-being (1)

28	General strategy	Recognising tradeoffs: climate change will have a transformational effect on natural ecosystems, though there will be a huge asymmetry between regions in terms of the scale of impacts. The costs and benefits of adaptation measures required to maintain ecosystem integrity within protected areas will need to be considered in the context of the likelihood of success, given that it will not be possible to maintain the status quo. This will have a bearing on decisions regarding where to focus investments geared to adapting protected area management (1)
29	General strategy	Factoring predicted stress factors into management plans: such as drought, fires, glacial lake burst, stream drying, invasive species etc. (1)
30	General strategy	Linking the management of protected areas and buffer zones into land use planning and management systems at landscape level, which manage economic activities to ensure the overall ecological integrity of the landscape, so as to sustain ecosystem functions and resilience (1)
31	General strategy	Introducing effective forecasting, including climate trends and population ecological modelling, to maximise the ability of protected area staff to meet changing conditions (1)
32	General strategy	Implementing, as appropriate, stabilising measures to address likely changes in fire frequency; snowfall; ice-melt; degree and incidence of drought; catastrophic weather events such as typhoons, hurricanes, torrential rain, flooding or ocean incursions; changing flux of water in wetlands, etc. (1)
33	General strategy	Planning and implementing control measures against harmful invasive species and new diseases caused by or exacerbated by changing climate (1)
34	General strategy	Planning and implementing procedures for translocation of species that cannot move quickly enough themselves in the event of altitudinal changes in weather conditions, sea-level rise or other major changes (1)
35	General strategy	Developing new approaches to collaborating with local communities and indigenous peoples in and around protected areas, particular on issues relating to management approaches and wider connectivity (1)
36	General strategy	Using flexible approaches: exploring new management models and governance options to maximise the flexibility of the system and its effectiveness (1)
37	General strategy	Establishing baselines for key conditions and species against which to measure future changes (1)
38	General strategy	Identifying key indicators (species, ecological processes etc.) that can be used to monitor any future changes in climate and ecosystem responses (1)
39	General strategy	Carrying out long-term monitoring and assessment and applying the results to design adaptive management strategies (1)
40	General strategy	Identify or redefine quick assessment methods to identify and measure the value (social and economic) of wider protected area benefits (1)
41	General strategy	Identify or redefine cost benefit assessment, to take into account tradeoffs and the cost effectiveness of different adaptation options, given prevailing budget constraints (1)

42	General strategy	Identify or redefine additional methodologies to be integrated into national protected area gap analysis to factor in potential for climate change mitigation and adaptation within protected area networks (1)
43	General strategy	Identify or redefine modifications to protected area management effectiveness assessment systems to include additionality (the net increase in carbon stored in response to increase management effectiveness of an existing protected area) as well as effectiveness of climate adaptation measures – taking into account responses at a national or even a global level (1)
44	General strategy	Identify or redefine methods for calculating carbon trade-offs between different management strategies, for example carbon impacts from use of prescribed burning as compared to occasional larger, hotter fires, taking the whole landscape and seascape mosaic into account and including issue of disturbance regimes and changes over time (1)
45	General strategy	Identify or redefine guidelines for adapting protected area management practices to ensure continuation of their ecological, economic and social functions in light of climate change (1)
46	General strategy	Identify or redefine guidelines and best practices for accessing funding options for protected areas including climate-related market and fund mechanisms (1)
47	General strategy	Identify or redefine possible modifications to existing certification schemes, such as the Forest Stewardship Council, to address issues of climate change within certification (1)

**Table 16: Recommended strategies related to law and policy**

No	Habitat type or other specification	Recommended strategies in different Literature
1	General strategy	Promote conservation policies that engage local users and promote healthy human communities (5)
2	General strategy	Institute government reform (i.e. adaptive governance) (5)
3	General strategy	Institutional capacity enhancement to address climate change (5)
4	General strategy	Institute reform to improve support for interdisciplinary, multi-institutional research (5)
5	General strategy	Adjust park boundaries to capture anticipated movement of critical habitats; Create institutional flexibility (5)
6	General strategy	Adaptation of human and financial capital: Augment the workforce and stretch budgets to institute adaptation practices (e.g., individuals or parties with mutual interests in learning about or addressing climate change that may be engaged at no additional cost) (4)
7	General strategy	Value creative thinking and support incremental learning and gradual achievement of management goals (4)
8	General strategy	Add climate change expertise; train resource managers and other personnel in climate change science. (4)

9	General strategy	Re-evaluate capabilities of, or authorities under, existing legislation to determine how climate change can be addressed within the legislative boundaries (4)
10	General strategy	Purchase or lease water rights to enhance flow management options (4)
11	General strategy	Introduce Payment for Environmental Services schemes: provide models for cost-recovery for communities or land-owners in places where land-management choices such as retention of natural vegetation in their catchment areas lead to downstream benefits (1)
12	General strategy	Incorporate the role of protected area systems into national climate change strategies and action plans (1)
13	General strategy	Address mitigation by reducing the loss and degradation of natural habitats (1)
14	General strategy	Ensure effective management of protected areas to provide benefits to biodiversity and climate change mitigation and adaptation (1)
15	General strategy	Ensuring strong political support for the maintenance and expansion of protected areas, with multiple designations and management approaches, implemented with prior informed consent by local communities (1)
16	General strategy	Drafting legislation to accommodate potential change, such as allowing flexible zoning of protected area boundaries if species response to climate change necessitates this need (1)

**Table 17: Recommended strategies related to stakeholder and land user, public relation and awareness**

No	Habitat type or other specification	Recommended strategies in different Literature
1	General strategy	Increase interdisciplinary collaboration (5)
2	General strategy	Improve inter-agency, regional coordination (5)
3	General strategy	Promote conservation policies that engage local users and promote healthy human communities (5)
4	General strategy	Leadership by those with power, senior management, government agencies (5)
5	General strategy	Create education programs for public about landuse practices and effects on and with climate (5)
6	General strategy	Increase communication of knowledge about climate change impacts to policymakers and stakeholders (5)
7	General strategy	Initiate dialogue among stakeholders (5)
8	General strategy	Provide education opportunities and summaries of primary literature for management staff to learn and network about climate change (5)
9	General strategy	Establish cross-national collaboration (5)
10	General strategy	Increase social acceptance of shared resilience goals (5)
11	General strategy	Promote personal action plans among employees to reduce emissions (5)
12	General strategy	Use social networks for education about climate change (5)
13	General strategy	Soften land-use practices in the matrix (5)

14	General strategy	Identify management authorities/agencies with similar goals and adjacent lands; share information and create coalitions and partnerships that extend beyond political boundaries to coordinate management; acquire property for system expansion (4)
15	General strategy	Improve the matrix surrounding the refuge by partnering with adjacent owners to improve/build new habitats (4)
16	General strategy	Manage Park Service and visitor use practices to prevent people from inadvertently contributing to climate change (4)
17	General strategy	Inform public and promote consensus-building on tough decisions; invite input from a broad range of sources to generate buy-in across stakeholder interests. (4)
18	General strategy	Implementation of the full range of governance types to encourage more stakeholders to become involved in declaring and managing protected areas (1)
19	General strategy	Implement new approaches for agrobiodiversity conservation, including community approaches, such as Indigenous and Community Conserved Areas along with support from the agricultural industry and NGOs (1)
20	General strategy	Increase collaboration with the agricultural sector, including seed companies, in promoting in situ protection (1)
21	General strategy	Multi-sector approaches: at a landscape/seascape scale, it is important that different sectors plan and work together rather than operating independently (1)
22	General strategy	Stakeholder consultation and active involvement: agreeing minimum standards for stakeholder consultation and involvement in REDD schemes associated with protected areas, particularly with indigenous and local communities (1)
23	General strategy	Assuring the involvement of stakeholders; local and indigenous communities as well as national interest groups and supportive private sector enterprises, such as low impact tourism (1)
24	General strategy	Introducing new approaches to managing visitors in light of expected changes to the ecology and the biome: such as additional fire hazards, extra avalanche risk or severe heat, along with actions to reduce carbon emissions such as better public transport access to protected areas (1)
25	Coastal and halophytic habitats	Improve water quality by raising awareness of adverse effects of land-based activities on marine environments, implementing integrated coastal and watershed management, and developing options for advanced wastewater treatment (4)
26	Freshwater habitats	Reduce or eliminate water pollution by working with watershed coalitions to reduce non-point sources and with local, state and federal agencies to reduce atmospheric deposition (4)
27	Freshwater habitats	Establish marine and freshwater protected areas agreed and managed with local communities as reservoirs for fish stocks threatened by climate change. Such protected areas should be carefully monitored for their impact on surrounding fish populations and size and management regimes adapted if necessary (1)



28	Forests	Integrate approaches to forest management and water supply: collaborative approaches are needed between environment ministries, private and state protected area agencies and water companies to ensure that the most effective use possible is made of protected forests in supplying clean water (1)
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**Table 18: Recommended strategies related to knowledge and research, science and technology**

No	Habitat type or other specification	Recommended strategies in different Literature
1	General strategy	Develop improved modelling and analysis capacity i.e. more effective software, integration with GIS, integrate greater complexity (5)
2	General strategy	Do integrated study of multiple global change drivers (5)
3	General strategy	Improve techniques for and do more restoration in wetlands, rivers, matrix (5)
4	General strategy	Validate model results with empirical data (5)
5	General strategy	Predict effects of directional climate change on ecosystems, communities, populations (5)
6	General strategy	Increase investment in climate related research (5)
7	General strategy	Practice proactive research on climate change (5)
8	General strategy	Study ecotones and gradients (5)
9	General strategy	Study effectiveness of corridors (5)
10	General strategy	Study processes of change at multiple spatial and temporal scales; Use GIS to study species distributions and landscape patterns (5)
11	General strategy	Study changes in populations at rear of range rather than only range fronts (5)
12	General strategy	Study response of undisturbed areas to climate change (5)
13	General strategy	Study social agency and human decision making (5)
14	General strategy	Train more taxonomists (5)
15	General strategy	Evaluate policies that use historic conditions and determine how to better reflect accurate baselines in the face of climate change; modify design assumptions to account for changing climate conditions. (4)
16	General strategy	Develop more efficient methodologies and criteria for identifying areas with high carbon storage and sequestration potential: and use this as an additional filter in selecting protected areas (1)
17	General strategy	Undertake management training: to plan for climate change, including likely responses to fire regimes, stream flow and invasive species (1)
18	General strategy	Investing in quality information: management of research to ensure that the information to help manage rapidly changing environments is readily available to protected area managers and, through them, to the wider community (1)

19	General strategy	Providing detailed training for managers and rangers covering technical (e.g. forecasting, modelling, threshold of potential concern, adaptive management); managerial (e.g. budget implications, new investments, new management challenges) and social (e.g. negotiation, information provision, ramification of changes) issues (1)
20	General strategy	Assess goods and services offered by the protected area that could help to mitigate impacts and adapt to climate change, such as amelioration of natural disasters, supply of valuable genetic material, provision of food and water etc. (1)
21	General strategy	Assess the tradeoffs associated with protected area management adaptation measures. Adaptation will impose new costs on protected area agencies; the cost benefit calculus of planned adaptation measures will need to be taken into account, taking into consideration the likelihood of success (1)
22	Freshwater habitats, Natural and semi-natural grassland formations, Raised bogs and mires and fens	Working out the best management strategies: further work is needed to find out more about carbon balance in peatlands and other inland waters; and particularly the combination of conditions that can tip a system from being a sink to source of carbon, along with the best management methods to maintain wetlands as sinks for carbon (1)
23	Natural and semi-natural grassland formations	Carry out further research on the status and trends in carbon sequestration in grasslands: focusing particularly on management options that can minimise losses and maximise storage and sequestration (1)
24	Forests	Use of natural ecosystems to control insect disease vectors: further research is urgently needed to establish the links between the retention of forest habitats and the reduction in insect-borne diseases, leading to accompanying management advice for landscape-level planning and for site-level responses including restoration (1)
25	Forests	Use the paleological record and historical ecological studies to identify environments buffered against climate change, which would be good candidates for long-term conservation (4)

**Table 19: Recommended strategies related to species conservation**

No	Habitat type or other specification	Recommended strategies in different Literature
1	General strategy	Study response of species to climate change physiological, behavioral, demographic (5)
2	General strategy	Translocate species (5)
3	General strategy	translocation of species with limited dispersal abilities and small, isolated ranges (3)
4	General strategy	Translocation of plants and other organisms from sites that are becoming unsuitable due to global climate change to other sites where conditions are thought to be more favourable for their continued existence (2)



5	General strategy	Study species dispersal across landuse boundaries, gene flow, migration rates, historic flux (5)
6	General strategy	Study species distributions current and historic (5)
7	General strategy	Broaden genetic and species diversity in restoration and forestry (5)
8	General strategy	Identify indicator species (5)
9	General strategy	Initiate long-term studies of species responses to climate (5)
10	General strategy	Model species ranges in the future (5)
11	General strategy	Study adaptive genetic variation (5)
12	General strategy	Preserve genetic diversity in populations (5)
13	General strategy	broaden the genetic variability and species diversity of managed sites (3)
14	General strategy	Increase representation of different genotypes, species, and communities under protection (4)
15	General strategy	Represent each species in more than one reserve (5)
16	General strategy	Study and protect metapopulations (5)
17	General strategy	Establish neo-native forests plant species where they were in the past, but are not found currently (5)
18	General strategy	Allow the establishment of species that are non-native locally, but which maintain native biodiversity or enhance ecosystem function in the overall region (4)
19	General strategy	Focus on annual plants rather than perennials near climate boundaries (5)
20	General strategy	Protect endangered species ex situ (5)
21	General strategy	Protect functional groups and keystone species (5)
22	General strategy	Manage populations to reduce temporal fluctuations in population sizes (5)
23	General strategy	Study time-series data on species dynamics (5)
24	General strategy	Substitute space for time to study the responses of species to climate change (5)
25	General strategy	Use caution in predictive modeling because the responses of some species are not well predicted (5)
26	General strategy	Reduce or eliminate stressors on conservation target species (4)
27	General strategy	increase the resilience of existing ecosystems and species in their current locations through site-based management, restoration and reduction of pressures from sources other than climate change (2)
28	General strategy	Remove dispersal barriers and establish dispersal bridges for species (4)
29	General strategy	Recognising and planning for changes in species' migration patterns, both for long-term migrants and changes in movement patterns of large mammals within a landscape (1)
30	General strategy	Actively plant or introduce desired species after disturbances or in anticipation of the loss of some species (4)
31	General strategy	Facilitate the growth of plant species more adapted to future climate conditions (4)
32	General strategy	Planting seedlings adapted to future climates (2)
33	General strategy	Practice bet-hedging by replicating populations and gene pools of desired species (4)

34	General strategy	Captive breeding and germplasm banks, which capture seeds, eggs, sperm, for species that would otherwise become extinct due to climate change (2)
35	General strategy	Provide redundant refuge types to reduce risk to trust species (4)
36	General strategy	Assist in species migrations (4)
37	General strategy	Facilitate long-distance transport of threatened endemic species (4)
38	Coastal and halophytic habitats	Manage functional species groups necessary to maintaining the health of reefs and other ecosystems (4)
39	Coastal and halophytic habitats	Design marine projected areas with dynamic boundaries and buffers to protect breeding and foraging habits of highly migratory and pelagic species (4)
40	Coastal and halophytic habitats	When restoring oyster reefs, replicate reefs along a depth gradient to allow fish and crustaceans to survive when depth-dependant environmental degradation occurs (4)
41	Coastal and halophytic habitats	Support migrating shorebirds by ensuring protection of replicated estuaries along the flyway (4)
42	Coastal and halophytic habitats	Restore important native species and remove invasive non-natives to improve marsh characteristics that promote propagation and production of fish and wildlife (4)
43	Coastal and halophytic habitats	Consider mangrove restoration for potential benefits including shoreline protection, expansion of nursery habitat, and release of tannins and other dissolved organic compounds that may reduce photo-oxidative stress in corals (4)
44	Coastal and halophytic habitats	Restore oyster reefs along a depth gradient to provide shallow water refugia for mobile species such as fish and crustaceans to retreat to in response to climate-induced deep water hypoxia/anoxia (4)
45	Coastal and halophytic habitats	Maintain high genetic diversity through strategy such as the establishment of reserves specifically for this purpose (4)
46	Freshwater habitats	Create side-channels and adjacent wetlands to provide refugia for species during droughts and floods (4)
47	Freshwater habitats	Establish programs to move isolated populations of species of interest that become stranded when water levels drop (4)
48	Freshwater habitats	Establish special protection for multiple headwater reaches that support keystone processes or sensitive species (4)
49	Freshwater habitats	Actively remove invasive species that threaten key native species (4)
50	Freshwater habitats	Increase genetic diversity through plantings or by stocking fish (4)
51	Forests	Modify genetic diversity guidelines to increase the range of species, maintain high effective population sizes, and favor genotypes known for broad tolerance ranges (4)
52	Forests	Where ecosystems will very likely become more water limited, manage for drought- and heat-tolerant species and populations, and where climate trends are less certain, manage for a variety of species and genotypes with a range of tolerances to low soil moisture and higher temperatures (4)

53	Forests	Use the paleological record and historical ecological studies to revise and update restoration goals so that selected species will be tolerant of anticipated climate (4)
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## 5. Resume and Conclusions

### 5.1. Challenges during the work on this report and reasons for delays

The identification, description and classification of today’s management practices in HABIT-CHANGE investigation areas were delayed by different obstacles during the implementation. First, the understanding of important terms and definitions describing the management practices did vary significantly between different project partners. The process of defining and standardising key terms (such as strategy, measures, goal and objective, see chapter 1.5) for this output required discussions among project partners. Secondly, the collection of information about management practices via questionnaires lasted longer than expected due to the limited resources and a lack of data in the HABIT-CHANGE investigation areas. After reviewing and sorting the data from the questionnaires a second round of reconfirmation was necessary, that again took additional time. Finally, the lack of new and climate-change adapted management activities in the HABIT-CHANGE investigation made it necessary to start an intensive literature review and look for recommendations for management actions and measures under climate change.

Another reason for the delay of this output was difficulties that the HABIT-CHANGE investigation areas experienced during the compilation of management actions from their respective area. For example: For some areas it was difficult to assign management measures to individual Natura 2000 sites and different protected habitat types because the management of protected areas is organised and implemented on the basis of territorial units (that include many different habitat types) and not on the basis of different Natura 2000 habitat types.

The management of protected areas has to achieve a wide variety of (competing) objectives and goals. Usually national regulations, requirements and objectives are well established in the areas and form the basis for the area management. In each country specific national classification systems for habitat types and biotopes exist that do not match the categories and classes of the Natura 2000 systems. In one single Natura 2000 habitat type different habitat types according to national classification may exist, and each of those national habitat types may require specific management. Since the implementation of the Natura 2000 network is still in progress, competing objectives and different management requirements from national legislation and the EU-Habitats-Directive made it difficult for the investigation areas to assign management activities to the Natura 2000 habitat types.

During the work for this output it became obvious, that management measures with precise information on what to do, when and where to do it and how to do it, are not described in management plans for the protected areas. Precise definitions of management objectives with information about measurable targeted conditions and timelines for their achievement are usually not part of the management plans for protected areas. For the identification and description of topical management activities the management plans could not be used as information source, but

members of the protected area administration had to be questioned to collect the needed information.

## 5.2. Short interpretation of data provided

This report, with its extensive compilation of different already implemented management activities and a wide choice of recommended options for future management, provides a solid basis for the evaluation of different management practices in output 3.4.1.

The HABIT-CHANGE investigations that donated contributions to this report by filling the questionnaires and reconfirming the suggested categories and definitions were the main source of information about topical management practices in protected areas. The compilation of strategies and measures in tables in chapter 3 shows the wide range of different management practices implemented today in protected Natura 2000 habitats. Due to the specific location of the HABIT-CHANGE investigation areas not all groups of habitat types (according to annex 1 of the EC-Habitats-Directive) could be covered. Very little information about management practices were reported for Coastal sand dunes and inland dunes (Code-Number 2000), no information was delivered for temperate heath and scrub habitats (Code-Number 4000) and Sclerophyllous scrub (Matorral) habitats (Code-Number 5000) because those habitat-types do not exist in investigation areas that answered the questionnaires.

For compensation an extensive collection of management practices was provided that could not be related to a specific Natura 2000 habitat type but that support the achievement of conservation goals in the protected areas by different means. In tables 10 to 13 management practices are compiled that may influence the conservation status of protected habitats indirectly or intermediately. Those practices are of great relevance because they give an insight to the different tasks, strategies, approaches, and techniques in protected area management. They also form the basic set from which measures and strategies for adaptation to climate change can be taken.

Due to the different background of project partners from different participating countries the definitions of strategies and measures vary somewhat. It was not intended to subsume and unify descriptions and specifications of measures and strategies but to present the whole spectrum of locally defined and implemented measures. Since the investigation areas will have to evaluate the strategies and measures they reported from their investigation area for output 3.4.1, it is important that area managers recognise their measures. That was one important motivation for leaving the descriptions from the investigation areas mostly unchanged.

The compilation of strategies and measures for adaptation to climate change in chapter 4 were taken from different publications. The recommendations found in scientific literature were assorted to the same categories of strategy-groups as measures and strategies in chapter 3. Different suggestions and descriptions were not summed up to show the full variety of recommendations. The separate listing of all suggestions from literature allows identifying the authors of each action proposed.

Recommended strategies and measures for climate-change adaptation are usually not related to specific habitat types, but they address general approaches different kinds of habitat types and species could benefit from. If they hold good for all habitat types such strategies are reasonable. On

the one hand these overall strategies are needed, on the other hand it is important to break them down to the habitat types. That allows creating fitting measures for each habitat type with their individual requirements and sensitivities. The most important challenge is to formulate concrete and detailed measures that may be easily understood and implemented by those who are responsible for the management of protected areas, habitats and species. The specification of suggested strategies and the development of fitting management measures for adaptation will be one of the main tasks within the elaboration of climate-change adapted management plans in output 5.3.1.

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