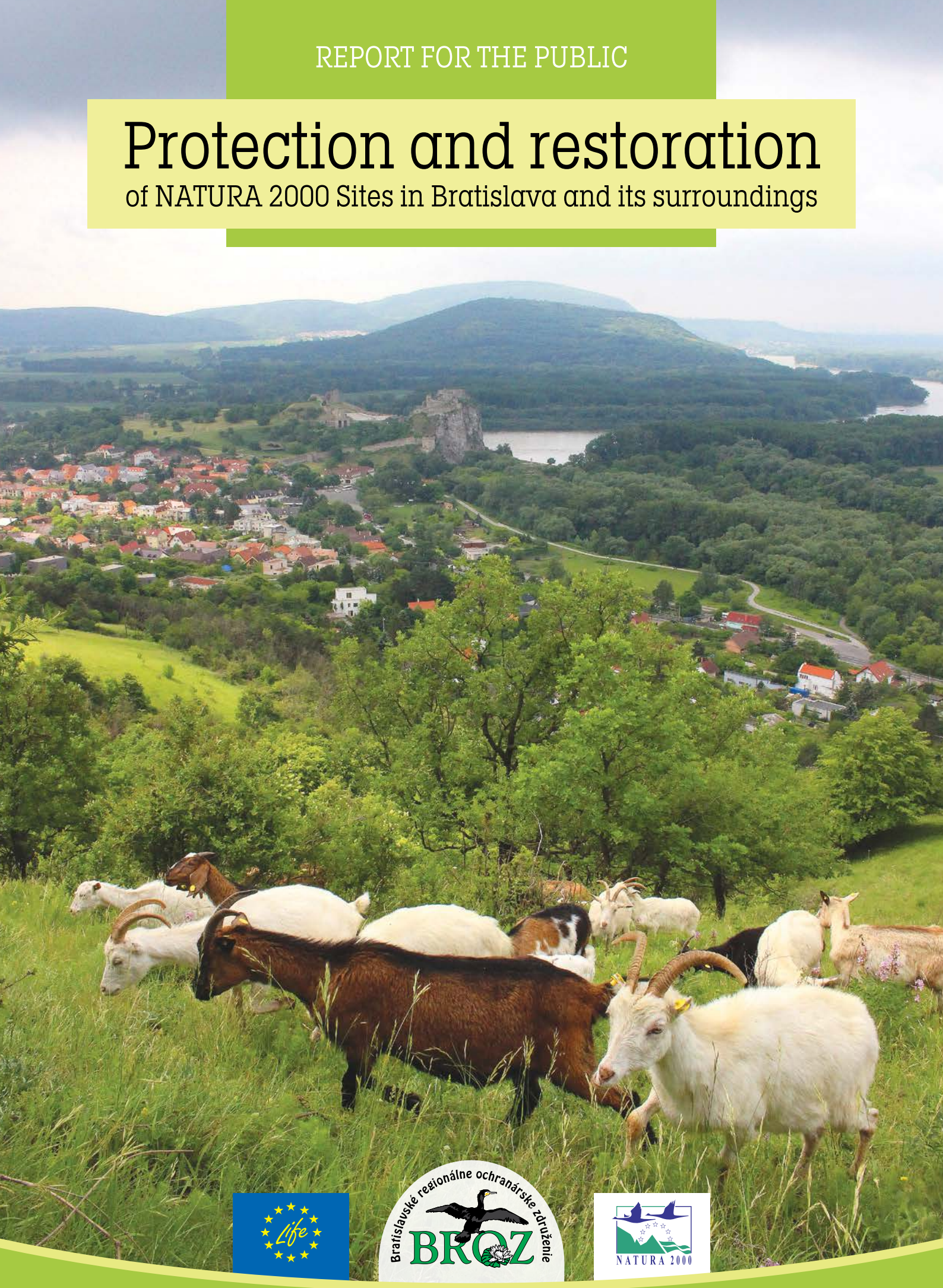
REPORT FOR THE PUBLIC

Protection and restoration

of NATURA 2000 Sites in Bratislava and its surroundings



INTRODUCTION

Bratislava and its surroundings are characterised by an exceptionally rich and unusually diverse mosaic of natural conditions. Despite its high population density and unceasing expansive force of the capital, there is wide range of unique habitats which are inhabited by a large number of rare animal and plant species.

Exceptionally species-rich alluvial meadows of the Morava stretch from the north to Bratislava. The river then enters the territory of the capital below the slopes of Devínska Kobyla, a site with the highest plant biodiversity in Slovakia, including many endemic species and rare orchids. Below Devín castle rock, the Morava is swallowed up by the larger Danube, which here flows through the so-called Devín Gate. It represents an important milestone on the Danube's journey through Europe, as it changes its nature considerably to a rather quiet lowland river after entering Bratislava. The large amounts of bed load that it brings along the way begin to be deposited in the Danubian Lowland where, over the millennia, they created massive deposits of gravel and sand. The Danube tirelessly fought its way through these deposits, which resulted in the creation of the largest inland delta of the Danube, consisting of a tangle of ever-changing river branches surrounded by dense riparian forests. Extremely dry forest steppe communities (*Asparago-Crataegetum danubiale*), which originated on the thick gravel deposits, remind of islands surrounded by the wet riparian forests. On the edge Bratislava, the Carpathian arc, one of Europe's most dominant mountain ranges, begins to rise, crossing the Danube at first and then flowing 1400 km to reunite with it in the Serbian-Romanian border region. Thanks to this, the inhabitants of Bratislava have the chance to enter the splendid Carpathian beech forests, which offer room for recreation and respite from the rush of a big city rush; but, at the same time, represent a significant habitat for a number of species of Community importance.

The exceptionally diverse wildlife is also demonstrated by the number of protected areas located directly in the capital or in its close surroundings. Sadly, many of these sites have been negatively affected by inconsiderate actions in the past when human considerably destroyed their natural character. However, they are also confronted with recent negative phenomena, such as the spread of invasive plants, intensive forest management, insufficient care, or uncontrolled visitor numbers.

The Regional Association for Nature Conservation and Sustainable Development (BROZ), with its partners, succeeded in initiating a project aimed at protection and restoration of these unique sites. With financial support from the European Commission and the Ministry of Environment of the Slovak Republic, unparalleled protection measures were successfully implemented. The involvement of a wide range of stakeholders, land owners and users, non-governmental organisations, governmental authorities, and professional organisations was a substantial contribution to raising awareness and improving communication about nature protection needs.

BASIC PROJECT INFORMATION

PROJECT DURATION: 1.1.2012 – 31.3.2018

PROJECT TITLE: Restoration of NATURA 2000 sites in cross-border Bratislava capital region
LIFE 10 NAT/SK/080

LEADING PROJECT COORDINATOR: The Regional Association for Nature Conservation and Sustainable Development

PROJECT PARTNERS:
Daphne - Institute of Applied Ecology
Faculty of Natural Sciences of the Comenius University in Bratislava
State Nature Conservancy of the Slovak Republic
Pisztráng Kör (Trout Circle Association) (Hungary)
Donau-Auen National Park (Austria)

TOTAL PROJECT BUDGET: € 3 490 059 - 50 % of financial means were financed from the contribution of the European Commission and 50 % from the contribution of the Ministry of Environment of the Slovak Republic

PROJECT SITES – SITES OF COMMUNITY IMPORTANCE:

SKUEV0064 Bratislavské luhy
SKUEV0090 Dunajské luhy
SKUEV0104 Homoľské Karpaty
SKUEV0117 Abrod
SKUEV0168 Horný les
SKUEV0269 Ostrovné lúčky
SKUEV0270 Hrušov
SKUEV0276 Kuchynská hornatina
SKUEV0279 Šúr
SKUEV0280 Devínska Kobyla
SKUEV0295 Biskupické luhy
SKUEV0312 Devínska alúvium Moravy
SKUEV0313 Devínske jazero
SKUEV0314 Morava
SKUEV0388 Vydrica
SKUEV0396 Devínske lúky
HUFH30004 Szigetköz

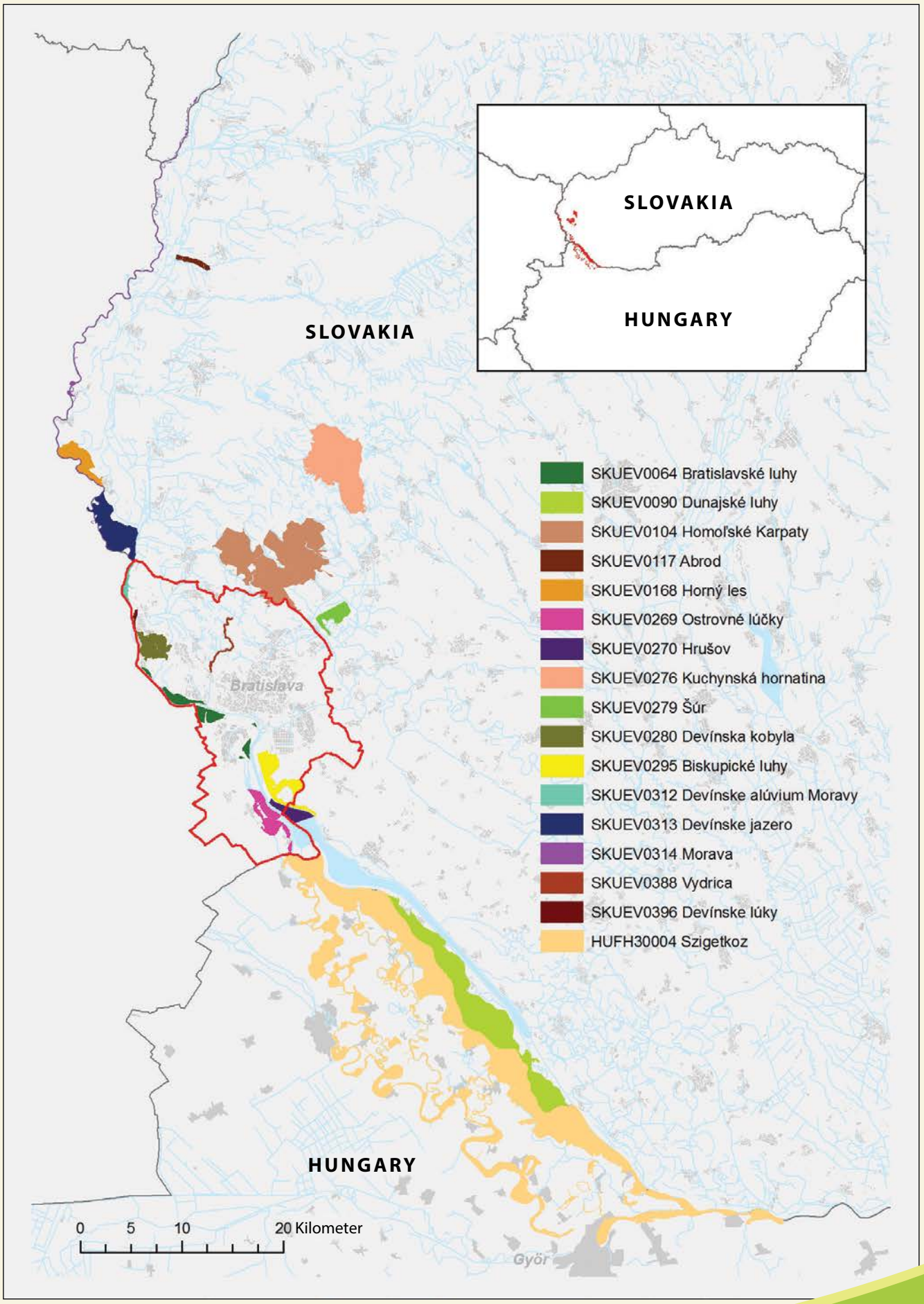
THE MAIN PROJECT OBJECTIVE:

The objective of the project was to strengthen the NATURA 2000 network of protected areas in the cross-border region of Bratislava and to ensure a favourable conservation status of habitats and species of Community importance. The main project objectives included the restoration and introduction of suitable care for forest and non-forest habitats, restoration of water regime in river branches and wetlands, as well as raising awareness of the public and key stakeholders.

SUB-OBJECTIVES:

1. restoration and introduction of suitable management of forest and non-forest habitats of Community importance,
2. restoration of water regime of river and wetlands,
3. lease of land for the purposes of nature protection and their subsequent restoration and maintenance,
4. implementation of preventive measures for controlling visitor numbers and disturbances in the target sites of Community importance,
5. raising awareness of the public and key stakeholders.

PROJECT SITES



CHALLENGES AND THREATS TO NATURE AND BIODIVERSITY

INTENSIVE FOREST MANAGEMENT

In recent decades, vast areas of native riparian forests within the project sites have been replaced by plantations of quickly growing non-native Euro-American poplars.

Their intensive management results in the creation of monoculture even-aged stands that are extracted once they reach the age of 30. The natural species diversity and varied age structure of woody plants of a riparian forest is thus being replaced by plantations of non-native woody plants. Many birds, insects and other animal species which need old trees with massive crowns or dead wood for their living cannot find suitable feeding and nesting conditions here. Intensive forest management also represents a gateway to the spread of invasive and non-native plants, which often colonize open and disturbed areas. The most frequent invasive plants include white ash (*Fraxinus americana*), red ash (*Fraxinus pennsylvanica*), tree of heaven (*Ailanthus altissima*) and ash-leaved maple (*Negundo aceroides*).

EXTINCTION OF MEADOW AND FOREST STEPPE HABITATS

Meadow and forest steppe habitats in the Bratislava region were formerly established and maintained mainly by human activities. In the past, a large part of these areas was used for grazing of livestock or preparation of hay. Their permanent utilisation resulted in the creation of a specific mosaic of rare habitats with unique animal and plant species. However, traditional management has been abandoned in recent decades, which has resulted in gradual overgrowth of these areas with shrubs and invasive plants. Herbs involved primarily include goldenrods (*Solidago* sp.), common milkweed (*Asclepias syriac*a), common ragweed (*Ambrosia artemisiifolia*) and woody plants include in particular tree of heaven (*Ailanthus altissima*). They represent very strong competition and are able to squeeze out the native flora species. In the past, efforts to afforest these areas with non-indigenous woody plants such as black locust (*Robinia pseudoacacia*), black pine (*Pinus nigra*) or manna ash (*Fraxinus ornus*) also contributed to the degradation of these habitats. These negative phenomena result in

Dry basin of the Devínske rameno river branch

Clearcutting causes damage to native riparian habitats

Plantations of fast-growing non-native poplars

the decline and extinction of typical animal and plant species, and thus in an overall decline in biodiversity in these areas.

DISRUPTED WATER REGIME

Particular during the 20th century, various technical adjustments were carried out along the Danube, with an impact on water and wetland habitats. Flood protection dams were built, the banks of the main channel were reinforced with stone, numerous river branches were separated from the main channel, and the overall inundation area was reduced. These water management measures were aimed in particular at improving flood protection and navigation on the Danube.

However, these changes had a significant impact on the ecosystem of riparian forests and the overall water dynamics of the riparian landscape. River branches and wetlands in the inundation area represent an important living space for the numerous living beings that inhabit them and look for feeding and reproduction possibilities. Water dynamics are of key importance for the ecosystem of a riparian forest – they bring large amounts of nutrients during floods, create periodical wetlands, and the flow of water constantly shapes the landscape. In some places, they take away material from the banks, thus creating vertical walls which are essential for nesting of rare species such as the common kingfisher (*Alcedo atthis*), and, conversely, it deposits sediment at other places, creating new small islands or gravel bars that are used as nesting places by, for example, little ringed plover (*Charadrius dubius*). It is on the sediments after floods that a riparian forest naturally arises and regenerates.

UNDESIRABLE EFFECTS OF HUMAN ACTIVITIES

The project sites are located mainly in the territory of Bratislava or its close surroundings, which puts these areas under a lot of pressure from inhabitants and visitors. In general, the visitors lack information on these extraordinarily rare sites and their great natural value. Often out of ignorance, they do not respect the rules in force in protected areas, stray off the paths, disturb nesting birds, collect flowers and fossils, start fires, or enter the protected areas with their vehicles. This was also because of insufficient designation of protected areas and lack of staff, as well as technical equipment of professional forest guards.

The lack of basic tourist infrastructure, educational and information elements in protected areas, as well as accompanying ecological educational activities, also seemed to be the problem.

Another reason for this undesirable situation is insufficient communication between nature protection organisations, professional institutions, local authorities, land owners and users. The lack of awareness of the NATURA 2000 sites in these stakeholders, as well as the lay public, is thus a threat to several rare habitats and species of Community importance.

Dried up river branches are proof of a disturbed water regime

Illegal entry of vehicles to the most valuable sites

RESTORATION OF NATIVE WOODY PLANT COMPOSITION AND THE ENHANCEMENT OF BIODIVERSITY IN FOREST HABITATS

Black woodpecker

RIPARIAN FORESTS

The countryside around large rivers, such as the Danube or the Morava, once created an impassable tangle of riparian forest full of life, intertwined with numerous river arms. However, with the arrival of humans, its character began to gradually change. Forests around human settlements began to be cut down and were gradually converted to fields. Later, humans began economic activities in the forests as well.

The quality of floodplain country is largely influenced by the water regime, being a living ecosystem characterized by constant changes and dynamics determined by the water course. Modifications of the basin of the Danube and the Morava, elimination of natural floods, and cutting off of river arms caused the change in natural dynamics of processes in the riparian forest ecosystem, which resulted in changes in riparian forest vegetation.

In addition, humans negatively affect these forests by planting non-native monocultures of hybrid Euro-American Canadian poplars (*Populus x canadensis*). These artificially planted plantations, typically consisting of one woody plant species of the same age, do not give room to typical inhabitants of a riparian forest. An impassable tangle of riparian forest made up of woody plants of various species and age, with frequent occurrence of old, massive trees with rich undergrowth of scrubs and herbs, is largely found only in more strictly protected parts of the area. Intensive forest management significantly reduces the biological value of sites of Community importance, so-called hard and soft riparian forest.

Seedlings prepared for planting

Stag beetle

CARPATHIAN FORESTS

Carpathian forests growing on the slopes of Little Carpathians are a sought-after location for many inhabitants and visitors of the Bratislava region. Increasing pressure from the inhabitants and visitors to these forests, demanding their protection and that their recreational function is put before the economic, are arousing a constant debate between the competent institutions. Intensive management in the form of large-scale interventions, forest homogenisation, felling of old trees, and the absence of dead wood deprive these habitats of many rare animal species.

INVASIVE PLANTS

Intensive forest management is also related to the spread of non-native plants. Open areas are gradually colonized by plants that are not indigenous, are very competitive, and spread over the new locations at the expense of native species very quickly. These include invasive herbs, for example Canada

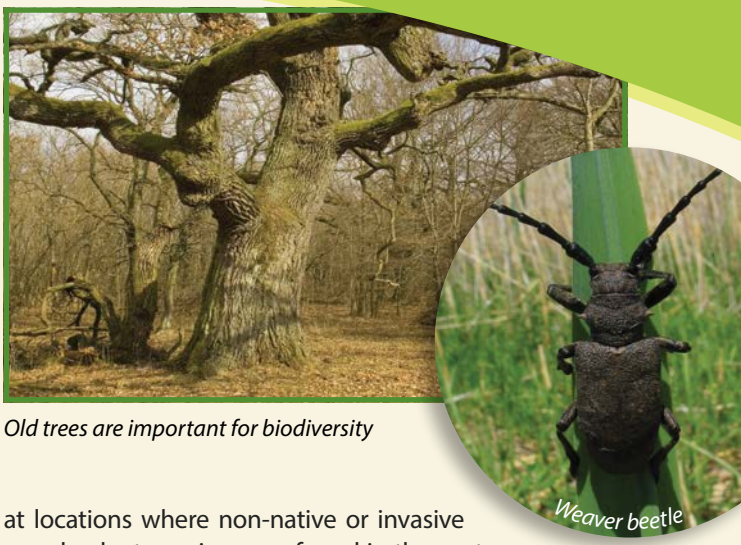
goldenrod (*Solidago canadensis*), giant goldenrod (*Solidago gigantea*), New York aster (*Aster novi-belgii*), Policeman's Helmet (*Impatiens glandulifera*), Japanese knotweed (*Fallopia japonica*) and woody plants such as tree of heaven (*Ailanthus altissima*), ash-leaved maple (*Acer negundo*), or red ash (*Fraxinus pennsylvanica*).

PREPARATION PHASE

During the preparation phase, we evaluated the state of forest habitats at selected project sites of Community importance and identified potential areas, methods, and principles for three basic measures in relation to the activity of restoration of natural woody plant composition in forest habitats: planting of native woody plant species, elimination of invasive woody plants, and protection of valuable tree individuals. An essential prerequisite for the implementation of these measures was intensive communication with all stakeholders, i.e. owners and users, governmental authorities, professional organisations, and the lay public. Numerous negotiations, workshops, presentations for owners and users (including an excursion abroad) were carried out to demonstrate the forms of management and use of forest habitats that do not conflict with the requirements of nature protection. The intensive preparation phase also resulted in a long-term lease of forest land, which significantly facilitated the implementation of intended measures. The participation on the preparation and adoption of the forest care programme (a basic document governing the management of forest habitats for the period of ten years) was also of key importance.

PLANTING OF NATIVE WOODY PLANT SPECIES

The objective of the project was to plant 45 000 of native woody plant seedlings. Planting of native woody plants took place in two stages and the original objective was exceeded by reaching the overall number of 61 000 seedlings of species typical of a riparian forest. From 2012 to 2014, 36 000 seedlings of native woody plant species were planted. From 2015 to 2016, a further 25 000 seedlings were planted. These were bought from certified forest nurseries and represented by species such as silver poplar (*Populus alba*), black poplar (*Populus nigra*), grey poplar (*Populus x canescens*), common oak (*Quercus robur*), common ash (*Fraxinus excelsior*), small-leaved lime (*Tilia cordata*), common alder (*Alnus glutinosa*), and some willow species (*Salix spp.*). Planting took place either generally



Old trees are important for biodiversity

at locations where non-native or invasive woody plant species were found in the past, or locally into the existing stands to promote the native species diversity of a forest.

ELIMINATION OF INVASIVE WOODY PLANTS

An important role for the protection of the natural species composition in riparian forests is also played by the elimination of invasive woody plants. The elimination of woody plants was carried out by an external supplier, as well as by project staff using the project machinery. Invasive plants were eliminated on a total area of 453 ha in the sites of Community importance Dunajské luhy, Bratislavské luhy, Ostrovné lúčky, and Horný les. In particular, tree of heaven, ash-leaved maple, and red ash were removed. Injecting a small amount of herbicide into individual trees or felling proved to be the most effective methods of elimination.

PROTECTION OF VALUABLE INDIVIDUALS

Old, often robust tree individuals were a natural part of riparian as well as Carpathian forests in the past. However, they are disappearing from stands as a result of intensive forest management and planting of monocultures of non-native woody plants, despite their key importance for biodiversity conservation. Dead wood also has an irreplaceable function, providing home to a variety of animals and representing a breeding ground for various, often rare, mushroom species that decompose it over time and thus return nutrients back to the ecosystem. By means of frequent personal communication with foresters as well as thanks to a long-term lease of a part of forest land, we succeeded in identifying 9 000 such individuals and saved them from felling.

Elimination of invasive plants

Elimination of tree of heaven

RESTORATION OF FOREST STEPPE COMMUNITIES

FOREST STEPPE COMMUNITIES

A natural part of riparian forests are also, paradoxically, extremely dry sites. They are created in places where the river dynamics deposited gravel and sand sediments through which water cannot rise high enough for a forest to grow. These conditions gave birth to unique steppe and forest steppe communities (so-called *Asparago-Crataegetum danubiale*) with a wide variety of animals and plants. Such locations were traditionally used by humans, especially as pastures for livestock or for the preparation of hay. A large part of forest steppes disappeared as a result of gravel mining. Their place was taken by popular bodies of water such as Veľký and Malý Draždiak in Petržalka, Rusovecké, and Čunovské jazero.

The preserved remains of forest steppes are among the most endangered habitats that overgrew with shrub plants, began to be colonized by invasive plants and were, in some instances, ploughed up or intentionally afforested by non-native woody plants such as black pine (*Pinus nigra*) and black locust (*Robinia pseudoacatia*) as a result of the abandonment of grazing.

Given the limitations related to the requirements of nature protection and the often small size and remoteness of these areas, conventional livestock breeders have little interest in them, which is a difficult challenge for the efforts to restore management in them.

Forest steppe habitat degraded by goldenrod vegetation

The same site after restoration of grazing

RESTORATION OF FOREST STEPPE COMMUNITIES

A prerequisite for the restoration work was thorough mapping of these communities, identification of undesirable factors, and a subsequent proposal of measures aimed at their restoration and maintenance. A fundamental measure to be implemented in nearly all sites was the elimination of invasive plants that were, in some instance, the most represented species. Of woody plants, the biggest threat was the tree of heaven (*Ailanthus altissima*) which grows very aggressively in these open sites. Invasive plants included in particular goldenrods (*Solidago spp.*), asters (*Aster spp.*), common ragweed (*Ambrosia artemisiifolia*), and common milkweed (*Asclepias syriaca*). The choice of suitable intervention as well as its timing was very important in the process of elimination of invasive and non-native plants. Elimination was carried out primarily by mulching, injecting herbicides, selective felling or, in the case of milkweed, by local spraying on leaves.

In the case of some invasive plant species, such as goldenrods or asters, repeated intervention and, in particular, the introduction of suitable follow-up care, proved to be necessary. Linking the activity to the restoration of traditional grazing, which is very effective in the process of restoration and maintenance of these sites, seemed to be of key importance. Other implemented measures included in particular the elimination of shrub plants by mulching and milling and felling of artificially planted black pines (*Pinus nigra*).

Restoration measures were implemented at the sites of Community importance Dunajské luhy, Biskupické luhy, Ostrovné lúčky, and Šúr, totalling 118 ha.

Restoration of forest steppes in Pečniansky les forest

Autumn lady's-tresses

Removal of non-native pines

Old World swallowtail

Opening up of overgrown areas

Elimination of tree of heaven

RESTORATION OF TRADITIONAL MANAGEMENT OF NATIVE MEADOW HABITATS

Spotted fritillary

Meadow ecosystems were much more widespread in the past. In particular in river-basins in the lowland areas, meadows were intensively converted to arable land, thus impoverishing the landscape consisting nowadays mainly of vast fields and human settlements. Meadows in the inundation areas were often afforested by planting of non-native quick-growing poplar monocultures. Wetland meadows in the alluvium of the Morava were protected in a specific way in the second half of the 20th century – along the Iron Curtain, a means of strict protection of the state border with Austria, on the divide between the socialist and capitalist worlds. Common people were not allowed to enter this zone which, paradoxically, conserved the valuable ecosystems of lowland meadows and forests. Nowadays, meadows have to face insufficient or unsuitable management, which is connected with their gradual overgrowth with shrubs and invasive plants. A similar scenario was repeated with meadow communities on the slopes of Devínska Kobyla, which belong to the sites with the highest biodiversity in Slovakia. This is determined by varied geological subsoil, their localisation on the border between the Pannonian and Carpathian floristic area, as well as the history of their use by humans. Traditional grazing was abandoned at the beginning of the second half of the 20th century, as a result of which these areas gradually became overgrown with shrubs and invasive plants.

Volunteers have also helped with restoration of meadows

Removal of shrubs on Devínska Kobyla

Mantid fly

RESTORATION OF ALLUVIAL MEADOWS ON THE MORAVA

Restoration of alluvial meadows was carried out in the sites of Community importance Devínske alúvium Moravy, Devínske jazero, and Abrod. The activity aimed to restore meadows that were left unmanaged over prolonged periods of time and bring them back to a state enabling their subsequent regular management, mainly by mowing. Restoration work was launched at the end of 2015 and consisted of removal of overgrowth of shrubs, mulching and mowing on the sites, as well as reconstruction of the access road, which was necessary for ensuring subsequent regular management of these areas by local farmers. The total area of restored alluvial meadows was 75 ha.

RESTORATION OF XEROPHILOUS GRASS AND HERBACEOUS STANDS

This activity was carried out within Devínska Kobyla massif. Since this is a very valuable area, located within Bratislava, a great deal of attention was paid to the preparation phase of the activity. A restoration study identified the state of area's overgrowth with shrubs and invasive plants and defined the scope and intensity of a restoration intervention. The activity was intensively discussed with land owners, professionals, local authorities, and the public, and necessary permissions and exemptions were obtained.

Restoration work began in 2015. It included elimination of shrubs, injecting the invasive woody plants – black locust (*Robinia pseudoacatia*), tree of heaven (*Ailanthus altissima*), and manna ash (*Fraxinus ornus*) – and local mowing on a total area of 82 ha. Linking the activity to the restoration of traditional grazing, which will ensure that the site will be permanently used and thus prevented from repeated overgrowth, turned out to be of key importance from the perspective of follow-up care for the restored areas.

Locusts on Devínska Kobyla after injection of herbicide

Mowing of valuable meadow habitat on Devínska Kobyla

Wetland meadows on the alluvium of the Morava

Restoration of overgrown meadows in Záhorie

RESTORATION OF TRADITIONAL LIVESTOCK GRAZING

Hoopoe

In the past, grazing was the most common method of grassland management. Extended pastures with numerous livestock were found on the outskirts of towns and villages. By grazing, the animals maintained the meadow character of these areas. All of today's most valuable project sites with a meadow character were, likewise, used as pastures in the past. Historical names of locations in forests near Podunajské Biskupice, robust, centuries-old, spreading oaks in Panónsky háj in Jurský Šúr, or historical pictures from Devínska Kobyla are testimonies to this.

Most of these sites were abandoned at the beginning of the second half of the 20th century. Grazing formed them, maintained the forest-free area, and helped create conditions for an exceptionally rich biodiversity. Sadly, all these sites have suffered the same fate of becoming overgrown with spreading invasive plants over time.

PREPARATION PHASE

Since there has been no grazing on most of the sites for at least 60 years, restoring it was technically and administratively very demanding. The choice of an area for the installation of grazing infrastructure with regard to regulations and requirements of nature protection as

Goats are very effective at eliminating shrubs

Original project solutions - crossing with a tourist path

Burnt orchid

Green-winged orchid

Bee orchid

well as technical provisions for grazing (water, electricity, access road, etc.), was of key importance. Many of these sites are part of protected areas with a higher level of protection and so it was essential to obtain necessary permissions and exemptions from Act No. 543/2002 Coll. on Nature and Landscape Protection. In the case of sites that are, despite their meadow character, registered as forest land, it was necessary to obtain an exemption from the Act on forests, as they fall under the prohibition of grazing on forest land.

Communication with hunting associations using these areas as hunting grounds was also important. Intensive communication and media coverage of the importance and objectives of grazing in protected areas contributed to easier implementation of the activity. High visitor numbers in these sites brings other specific challenges and pressure on the way grazing is carried out (dog walking, crossing by tourist paths, etc.), but it also made it possible to significantly promote the objectives of this activity as well as the project itself in general.

Goat herd on the slopes of Devínska Kobyla

Southern festoon

Elimination of shrubs through grazing is the most intensive during winter

RESTORATION OF TRADITIONAL GRAZING

Thanks to the project, grazing infrastructure could be installed and herds of sheep, goats and cows supplied, which were necessary initial investments to successfully restore grazing and then carry on with it effectively during and after the end of the project. In sites heavily overgrown with shrub plants, where a large-scale restoration was carried out (e.g. Devínska Kobyla), the goat herd has proved to be effective in suppressing these woody plants. Once the woody plants are eliminated, goats begin to graze on grass and herbaceous vegetation. The sheep herd was used for restoring forest steppe communities (so-called *Asparago-Crataegetum danubiale*) in Biskupické luhy. Sheep have proved as extremely effective in suppressing the invasive goldenrod (*Solidago spp.*). In sites where this invasive plant grows almost as a monoculture, often exceeding the height of 150 cm, its complete suppression can be observed after only two grazing seasons.

The island of Dolný ostrov near Bodíky in Dunajské luhy, as well as meadow and forest steppe habitats in Jurský Šúr, were characterised by cattle grazing. Former pastures have since become overgrown with dense vegetation of shrubs and invasive plants. Witnesses of grazing are robust willow, poplar or oak individuals, the spreading crowns of which are evidence for the fact that they grew solitarily on open pastures in the past. Even here, grazing animals have managed to effectively convert this overgrown dense vegetation to low stands, while eliminating invasive plants by treading on or eating them. Restoration of pastures with solitary tree individuals resulted in the creation of a valuable habitat suitable for numerous rare insect and bird species.

Of key importance on all sites is cooperation with local breeders and land users, as well as inhabitants. The sites are regularly monitored and a grazing regime and schedule for the upcoming periods are designed in cooperation with the State Nature Conservancy of the Slovak Republic.

Overall, as part of the project grazing was restored at five locations in the sites of Community importance Devínska Kobyla, Šúr, Biskupické luhy, and Dunajské luhy, totalling an area of 150 ha.

Grazing in Kopáčsky ostrov Nature Reserve

A herd in Pánsky Diel Nature Monument

THE IMPORTANCE OF GRAZING FOR HABITAT RESTORATION

- suppression of overgrowth of shrub plants in the area,
- restoration of the area through dispersing plant seeds on animal bodies and their faeces,
- promotion of specific animal species linked to the presence of certain animals – various insect species are linked to faeces and also birds that feed on them,
- effective suppression of invasive and allergenic plants such as goldenrod (*Solidago spp.*) and common ragweed (*Ambrosia artemisiifolia*),
- disturbance of soil surface by hooves, thus creating conditions for reproduction of valuable plant species and optimum conditions for various life forms of insects,
- in comparison to one-off mowing of areas, grazing creates a mosaic of more intensively and extensively grazed areas, which is significant in terms of the promotion of biodiversity,
- animal grazing is a way to maintain sites that are not accessible to other types of maintenance (steep, inaccessible slopes).

Restoration of habitats near Bodíky in Dunajské luhy

Cattle are very effective at eliminating invasive plants

Earth-boring dung beetle

Restoration of traditional grazing in Šúr National Nature Reserve


Wels catfish

RESTORATION OF SELECTED WATER AND WETLAND HABITATS

Common kingfisher

After entering Slovakia through the so-called Devín Gate, the Danube flows into the Danubian Lowland, where it changes its character and begins to deposit large amounts of sediments. As a result of this, several tens to hundreds of metres thick layers of gravel and sand were created in the past, which were tirelessly pushed through by the Danube and its numerous ever-changing river branches, thus creating a unique river system, the so-called inland delta.

Sadly, human activities in the past aimed at cutting off river branches from the Danube's main channel also affected the ones in Bratislava. Due to the regulation of the Danube for the needs of navigation, river branches were dammed with stone barriers, through which water flowed into a river branch only at the time of high overflows. At higher water levels, water brought large amounts of sediments, which stayed in the river branch after the decline in the water level, resulting in their gradual clogging. At lower water levels, conversely, the river branch dried up regularly, thus becoming a trap for fish that had no way of escaping the river branch. By this, the river branches stopped fulfilling their irreplaceable function for numerous fish species that used them for reproduction, birds that came hunting here, as well as for the ecosystem of a riparian forest itself. A riparian landscape cannot exist without river dynamics; the strength of water is a crucial factor that constantly shapes it.

COOPERATION

The project set itself the objective of restoring flow in the two best-known Danube river branches around Bratislava – Devínske and Karloveské rameno. For this purpose, cooperation with professionals from the Water Research Institute was established; they thoroughly analysed the original state, identified obstacles in the river branches, and modelled possible restoration solutions. The Slovak

Bank reinforcement separating Devínske rameno from the Danube before restoration

Devínske rameno reunited with the Danube

Before restoration, Karloveské rameno used to dry up during the year

Gravel bars started to form thanks to restored river dynamics

Water Management Enterprise, state enterprise, which manages these water courses, also participated in this cooperation by creating a technical documentation for the work on river branches. Both flow around the islands with important water resources for Bratislava and its wide surroundings that have also been negatively affected by disturbed water dynamics in the river branches. Sediment that gradually made its way to the river branches and was deposited there also brought a large amount of unwanted substances that could gradually deteriorate the quality of the water resource. Therefore, the Bratislava Water Company, a joint-stock company, also decided to participate in the restoration process and took care of some parts of the work necessary for the overall restoration of the river branches.

IMPLEMENTATION

A multi-year preparation phase resulted in the beginning of the restoration in 2015, when work on Devínske rameno river branch was initiated. Inflow and outflow parts were restored. Stone reinforcement at the inflow and at the outflow was removed on a width of 28 metres, which allowed water to flow freely into the river branch again. Other parts were cleaned from sediment deposits that accumulated here over the years. An essential activity, covered by the Bratislava Water Company, was the replacement of the old ford, representing an obstacle for the water flow in the river branch, with a new bridge to the island.

The company also took part in the work on the Karloveské rameno river branch. In 2015, it carried out the work related to the widening of the inflow part and its subsequent cleaning in the part leading up to the old bridge. Further restoration under the project took place at the beginning of 2016 by removing all artificial obstacles from the river bed, especially barriers of rubble that was heaped up in the river-basin in the past, sediments accumulating in the river branch, as well as litter.

Restoration helped start up natural river dynamics processes; vertical banks as well as gravel bars reappeared on the river branches, which are significant characteristics of a healthy riparian landscape and important habitats for a number of animal species. The flow restoration brought back living space for many water animals and fish that will be able to swim freely in and out of the river branches and that will find a suitable place for reproduction here. Restoration will also contribute to the improvement of water quality, its better infiltration into the subsoil, and to an increase in the well yield in local drinking water resources on the islands.

Restoration of the Danube's river branches represented the largest nature protection activity of its kind in Bratislava, which attracted an enormous attention of media and citizens, but also professionals. The measures were also supported by water sportsmen, who have traditionally used these river branches, as well as local representatives and inhabitants of relevant city boroughs.

Media briefing with the Minister of Environment

New bridge over Devínske rameno

Restoration of the outflow part of Devínske rameno


European fire-bellied toad

Supply canal for supplying water into wetlands

RESTORATION OF WETLANDS

Wetlands, which are an important habitat for several amphibian species, were also a part of the extensive system of river branches and riparian forests within the so-called Danube inland delta. The number of these wetlands was dramatically reduced as a result of water management measures, as the amount of water flowing through the old basin of the Danube under the Čunovo weir had decreased and natural floods were restricted due to the construction of the Gabčíkovo Waterworks. The lack of water has negatively affected not only animals directly linked to water, but also natural stands of the riparian forest found here. Sites suitable for the re-irrigation were selected within the area. Technically simple measures based on field measurements were proposed, identifying the depressions located lower than the usual water level in the surrounding system of river branches. Reconnecting the areas by means of four water supply canals ensured a supply of water, which resulted in the creation of 2.7 ha of wetlands suitable for amphibians.

RESTORATION OF THE POREC BROOK IN ZÁHORIE

In the 1950s and 1960s, the area of Záhorie was negatively affected by intensive melioration projects aimed at the drainage of the area that had a significant impact on wetland habitats in particular. These measures also negatively affected the Porec brook by artificially straightening it and by reinforcing its banks, which significantly changed its natural character for a long period of time. As a result of these regulations, the surrounding areas suffered from drainage, which had a negative impact on the wetland site, Abrod, through which the Porec brook flows. In cooperation with water managers, a new route was set out for restoration of the brook, with an overall length of about 500 m. The restoration measures aimed to bring the basin of the Porec brook back to its natural shape before the regulation. The restored basin has a natural meandering character and natural banks without artificial reinforcement. The restoration will ensure sufficient water flow and allow for the creation of natural water and wetland habitats that are of key importance for the restoration of the original biodiversity of the brook and its close surroundings.

Porec brook before and after revitalisation

Restoration of wetlands at Dunajské luhy

PROTECTION OF ROCKY HABITATS AND CAVES

Greater mouse-eared bat

Animals are very effective at maintaining rocky habitats

Rocky and cave habitats are very specific and often inhabited by numerous rare animals and plants. Many of these habitats are endangered mainly by the overgrowth of woody plant vegetation and intensive visitor numbers. Caves that can be freely entered into are especially vulnerable to human impact. Although it is officially forbidden to enter such caves, they are visited intensively, which negatively affects the living beings dwelling there, especially bats.

Measures implemented as part of this activity consisted of the local removal of woody plants and construction of barriers and means of regulating the movement of tourists inside the caves.

In 2016, closure of the former Veľké Prepadlé adit in the site of Community importance Homoľské Karpaty was carried out. The adit itself is dug into limestone, has two entrances and an overall length of accessible passages of over 500 m. It is one of the most important wintering sites of bats in the Little Carpathians with the recorded occurrence of up to 10 species. The old and damaged wooden structure was removed from the main entrance and a new masonry wall with a strong iron entrance door was installed. A small bar was installed on the side entrance. The implemented measures will provide a free entry for bats and, at the same time, will prevent illegal entry of humans who disturbed wintering bats.

The second facility was the former Slovinec adit located under Devínska Kobyla massif, near Sandberg. This adit represented an important wintering site for bats in the past. In 2011, however, it was filled in, which prevented the entry of these rare animals. The work was carried out very quickly after good cooperation with the local authority in 2017. The entrance was cleaned of various materials (soil, rocks, concrete, litter, etc.) and a new, massive entrance of local rocks was built. This measure allows entry for bats but prevents humans from entering. Monitoring of bats in this site is done with modern ultrasound detectors so there is no need for people to enter the facility.

Modification of rock habitats overgrown with shrub and tree vegetation took place in two sites at Devínska Kobyla by short-term inclusion of these sites in the grazing regime. This concerned mainly locations that are hard to reach and also dangerous for common machinery. Based on the experiences gained, we can confirm that a goat herd is an ideal means of caring for such inaccessible habitats.

Restoration of an important habitat for bats at Devínska Kobyla

The adit was filled up, which prevented the entry of bats

New closure of Veľké Prepadlé adit

VISITOR INFRASTRUCTURE –
EDUCATIONAL ELEMENTS, OBSERVATION POINTS, INFORMATION PANELS AND EDUCATIONAL TRAILS

One of the project's objectives was also the regulation of visitor numbers by installing a wide spectrum of visitor infrastructure and the promotion of educating visitors at individual project sites.
Part of a tourist path on Devínska Kobyla was stabilised as it subjected to excessive erosion, making it dangerous for visitors. A wooden fencing was rebuilt and extended at Sandberg, a site of palaeontological significance. Two tourist shelters and five benches for visitors were installed in the area, as well as several large and small information panels. Very attractive educational elements were also installed, such as a palaeontological sandbox, an insect house, as well as wooden models of violet oil beetle, butterflies, and grazing sheep.

Overall, 30 large and 20 small information panels were installed in the project sites, informing about the individual sites as well as the project activities.
Wildlife observation points are among the very attractive elements of such tourist infrastructure. Six non-traditional objects were installed in the project site in Hungary, allowing visitors to observe the wildlife of the Danubian floodplains from unconventional perspectives: from the tops of the trees, under water, from an underground hideaway, or from a solar-powered ship. In Slovakia, an observation tower was installed on Hrušovská zdrž reservoir, from where tens of thousands of water birds can be observed overwintering on this large body of water.

Installed infrastructure serves to promote project activities and objectives

Several information panels were located at Devínska Kobyla

Oversized wooden model of violet oil beetle

Tourist shelter at Devínska Kobyla

Observation tower at Hrušovská zdrž reservoir

Tourist path repair on Devínska Kobyla

A solar-powered ship enables one to quietly observe the nature in Dunajské luhy

Restoration of fencing at Sandberg site at Devínska Kobyla

Non-traditional observation point in the tree tops at Szigetköz

Observation point enabling one to observe underwater life at Szigetköz

EXCURSIONS, ECOLOGICAL EDUCATION, AND EXCHANGE OF EXPERIENCE

Over 160 events and activities aimed at broad lay and professional public were also a part of the project. A large number of excursions and presentations were held during the project, within which we talked about the individual project sites, the implemented protection measures, and the necessity of protecting these valuable sites.

Building a systematic relationship towards natural values from an early age is of enormous importance. One of the central educational activities of the project was the development of a complex ecological educational programme, its incorporation in the learning plans, as well as teaching in schools. Complex teaching programmes about the following protected sites in Bratislava and its surroundings were developed: Bratislavské luhy, Šúr, Devínska Kobyla, Devínske jazero, and Vydrica. These programmes were taught in primary and pre-primary schools, especially in the Bratislava region. This complex teaching programme was complemented by various teaching tools, such as workbooks, colouring books, memory games, and various identification sheets. When ensuring the implementation of this teaching programme, it was necessary to promote continuing training of teachers, which took place in seminars for teachers.

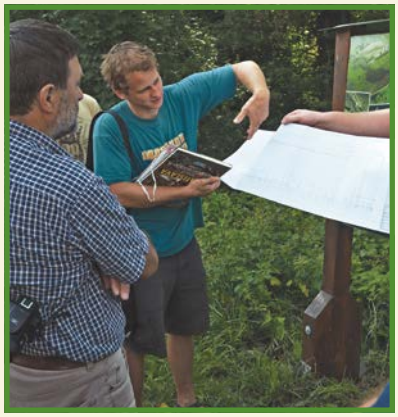
The project was presented at nine national and international conferences. Numerous contacts were established with organisations abroad to exchange experience from the implementation of nature protection measures. Measures implemented as part of the project were often unparalleled and required unconventional approaches, as well as a high level of communication between land owners and users, governmental authorities, professionals, and the public.

In order to improve communication and raise awareness between these stakeholders, eleven workshops and three two-day excursions abroad were organised.

Outdoor environmental education

Teaching in schools

Excursion for children in Biskupické luhy



Presentation for the professional public

Two-day excursion to Donau-Auen National Park

Presentation of project achievements to representatives of Austrian national parks

Information stand for the public

Presentation as part of World Fish Migration Day

Excursion to Devínska Kobyla

Exchange of experience with Austrian water managers

PROMOTION OF NATURE PROTECTION

Numerous project outputs were aimed at the promotion, awareness, and presentation of natural values of the project sites and project activities. Information on the project sites, project partners and running results of the project were made public on the project's website: http://www.broz.sk/natura2000ba.

Numerous publications and materials promoting the project were produced, such as leaflets, brochures, calendars, t-shirts, fridge magnets, and textile bags. These materials have been and are used in activities aimed at the public as well as in communication with stakeholders.

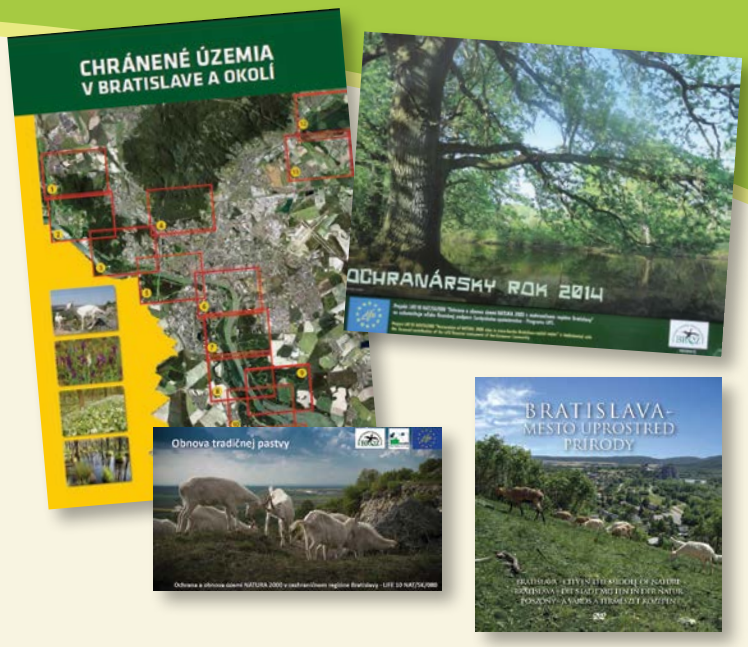
A professional documentary called Bratislava – mesto uprostred prírody (Bratislava – a city in the middle of nature) was produced in cooperation with the Radio and Television of Slovakia to promote the project. The documentary offers a unique insight into the inconspicuous lives and habitats of rare animals and species. It captures their fragile stories, taking place simultaneously with tireless human activities in the rush of an expanding capital. The film was presented at several film festivals and produced on DVD in German, English, and Hungarian language versions.

Besides the film, short videos about our activities were produced capturing the water restoration on the Danube, protection of riparian forests, as well as the restoration of traditional grazing.

Initiation of grazing on Devínska Kobyla

Press conference after restoration of flow in Devínske rameno river branch

The European Commissioner appreciated the project achievements



With regard to the fact that many project activities were implemented in Bratislava and its close surroundings, there has been very intense attention from the media. The project and its main activities were presented in a large number of radio and TV appearances, press releases, and conferences, as well as in numerous printed and online articles. The importance of project activities was also emphasized by repeated presence of the Minister of the Environment of the Slovak Republic at media briefings on the project.

A notable event was also the visit of the European Commissioner for the Environment, Maritime Affairs and Fisheries, Karmenu Vella; the achievements of the project related to restoration work on Devínska Kobyla and restoration of Danube river arms in Bratislavské luhy were presented him in person.

The project attracted a lot of attention from the media

MONITORING


Sooty copper

Project activities also involved monitoring of selected animal and plant species. The results obtained helped us to record changes in habitats where nature protection measures were implemented. Among the monitored animal groups were the dragonflies, butterflies, beetles, fish, and amphibians. Vegetation was monitored at a total of 18 permanent monitoring areas on meadow and forest steppe habitats. Monitoring recorded the state of habitats before, during, and after the protection measures had been implemented. The data obtained helped us to adjust individual methods and the intensity of measures being implemented effectively throughout the project duration. Moreover, the results will also be of help in planning follow-up activities in the sites in question and, at the same time, represent valuable data for the implementation of such measures in other similar sites.

The total of 40 fish species were recorded in the Devínske and Karloveské rameno river branches. They also included species of Community importance such as asp, spined loach, white-finned gudgeon, schraetzer, European bitterling, pigo, golden spined loach, and streber. An interesting discovery was the occurrence of European bullhead, whose population in the Danube has decreased after the arrival of invasive gobies and whose current data reveal only sporadic occurrence. After the restoration of river branches, an increase in the abundance of species living in flowing waters was recorded. Moreover, restored river branches represent an important spawning site for fish,


Earth-boring dung beetle


Stag beetle


Monitoring of butterflies in Biskupické luhy

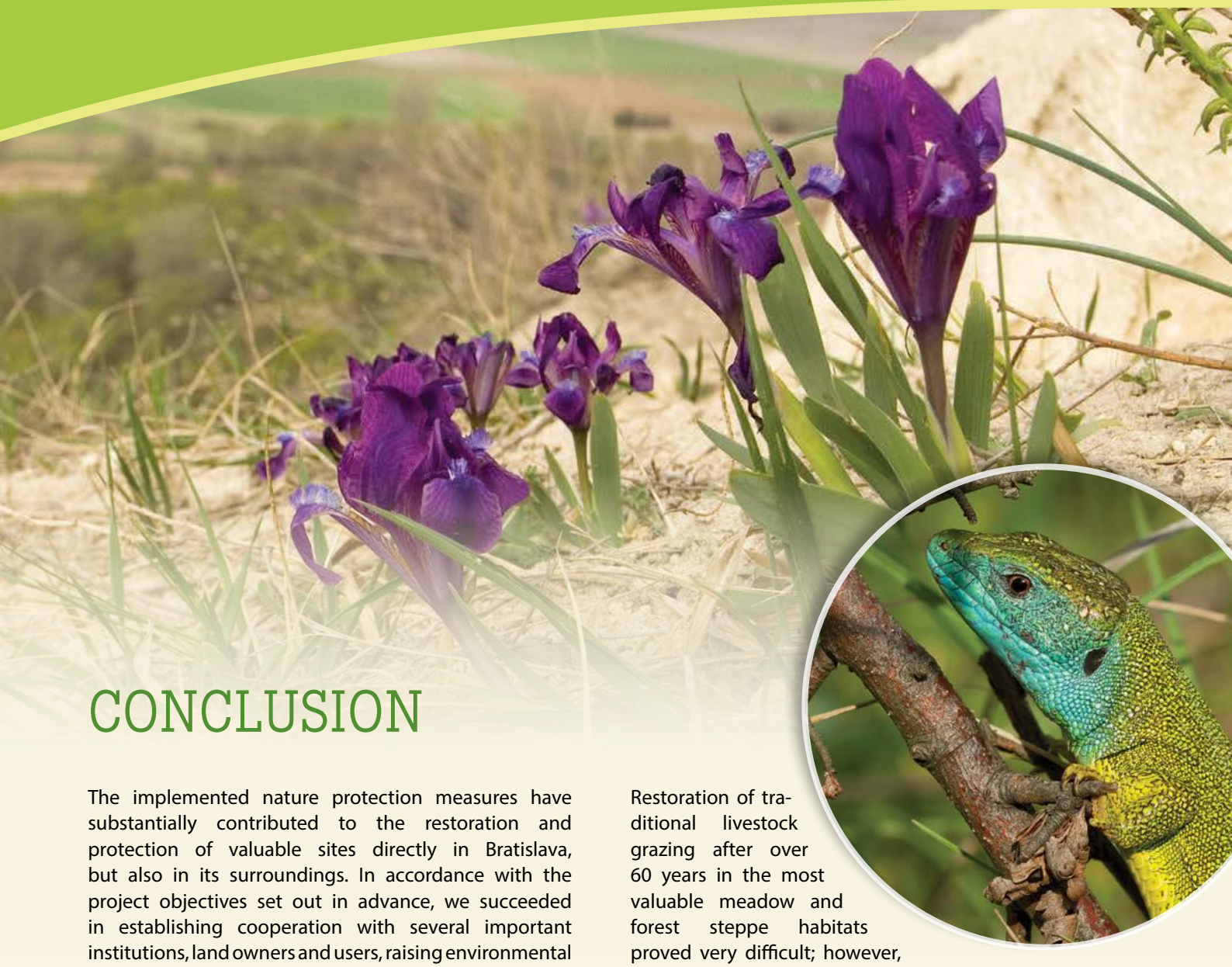
The number of butterfly species has significantly increased on Devínska Kobyla at the site called Waitov lom

Fish sample during monitoring of Danube river branches

as demonstrated by numerous juvenile fish recorded during the research.

Monitoring of butterflies on Devínska Kobyla found 63 species. Among these, it is necessary to mention the occurrence of species of Community importance such as eastern eggar, Jersey tiger, and large copper. Implementation of protection measures, in particular the removal of shrub plants and subsequent opening up of these areas, had a positive impact on the spread of butterfly species from the surroundings into these sites. Before the intervention, the sites were densely overgrown with shrub vegetation not suitable for many butterfly species. A significant increase in species abundance was found in some monitored areas – up to 25 species were recorded after the removal of shrub plants in sites with nearly no previous records of daytime butterfly species. These measures, as well as follow-up management of these areas by grazing, resulted in opening up of these sites and subsequent growth of typical plant species. The importance of grazing for the suppression of invasive plants was very clear, especially in the forest steppe habitats in Biskupické and Dunajské luhy. In the areas with nearly monocultural representation of invasive plants, its complete suppression could be observed after only two grazing seasons, which is an essential prerequisite for gradual restoration of natural biodiversity of these valuable habitats.

Common chub caught during monitoring of Karloveské rameno river branch



CONCLUSION

The implemented nature protection measures have substantially contributed to the restoration and protection of valuable sites directly in Bratislava, but also in its surroundings. In accordance with the project objectives set out in advance, we succeeded in establishing cooperation with several important institutions, land owners and users, raising environmental awareness and the interest of the public in valuable natural sites and, in particular, restoring the valuable original character of many sites.

Initially seemingly ambitious project objectives could be substantially exceeded in some instances. Despite the fact that the implementation of protection measures directly in a densely populated capital had its specificities and had to face numerous obstacles, the project managed to turn this to its advantage as, thanks to this, the importance of project activities as well as the needs of nature protection and landscape in general could be heavily promoted. Considerably exceeded project plans in relation to media coverage and promotion are evidence of special attention from the media and the public.

Several implemented activities, for example restoration of Danube river branches, were among the largest nature protection measures of their kind in the Bratislava region. The restoration of flow in the Devínske and Karloveské rameno river branches resulted in a successful restart of natural processes of river dynamics, which represents vital energy of the ecosystem of a riparian landscape and that has been disturbed by our thoughtless actions in the past for long periods of time.

Restoration of traditional livestock grazing after over 60 years in the most valuable meadow and forest steppe habitats proved very difficult; however, the project managed to overcome this and made its way past numerous administrative and technical obstacles, which will facilitate the future implementation of similar measures on other sites. The goat herd on Devínska Kobyla or the sheep herd in Biskupické luhy have become one of the typical features of the capital.

By planting tens of thousands of native woody plant seedlings typical of a riparian forest, a precondition for the restoration of the original biodiversity at Dnajské luhy was created, which was, sadly, negatively affected by intensive forest management, especially by planting quickly growing non-native woody plant plantations. Thanks to a long-term lease of forest land, these areas can be managed in accordance with the requirements of nature protection, giving a positive example to other people in charge of forest management.

Ecological educational activities aimed at the youngest generation were also of crucial importance. A large amount of teaching materials was developed and lessons given, but in particular their sincere interest gives us some hope that they will learn from our mistakes from the past and find enough determination and energy to restore the respect for values tirelessly offered to us by nature.

NATURA 2000

Natura 2000 is name of network of nature protection areas in the territory of the European Union with the aim of protection the most valuable natural habitats, threatened species of plants and animals and biodiversity all around European Union.

The base of Natura 2000 are two EU directives:

- Council Directive 79/409/EEC – The Birds Directive – aims to protect all of the 500 wild bird species naturally occurring in the European Union.
- Council Directive 92/43/EEC – The Habitats Directive – ensures the conservation of a wide range of rare, threatened or endemic animal and plant species.

These two directives are the most complex law directives for nature conservation all around the world.

Natura 2000 is created by two types of areas:

- A special protection area (SPA) is a designation under the European Union Directive on the Conservation of Wild Birds
- A Special Area of Conservation (SAC) is designed under the in the European Union's Habitats Directive

Designation of the site into the Natura 2000 means the recognition of its natural values and expressions of interest for the European Union to maintain this area as part of the European natural heritage for future generations.

PROGRAM LIFE

LIFE is a specialized fi nancial instrument of the European Commission for the Environment and Climate, implemented since 1992. The programme aims to contribute to the implementation, updating and development of European policy and legislation in the fi eld of environmental protection, nature and climate, which fi nance projects with European added value. LIFE supports the implementation of European directives in the area of nature and water conservation. Within the EU and Slovakia as well, LIFE is an important tool for the protection of nature, halt and reverse of the loss of biodiversity and the development of Natura 2000 network.

ACKNOWLEDGEMENTS

Our thanks go especially to all our project partners whose effort and work were a contribution to successful implementation of the project. Furthermore, we would like to thank the Ministry of the Environment of the Slovak Republic for co-financing the project as well as the Slovak Water Management Enterprise, state enterprise; the Bratislava Water Company, a joint-stock company; the professionals from the Water Research Institute and other institutions, governmental bodies and local authorities. Last but not least, we thank all individual volunteers and voluntary groups, without the help of which a large number of activities could not have been successfully implemented.

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Regional Association for Nature Conservation and Sustainable Development (BROZ)
is a non-profit, non-governmental organisation established in 1997. Our activities are aimed in particular at practical nature protection and promotion of sustainable development in the southwest of Slovakia. We do our best to conserve the remains of original habitats and actively restore and regenerate damaged parts of nature.

- We promote traditional forms of landscape management such as extensive livestock grazing or pruning, and using pollarded willows that have a favourable impact on the conservation of animal and plant species richness.
- We manage land in protected areas that we purchased from private communities, towns, and municipalities.
- We cooperate with various institutions from the field of nature protection, forest, and water management, as well as Slovak and foreign universities.
- By means of environmental education we promote the importance of nature protection and develop the relationship of the public towards nature, from the youngest children to seniors. This is done through organising excursions, lectures, seminars, and preparing various publications, documentaries, and exhibitions.

In the project, we had the role of a leading partner, covering the overall management of the project and communication between project partners and with the European Commission. The project activities implemented by us mainly included the restoration of forest, forest steppe and water habitats, restoration of traditional livestock grazing, as well as numerous activities aimed at the public.

DAPHNE - Institute of Applied Ecology
Since 1993, DAPHNE has been active in the field of applied research and practical nature protection, as well as environmental education aimed in particular at pre-school and school children. As part of the project, its members developed a complex educational programme for schools, materials promoting project sites, and organised excursions for the public. The practical nature protection activities carried out by them included the restoration of meadow habitats and the Porec brook, and the monitoring of vegetation.
www.daphne.sk

Comenius University in Bratislava
Comenius University was represented in the project by the Department of Zoology of the Faculty of Natural Sciences. Its staff were responsible for the monitoring of target animal species.
www.uniba.sk

State Nature Conservancy of the Slovak Republic
The Malé Karpaty, Dunajské luhy, and Záhorie PLAs as well as the Regional Centre of Nature Conservation in Bratislava also participated in the project as part of the State Nature Conservancy of the Slovak Republic. Their main task was to regulate undesirable anthropogenic effects on habitats and valuable animal and plant species, and to develop management programmes for selected areas.
www.sopsr.sk

Pisztráng Kör (Trout Circle Association)
The Association is aimed at raising environmental awareness of the public. Their members cooperate with schools and universities, but also with forest and water managers. It is especially active around Szigetköz, managing an environmental centre in Dunasziget. Their main project activity was the construction of non-traditional observation structures and organisation of excursions for children and the public.
www.pisztrangkor.hu

Donau-Auen National Park
The National Park was established in 1996. Within the project, it provided the site for excursions for the public and training of project staff, aimed in particular at managing the visitor numbers in protected areas.
www.donauauen.at

The Ministry of Environment of the Slovak Republic
The Ministry of Environment of the Slovak Republic is the central governmental body responsible for environmental affairs. It co-financed the implementation of numerous project activities.
www.minzp.sk