Appendix A. Legal, institutional and financial changes since the transition

From 1990 to 2010 a deputy state secretary supervised nature conservation activities within the responsible ministry (Rakonczay, 2009; OFFB, 2013). In 1996 a progressive law on nature conservation (53/1996) came out including landscape protection outside protected areas, influencing forest and hunting regulations and proposing economic instruments. Later on in its amendments it defined the ecological network and environmentally sensitive areas (recently called high nature value areas – HNVAs). The Natura 2000 network was referred to in the amendment of the law on nature conservation (53/1996) and a governmental decree (275/2004) came out with more detailed regulation.

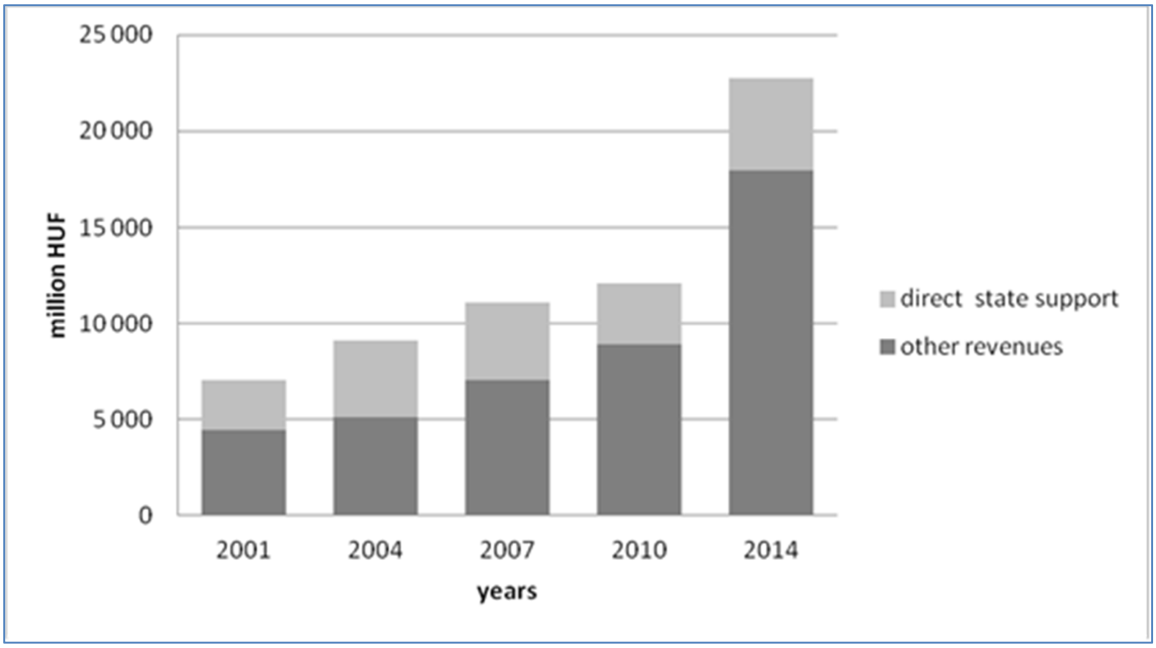
Between 1990 and 2002 six national parks and related directorates were established adding to the existing four, replacing the previous nature conservation directorates. National park directorates (NPDs) were responsible for the supervision of protected areas including national parks and they acted also as a nature conservation authority in their operative territory till 2005 (Rakonczay, 2009). The number of personnel including the rangers in NPDs increased with temporal fluctuations till 2004. Since the 1990s the state has provided financial resources for the purchase and appropriation of protected land, and their management has been assigned to the NPDs.

Before 1989 resources allocated to nature conservation were rather limited, while after 1990 state support increased, the state budget and the state's Environmental Fund with its successors provided financial support for the nature conservation activities of national park directorates, other national state organisations, local governments and NGOs (Kovács, 2005; Rakonczay, 2009). Between 2002 and 2004 farmers' nature conservation activities were supported by the pilot National Agri-environmental Program. Only a few international sources were available in the early 2000s to help candidate EU countries to develop (e.g. PHARE: Poland and Hungary: Assistance for Restructuring their Economies, a pre-accession instrument of the EU) (2nd National Nature Conservation Plan 2003-2009, 132/2003 Parliamentary Decision).

In the 2007-2013 period close to 2 billion euro (more than 500 billion HUF) was available for projects with some potential for improving nature conservation purposes. The majority of this amount came from the EAFRD (European Agricultural Fund for Rural Development) covering Natura 2000 payments in grasslands and forest areas, and voluntary agri- and forest-environmental measures (Kovács et al., 2014).

After the accession to the EU, the amount and ratio of EU funding increased also in the budget of the national park directorates. These changes had positive and negative effects as well. As a result, NPDs developed new skills in project planning and implementation, and accommodated to participate in a more competitive financing environment, but at the same time they became more dependent on outside financial sources even for fulfilling their main tasks assigned to them by the state and required by EU. The amount of direct state support stayed at a low level (see Fig. A.3). While large part of the funding was earmarked and supported infrastructural development and rehabilitation projects, it can be supposed that regular conservation management tasks like biodiversity surveys, research and monitoring became underfinanced.

Figure A.3. Changes in the amount and composition of the national park directorates' yearly budget, 2001-2014. Other revenues include financial support from EU (e.g. direct agricultural or agri-environmental payments, LIFE, support through structural funds), revenues from leasing land or selling goods and services. (Source: laws on the implementation of the previous years's budget plans: 40/202, 118/2005, 78/2008, 133/2011, 172/2015).



Appendix B. Databases used for analysis

Distributional data and information on habitat quality and threatening factors was derived from the Hungarian Habitat Mapping Database (MÉTA), which contains data on 287,613 ha grid cells surveyed between 2003 and 2006 (Molnár et al., 2007). We also used the extended forest naturalness assessment data, 2001-2004 (e.g. Bartha et al., 2006). Data on habitat area in the present paper (cf. Bölöni et al., 2008a; Molnár et al., 2008a) were recalculated (e.g. the area of young forests was included). Threatening factors were based on Molnár et al. (2008b, percent of habitat area threatened) and were summarized into 4 categories for the purpose of this study (0=no threat, 3=strong threat). For non-forest vegetation naturalness-based habitat quality is indicated on a 4 grade scale (Bölöni et al., 2008b) from '2' as heavily degraded habitat to'5' as habitat in a nearly natural state, high quality habitat (surveyed for each habitat type in each grid cell). For forest habitats the value of naturalness (VN) was assessed by collecting data in 3000 forest sites selected in a stratified random sampling using 57 indicators of forest naturalness related to tree species composition, tree stand structure, species composition of shrub layer, structure of shrub layer, composition of forest floor vegetation, structure of forest floor vegetation, dead wood, effects of game and site characteristics (for further information see Bartha et al., 2006). 100% VN indicates a pristine, undisturbed forest while 0% indicates an artificial site based on the combined assessment of the 57 indicators (Bartha et al., 2006).

The area of potential vegetation types (i.e. landscape types with a certain dominant potential vegetation type) were based on the map of Zólyomi (1989). For each landscape type the actual area (percent) of remnant semi-natural vegetation was calculated based on the data in the MÉTA database. Trends for changes of grasslands, forests, old fields and shrub vegetation was based on the Hungarian Habitat Trend Database (Biró et al., 2016) which contains habitat data of 5000 randomly selected points for 7 time periods (1780s, 1850s, 1940s, 1960s, 1980s, 2000s, 2010s) based on military maps, aerial photos, satellite images, historical botanical site descriptions and recent field data (MÉTA database plus new field surveys). Main Sources of the Hungarian Habitat Trend Database: First Military Survey (1782-1785; HM HIM, Arcanum Ltd.), Second Military Survey (1840-1866; HM HIM, Arcanum Ltd.), WWII Military Survey (1940-44; HM HIM, Arcanum Ltd.), Corona satellites (1961-1969; USGS, Interspect Ltd.), Landsat TM4-5 (1984-1987; USGS), Digital orthophoto series (2000; FÖMI, Budapest) and World Imagery satellites (2010-2013, ArcGIS.10.1.ESRI/ onlinebasemaps). Most important additional sources for the processed periods: MÉTA Database (Molnár et al. 2007) and DT-Map Habitat Databases (Biró et al. 2007), National Forest Inventories of Hungary (NÉBIH, Budapest), New Military Survey (1953–1959; MH GEOSZ, Budapest), Agrotopo Soil Maps (MTA ATK TAKI, Budapest), Archive aerial photos (1950s-1980s. MH GEOSZ, FÖMI, Budapest, www.fentrol.hu, Accessed Jan.2017), Digital orthophoto series of Hungary (2005, FÖMI, Budapest), Topographic Maps (1976-1998, FÖMI, Budapest, Hungary, http://tajertektar.hu/hu/ Accessed 08.11.2016.).

Review of the current status and threatening factors of particular habitats was based on an extensive review of the published and "grey" literature related to forests, grasslands, wetland and aquatic habitats in Hungary including CBD country report (CBD Report, 2014), the National Biodiversity Strategy 2015-2020 (NBS, 2015) and the National Conservation Plan 2015-2020 (NCP, 2015). Species and habitat conservation projects were reviewed by web-based searches, literature reviews and expert consultations.

Appendix C.
Status of and threats to terrestrial and aquatic habitats in Hungary

Forests

Forest types: Continental forest-steppes and broadleaved temperate deciduous forests are the two major biomes in Hungary. Forest-steppes are characterised by a spatially fine-grained mosaic of closed dry grasslands and more or less open forests dominated by pedunculate oak (*Quercus robur*) and pubescent oak (*Q. pubescens*) (on loess also turkey oak, *Q. cerris* and sessile oak, *Q. petraea*). Mixed oak forests dominated by sessile oak, turkey oak and pedunculate oak are characteristic at lower elevations, mixed sessile oak – hornbeam (*Carpinus betulus*) forests at mid elevations, whereas beech (*Fagus sylvatica*) forests dominate the highest mountains in Hungary. Riparian soft- and hard-wood forests were also widespread in the past (with willow and poplar (*Salix alba, S. fragilis, Populus alba, P. nigra*), pedunculate oak(*Quercus robur*), ash (*Fraxinus excelsior, F. angustifolia ssp. danubialis)* and elm (*Ulmus spp.*).

Changes in habitat area: While currently forests cover the 20.8% of the country area (NÉBIH EI, 2014), the potential forest cover (based on climatic and edaphic factors) is estimated between 60-85% (including the zonal and the edaphic riparian forests (see Table B.1, Zólyomi, 1989; Bartha and Oroszi, 1995), however forest cover decreased dramatically to 11.8% by 1920. After a large-scale reforestation process, forest cover increased to the current rate, which is still only one-third/one –quarter of the potential cover (NÉBIH EI, 2014).The magnitude of this habitat loss shows a decreasing trend with elevation: steppe-woodlands, for instance, suffered major losses from their original distribution on the Great Hungarian Plain and some Transdanubian lowlands while montane and sub-montane forests suffered relatively less decrease in area (Table C.1). Tree species composition have been largely affected by introduced exotic tree species: as Table C.2 shows, 40 % of the forested area is recently covered by plantations of exotic species such as locust tree (*Robinia pseudoacacia*) or poplar cultivars and different pine species (*Pinus nigra, P. sylvestris*).

Threatening factors: For the past 150 years uniform shelter wood system has been the major practice in Hungarian forests resulting in an artificial disturbance regime that created forested landscapes with unnatural spatio-temporal dynamics and with stands that lack several structural elements required by forest specialist species for their long-term survival, e.g. dead-wood (Ódor et al., 2006). This management system had a substantial impact on both tree stand structure and species composition creating large, homogeneous (often pure, even-aged) stands and applying much shorter rotation times than the natural lifespan of dominant tree species (Brunet et al., 2010; Paillet et al., 2010; Ódor and Standovár, 2011).
In addition to the uniform forestry management system the two most important threatening factors affecting semi-natural forests are the spontaneous spread of aggressive non-native tree species, especially in riverine and lowland forests, and the browsing pressure of constantly increasing populations of large game herbivores (Table C.3). High game density is a potential obstacle against the widespread application of more nature-based forestry techniques by impeding natural regeneration (e.g. Molnár et al., 2008b). Moreover, in homogeneous, even-aged stands with poor understory browsing pressure is even stronger on the available tree seedlings, than in stands where diverse shrub-layer provides preferred resource for large herbivores (e.g. Katona et al., 2013). Addressing these issues are seriously hindered by the

influence of various stakeholders: for example, while non-native Black Locust threatens semi-natural grasslands in many areas, it is promoted by forest managers and honey producers as an economically utilized species (e.g. Cierjacks et al., 2013). By supporting these stakeholders' interest, recent government policies increasingly tend to relax current strict regulation controlling the deliberate spread of Black Locust, as the species has recently become "Hungaricum": a unique Hungarian asset (e.g. Demeter et al., 2015).

Hungarian forests also face the effects of global climate change, to which beech forests are especially sensitive (Czúcz et al., 2011). While artificial preventative tree species substitutions as useful means for mitigating adverse effects is strongly advocated, nature-based forest management can also buffer these changes by maintaining high tree species diversity and by applying silvicultural regimes that support continuous forest cover (Ódor and Standovár, 2011).

In spite of their relatively small cover, Hungarian forests still sustain high levels of biodiversity partly as a result of the biogeographic heterogeneity affecting the flora and fauna. Although 21.8% of the forest stands is under protection by national law, 85% of them serve timber production. Since 55,7% of all forests including the great majority of semi-natural forests are state-owned, the Hungarian Government bears special responsibility in forest biodiversity conservation (NÉBIH EI, 2014). However, in recent years, there have been three different state organizations exercising property rights, raising concerns regarding the consistent governance and sustainable use of this "slow-pace" natural system.

Grasslands

Grassland types: The most widespread grassland types in Hungary are halophytic (approx. 1,870 km^2), other millennia old primary grassland types are the Pannonian loess and sand steppes, and rocky grasslands (Molnár et al., 2008a). Many of these grassland areas were open habitats during the Holocene (Fekete et al., 2014), while mesophilous grasslands of the hilly and mountain regions are mostly secondary clear-cut and often species-rich pastures and meadows (Bölöni et al., 2011). Nearly all mentioned grasslands are of Community Interest (Natura 2000 habitats, Annex I.).

Changes in habitat area: Since the end of the 1950s total area of semi-natural grasslands (including treeless wetlands) decreased by approximately 43% (Biró et al., 2016). Area loss, fragmentation and degradation have not affected evenly all grassland types (Molnár et al., 2008a). Some type of grasslands on productive soils, especially in lowland areas, were almost completely destroyed (i.e. loess grasslands, Török et al., 2011; closed sand grasslands, Biró et al., 2013a), The main factors in grassland destruction and degradation were: the conversion of grasslands to croplands (especially in the late 1940s and the1950s), afforestation, urbanisation, or by shrub and tree encroachment after ceased management (Bölöni et al., 2011; Biró et al., 2013a). Hilly areas were especially affected by shrub and tree encroachment after ceased management from the late 1960s in hilly areas (Valkó et al., 2012). In high productive grasslands (i.e. in mesophilous and wet grasslands in lowland areas), similarly to the western European countries, extensive management was replaced by an intensive one during the 1960s and 1970s (Dengler et al., 2014). This led to the melioration and drainage of wet patches, increased use of mineral fertilisers, overseeding by seed mixes (often with highly productive cultivars), increased frequency and lowered height of mowing or increased stocking rates (Molnár et al., 2008b; Dengler et al., 2014). Large areas of sand regions were afforested with pines (*Pinus nigra*, *P. sylvestris*) and *Robinia pseudo-acacia* resulting in uneconomical, species-poor plantations (Szitár et al., 2014). Unproductive, abiotically stressed grasslands unsuitable for industrial crop production and intensive farming were remained in considerable extension and in good habitat quality (see for example various types of saline grasslands, or steep rocky grasslands (Bölöni et al., 2008b). Drainage also threatened and still threatens sodic lakes: almost all lakes on the sand ridge disappeared, but the ones on the former Pleistocene Danube floodplain are maintained by a groundwater flow system originating from the Carpathian mountains and the nearby sand region (Biró et al., 2007; Mádl-Szőnyi and Tóth, 2009; Boros 2014).

Threatening factors: Intensification of farming, ploughing of grasslands are profound in productive grassland areas (Table C.3, Molnár et al., 2008b; Stoate et al., 2009). In grasslands with low productivity and/or low accessibility (e.g. on sand and eroded sites or hillsides)the former, often extensive management was ceased in the previous decades (Valkó et al., 2011; Bölöni et al., 2011; Kertész et al., 2011) and the number of livestock, especially the total number of cattle and sheep sharply declined in the last 20 years (Stoate et al., 2009; KSH, 2013). Cessation of management and land abandonment resulted in a further crucial problem: the increase of area of invasive plants. The most vulnerable and also the most resistant grassland habitats are stressed grasslands: the most threatened are open sand grasslands, while rocky grasslands and saline dry grassland types are highly resistant to invasion (Botta-Dukát, 2008). Many of the lowland mesophilous meadows in the last decades were also heavily affected by invasive species (Bölöni et al., 2011) or in some regions by the economic turnover after the fall of communisms (ploughed after the collapse of agricultural cooperatives, Biró et al., 2013b).
EU agri-environmental schemes had a huge effect on shrub encroachment. Many pastures, meadows, even abandoned arable fields were cleared by the users to become or remain eligible for payments. This is the explanation for the reversed trend of dry shrub vegetation which was not only caused by succession towards forests but also by shrub removal. Shrub encroachment on wet grasslands (or by invasive shrub species) was less affected by the subsidies. Unexpectedly reed beds started to spread on abandoned or under-used grasslands all over the country (1.8 gain % / year, from 1986 to 2002 and 0.6% gain / year from 2002) while marshes in general have a decreasing trend (Biró et al., 2016).

Freshwater habitats

Freshwater habitat types: Hungary belongs to the Dniester-Lower Danube freshwater ecoregion (Abell et al., 2008), which hosts one of the most species rich freshwater fauna in Europe (Bănărescu, 1990; Abell et al., 2008). Due to its special geographical position in the Carpathian basin the country contains a diverse array of freshwater habitat types, from small submontane streams to large floodplain rivers (e.g. Danube, Tisza), and from the largest shallow lake in Central Europe (Lake Balaton) to small sodic ponds. This diversity of habitat types is responsible for the outstanding freshwater biodiversity relative to the country's small size (Erős, 2007; Borics et al., 2011).

Changes in habitat quality: The transition in 1989 led to the improvement of water quality in many areas. Nutrient loads to freshwater habitats decreased abruptly when the Hungarian agriculture collapsed in 1989 (Istvánovics and Honti, 2012). Fertilizer application dropped to one tenth of the former level (Tátrai et al., 2008; Stoate et al., 2009). Heavy industrial activity also decreased as former socialist markets disappeared. Improving water quality yielded more

clear water and the recolonization of streams and rivers with sensitive taxa. For example, the Sajó River, which was one of the most polluted rivers in Hungary in the 1970s and 80s has been repopulated by several protected or strictly protected fish species at the end of the century (Harka et al., 2007). Heavy algal blooms ceased in Lake Balaton, and decreasing primary production influenced the whole aquatic food web at a degree that fishermen have become unsatisfied with the yields.
Large-scale river regulations starting from the second half of the nineteenth century, and paralleled by massive agricultural industrialisation, have substantially changed the landscape in the Hungarian lowlands which formerly functioned as the floodplain area of the River Tisza (the second largest tributary of the Danube). Water flows in the highlands were, however, mainly locally affected by small-scale canalisation, reservoir construction and, in the past, industrial activities. Submontane streams remained relatively unimpacted (Erős, 2007), although some of them are now exposed to local influences such as intensive tourism, forestry and organic pollution from villages. Consequently, the landscape is largely affected by human perturbations, which may have contributed to the successful establishment and recent proliferation of non-native fishes and the decline of native fish populations in this region.

Threatening factors: Ninety-five percent of the water supply (i.e. streams and rivers) originates from abroad raising specific challenges in effectively conserving freshwater biodiversity and improving ecosystem health (Dolezsai et al., 2015). The most characteristic examples of out of border effects are upstream chemical spills, which occur still relatively frequently. In 2000, for example, a gold mine company of Australian-Romanian ownership in Romania spilled thousands of tons of cyanide and heavy metals into the Tisza and Szamos Rivers (Lucas, 2001; Harper, 2005), killing tens of thousands of fish and other forms of wildlife and poisoning drinking water supplies (Cunningham, 2005; Antal et al., 2013).
Fragmentation and other human effects downstream of Hungary also have a negative effect on biodiversity of the country. For example, overfishing in the lower Danube, and construction of the Iron Gate hydro-electrical power plant complex in the socialist era (Iron Gate 1 between 1964 and 1972, Iron Gate 2 between 1977 and 1984), which restrict upstream migration of fish caused the extinction (i.e. almost complete disappearance) of large bodied anadromous sturgeon species, like the beluga sturgeon (*Huso huso*).
Despite substantial improvement in water quality, physical modification of the habitat is a recurrent issue which threatens freshwater biodiversity. Construction of reservoirs for irrigation and recreation (e.g. fishing) purposes on streams and rivers causes the fragmentation of upstream downstream habitats and enhances the invasion of non-native species (Johnson et al., 2008; Erős et al., 2011).
Local scale revitalization projects by NGOs and national park authorities have become more frequent since Hungary joined the EU, and the possibilities for conducting revitalization projects have greatly improved compared in the last 20 years. Fulfilling the requirement of the EU Water Framework Directive (WFD) provides a press on political governance to halt vanishing biodiversity and improve the ecological status of freshwaters. However, at present ~ only 9% of the natural surface water bodies are in excellent or good ecological status (Water Management Plan, 2015). Consequently, WFD targets to achieve at least good ecological state for all water bodies by the year 2015 have not been achieved, similarly to many other European countries.

Table C.1. Relative share of potential and actual wooded vegetation in Hungary (based on Zólyomi, 1989 and the MÉTA habitat database). Remnant vegetation is not necessarily equals with pre-human potential vegetation.

POTENTIAL wooded VEGETATION (based on Zólyomi, 1989)			**ACTUAL wooded VEGETATION (based on MÉTA database, Molnár et al., 2007)**		
Partially wooded potential vegetation types	Dominant Natura 2000 habitats consisted the potential vegetation types […] = other consisting Natura 2000 habitats	Estimated past share of partially wooded potential vegetation types (%)	Habitat groups of actual wooded vegetation equal to dominant forest types in the potential vegetation types	Natura 2000 habitats dominant in the habitat groups / ÁNÉR 2003 codes	Actual share of the habitat groups (%)
Sand forest steppes*	91I0, 6260	13.7	Sand steppe forests	91I0 / L5, M4, M5	0.1
Other steppe forests	91I0	8.2	Other steppe forests	91I0 / L2x, L5, M2, M3	0.1
Calcifrequent woodlands	91H0	1.9	Calcifrequent oak forests	91H0 / L1, M1	0.3
Mixed Turkey woodlands	91M0 [91G0, 91L0]	18.2	Mixed Turkey forests	91M0 / L2a, L2b, L4a, L4b	1.8
Oak-hornbeam woodlands	91G0, 91L0 [9180, mixed pine woods]	7.3	Oak-hornbeam forests	91G0, 91L0 / K1a, K2, K7b, LY2, LY4	2.7
Beech woodlands	9130, 91K0 [9110, 9150, 9180, mixed spruce woods]	1.9	Beech forests	9130, 91K0, 9110, 9150 / K5, K7a, LY1, LY3	1.3
Flood-plains and extensive marshes*	91E0, 91F0, reed beds [6440]	27.9	Riverine forests	91E0, 91F0 / J4, J5, J6	0.7
Fens*	7230, reed beds [91D0, 91E0]	2.4	Swamp forests	91D0, 91E0 / J1b, J2	0.0
Sum		**81.5****			**7.0**

* Note, that these landscape types contained relatively large areas of nonwooded habitats.

** Further 18.5% were mostly covered by non-wooded landscape types (e.g. saline habitats and loess steppe)

Table C.2. Relative share of major tree species (NÉBIH EI, 2014). Non-native species are shown in bold.

Tree species	Share based on area (%)	Share based on volume (%)
Oak species (*Quercus* spp.)	20.8	23.3
Turkey Oak *(Quercus cerris)*	11.2	12.5
Beech *(Fagus sylvatica)*	5.9	10.7
Hornbeam *(Carpinus betulus)*	5.2	4.7
Native poplars *(Populus spp.)*	4.2	4.4
Other broadleaved species	11.3	12.2
Black Locust *(Robinia pseudoacacia)*	**24.1**	**13.6**
Pines and spruce	11.0	14.7
Poplar cultivars	**6.3**	**3.9**
SUM	100.0	100.0

Table C.3 Distributional and habitat quality trends and major pressures for the main habitat types. Trends: 0 = stabil, - = decreasing, + = increasing. Pressures 1: low impact, 2: moderate impact, 3: strong impact

Habitat groups	**Trends**		**Pressures**							
	Estimated trends in distribution	**Estimated trends in habitat quality**	**Spread of invasive species**	**Hydrological problems**	**Under-, over- and improper grazing**	**Mowing problems (incl. abandonment)**	**Shrub encroachment**	**Ploughing of grasslands**	**Overpopulated game**	**Unsustainable forestry practices**
Euhydrophyte habitats	-	-	2	3						
Fens	-	-	3	3	1	1	2	1		
Halophytic habitats	-	-		2	2	1		1		
Marshes	0	0	1	3	1		1			
Rocky grasslands	0	0					1		2	
Open sand steppes	-	0	3		1		3			
Wet meadows	-	-	3	3	2	3	2	2		
Wet tall herb habitats	0	-	3	2	1	2	2			
Mesic meadows	-	-	3		1	3	3	1		
Steppe grasslands	-	-	2		2	2	3	3		
Dry shrubs	0	0	1						2	
Wet shrubs	0	0	3	2						
Pioneer shrubs	+	+	3							
Swamp woods	0	-	3	3					2	1
Riverine woods	0	-	3	2	2		2		2	3
Beech woodlands	0	0	1						3	3
Oak-hornbeam woodlands	0	0	3						3	3
Rocky woods	0	+							3	1
Calcifrequent oak woods	0	0	1						3	2
Dry-mesic oak woodlands	0	-	3		1				3	3
Steppe woods	-	-	3	1	1				2	3
Coniferous woods	0	-							3	3

Appendix D. Species and habitat protection and conservation programmes in Hungary

Among the 2200 vascular plant species and 42000 animal species 1901 species are protected by national law, 273 of them are strictly protected. There are also 3,000 – 3,500 fungi species of which 58 are protected, and an additional 17 lichen species are also under protection. Level of protection and assigned values are being revised from time to time. While upgrading is the general rule, there are also several examples of downgrading, for example both the golden jackal (*Canis aureus*) and the European badger (*Meles meles*) became game animals with a season for hunting specified, while the monetary value assigned to the European pine marten (*Martes martes*) was also decreased recently.

By joining the EU, Hungary compiled the list of species and habitats of Community Importance. While the country covers only 2 % of the total area of the European Union, 19% (46 out of the 233) of the habitats of Community Importance can be found in Hungary, indicating the highly significant contribution of the country to the biological diversity of the EU. Regarding species, 17% of the plant and animal species of the EU Habitat Directive and 36% of species of the EU Birds Directive are present in Hungary, covering 36 plant species, 91 bird species and 105 other animal species of EU Community Importance listed in the Annexes of the Habitat and Bird Directives (CBD Report, 2014). Endemic species were included in the Directive's Annex II only on request of the accession states resulting a few challenging outcomes. For instance, since the lesser blind mole-rat (*Spalax leucodon*) is considered as an agricultural pest in Romania and Bulgaria, the species was not included in the Annex despite the Hungarian request. Even though recent researches have proved that *Spalax leucodon* (= *Nannospalax leucodon*) is a superspecies containing critically endangered species, the Annexes cannot be amended retrospectively (Németh et al., 2013).

In 2013, 335 protected plant species were registered under *ex situ* conservation programmes throughout the country. Species conservation programmes are completed for 20 plant and 23 animal species with various success in terms of implementation depending on the available financial resources, mostly from the European Union (NCP, 2015). The EU-funded LIFE Nature and LIFE+ Nature and Biodiversity components contributed largely to species conservation achievements as these programs co-financed 34 projects in Hungary with state contribution. Altogether €74 million has been invested in these projects, of which €52 million has been contributed by the European Union resulting in further increase of target species populations such as the imperial eagle (*Aquila heliaca*), great bustard (*Otis tarda*), the Hungarian meadow viper (*Vipera ursinii rakosiensis*) and the Pannon endemic plant *Dianthus diutinus* (EULIFE2014). Further ongoing LIFE+ projects aim at conserving species, such as the European roller (*Coracias garrulus*) or the red-footed falcon (*Falco vespertinus*) among others (EULIFE2014). A recent LIFE+ project (LIFE+ 08 NAT/ H/000288) has been conducted between 2010-2014 aiming to establish a joint seed bank (Pannon Seed Bank) for the agricultural and wild flora in Hungary and collected the seeds of 910 species, more than 40 % of the wild native flora including 204 protected and 45 strictly protected species (PSB 2015).

The Environment and Energy Efficiency Operational Program (EEEOP) financed projects have been targeting habitat reconstruction in 79000 ha land of PAs and/or Natura 2000 sites (MinAgr2015). Concerning the LIFE and LIFE+ Programs, the national park authorities accounted for more than half of the project beneficiaries, while the remaining projects were implemented by non-governmetal organizations (EULIFE2014).Recent further projects running under the LIFE+ Nature and Biodiversity component target high-priority habitats such as alluvial forests, dry grasslands in Central Hungary, Pannonic sodic wetlands and the Drava river (EULIFE2014).

Currently PAs under national legislation in Hungary cover 9,1 % of the total area (8943 km2), including 10 national parks (4807 km2), 39 landscape protection areas (3369 km2), 169 nature conservation areas (305,67 km2) and locally protected areas (461,39 km2). Management plans for nationally protected areas (PAs) are available, completed and enacted in legislation only for the 6,7% of the total area of the PAs (May 2013), while non-binding supporting management documentation are available for 60,3% of the remaining PAs. Management plans for 284 Natura 2000 sites (out of 525 in total) have been completed by the end of 2014 with an additional 14 plans close to completion (mid-2015 status) (NBS, 2015). Bogs and mires, sodic lakes, kurgans and all caves are under „ex lege" protection (CBD Report, 2014). The 29 Ramsar Areas (under the Convention on Wetlands of International Importance) reach 2% of the total country area. Other internationally important areas include the 6 UNESCO Man and Biosphere Reserves (UNESCO, 2015a) totalling 5090 km2 and World Heritage Sites (7) (UNESCO, 2015b) in addition to the 3 PAs of European Diploma (Council of Europe, 2015).

Appendices - References

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