

THE HIDDEN TREASURE OF THE GREAT HUNGARIAN PLAIN

LIFE-NATURE PROJECT FOR WILDLIFE
PROTECTION IN THE TURJÁNVIDÉK

2011-2018



NATURE CONSERVATION AND NATIONAL DEFENCE IN THE TURJÁNVIDÉK

Where does the name ‘Turjánvidék’ come from? The local name of the spongy, marshy wetland typical of this region is the ‘turján’ and ‘vidék’ – well, it just means ‘land’ or ‘region’ in Hungarian.

BASIC DATA OF THE TURJÁNVIDÉK LIFE PROJECT

Website:
www.turjanvidek.hu

Full title of the project:
CONSERVATION OF PRIORITY NATURAL VALUES IN TURJÁNVIDÉK NATURA 2000 SITE SOUTHERN UNIT
(project ID: LIFE10NAT/HU/000020)

Project site:
Turjánvidék Special Area of Conservation (HUDI20051), southern part (7,300hectares)

Project duration:
1 September 2011 – 30 September 2018

Beneficiaries:
Duna-Ipoly National Park Directorate, Defence Economic Bureau of the Ministry of Defence, Budapest Forestry Company, WWF Hungary

Co-financed by
the Ministry of Agriculture

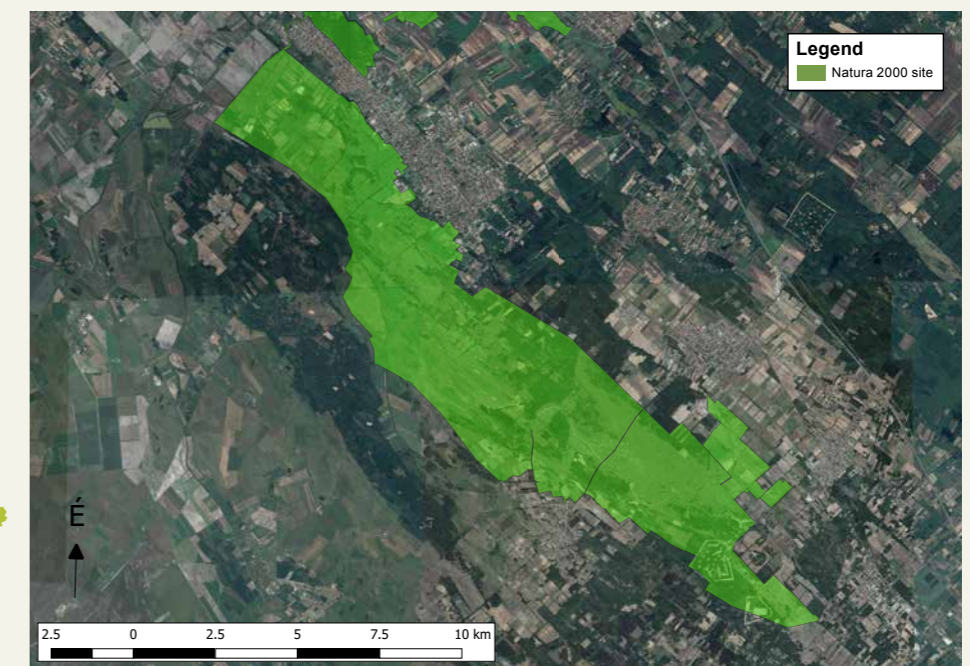
Full budget:
EUR 2,730,102
(of which EU support: 75%, EUR 2,047,577)

This few kilometres wide geographical region stretches for some 80 kilometres along the boundary of the Danubian Plain and the Sand Ridge of the Danube-Tisza Interfluvium. One of the peculiarities of this part of the Great Hungarian Plain is that here a tract of 7,000 hectares has somehow avoided the land conversion – typically from wetland to ploughfield – that otherwise heavily impacted the rest of the lowlands. Thus, it still shelters the remnants of the has-been natural diversity.

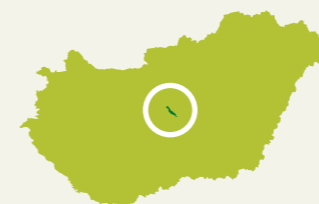
Nowadays, most of this area, rich in natural values, is part of the Natura 2000 network. The network consists of sites protecting valuable, threatened or rare habitat types and species characteristic of the natural environment of Europe. Due to the fact that the Turjánvidék is also a Natura 2000 site, the LIFE funds of the European Union financed a comprehensive conservation project here in order to protect Hungary's largest contiguous system of wetlands and sandy habitats, and avert the threats that could have destroyed the natural values.

The project site consists of two parts. One of them is the Dabas Turjános Nature Conservation Area, which was established more than 50 years ago, in 1966 as a protected area of national importance. The other part is the Táborfalva Military Shooting Range and Training Area, one of the largest military shooting ranges in Hungary which is still active. On this site, nature conservation and national defence goals must be met at the same time demanding a unique cooperation between the two sectors.

This booklet presents the results, the activities of this nature conservation project and the work that has been carried out by the consortium partners until the project completion in 2018 in order to preserve the natural values within the northern part of the Turjánvidék region.



Southern part of the Turjánvidék Natura 2000 site | Edited by György Verő | Map: Google Maps



IMPRINT

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On the cover: Montagu's harrier | Photo: Péter Hencz
On the back cover: Black woodpecker | Photo: Péter Csonka



www.turjanvidek.hu

European bee-eater | Photo: Péter Csonka

NATURAL VALUES TO BE PRESERVED WITHIN THE TURJÁNVIDÉK



THE HUNGARIAN MEADOW VIPER

It is strictly protected in Hungary and its conservation worth in monetary value is 1 million HUF per individual. Fully grown animals are rarely longer than half a metre. Adult vipers feed on lizards, chicks of ground-nesting birds and vole pups, while young snakes feast on locusts, grasshoppers, crickets and other arthropods. It hunts within the low-lying, moist patches but overwinters within higher and drier dune tops where burrows of rodents shelter it from the harsh winter temperatures. The Hungarian meadow viper is a venomous snake, but it is not very prone to bite people. The venom is not dangerous; it causes symptoms similar to the sting of a bee. It is an overly cautious animal; there is little chance of bumping into it in the wild.

The project site, which is the southern part of the Turjánvidék Natura 2000 site, is situated to the southeast of Budapest, more or less in the centre of Hungary, stretching across the municipalities of Dabas, Örkény, Tatárszentgyörgy and Táborfalva. Most of the project area belongs to the Táborfalva Military Shooting Range and Training Area and the Dabasi Turjános Nature Conservation Area.

The northern part of the site is a low-lying wetland with hydrophilous or 'mesic' habitat types. Alder and ash forests characterize the deepest dents while the higher reliefs are covered by tall sedges, tussocks, mesic and drier fens. The southern, drier part is home to sandy

habitat types with extensive sandy steppes and the juniper-poplar thickets that are specific to this dune region. There are also some steppic oak woods that are in fact a mosaic of oak trees and dry sandy steppes. These diverse habitats are home to a huge number of precious plant and animal species. Many species only occur here, in the Carpathian Basin – these are the so-called 'endemic' species, the conservation of which is thus trusted onto us. Such a species is the Hungarian meadow viper (*Vipera ursinii rakosiensis*), a flagship species of our project.

LADYBELL, HUNGARIAN GROUND BEETLE, GREAT BUSTARD AND OTHER PECULIARITIES

As of today, we have records of more than 300 protected species of plants and animals from this area. Field research financed by means of this 7-year-long project has collected evidence on the presence of an immense number of protected species that had never even been seen here before.

What makes the otherwise diverse landscape of the Turjánvidék even more interesting is the fine-scale mosaic of the different vegetation types that can change within a couple of metres and still shelter completely different species. This contributes to the emergence of an outstanding diversity of natural riches. Half of all plant species occurring on the Danube-Tisza Interfluve can be found here, such as the ephemeral and endemic sand iris, which numbers hundreds of thousands in the region. The strictly protected sand saffron blooms late in the autumn, but its leaves and fruits only appear next spring. The giant plantain that can reach an impressive 120 cm in height has two of its scarce Hungarian populations within the shooting range. The sandy patches of the training range are crowded with rare species that can be hardly seen elsewhere such as the black pasque flower, the sea grape, the dyer's alkanet and others. The Dabas Turjános NCA is also rich in beautiful orchids and a rare ice age relict, the ladybell, a close relative of the bellflowers that has been named after the characteristic style protruding from its flower as the clapper of a bell.

The dense mosaic of habitats gives home to a number of rare arthropods. The site is also famous for the largest Hungarian population of the strictly protected Hungarian ground beetle (*Carabus hungaricus*).

The Turjánvidék also provides food and shelter for more than 180 species of birds that either stop over here on their migration or breed within the region. Such iconic birds are the Montagu's harrier, the short-toed eagle, the white-tailed eagle or the great bustard. The strictly protected great bustard (*Otis tarda*) is a heavy-bodied, globally endangered bird that has its most extensive European courtship grounds and breeding sites in Hungary. This iconic bird has even nested recently in one of the reconstructed ploughfields purchased by the national park directorate by means of the present project.

THE HUNGARIAN MEADOW VIPER

One of the most interesting inhabitants of the Turjánvidék is the Hungarian meadow viper, the only endemic vertebrate of Hungary which is also amongst the rarest reptiles of Europe. Once, its distribution area used to be much larger, but today it only occurs in isolated patches on the Danube-Tisza Interfluve, the Hanság region and in Transylvania. According to expert opinion, the global population cannot be much larger than 500 individuals. The Hungarian meadow viper inhabits meadows where dry and moist (xeric and mesic) patches alternate as this provides it with its preferred microclimatic and microrelief conditions. This is why the population thrives in the Turjánvidék.



Juniper-poplar thickets on the sandy steppes | Photo: Sándor Bérecs



The Montagu's harrier nests on the military site | Photo: Péter Csonka



Birds of prey hunt for the sand lizard | Photo: Bálint Halpern



The Hungarian meadow viper is endemic in the Carpathian Basin | Photo: Gábor Szélényi



The ornaments of the fens are the different orchids | Photo: György Verő

PROTECTION AT THE EUROPEAN LEVEL NATURA 2000

The Turjánvidék Natura 2000 site was designated as part of the network on account of several plant and animal species that are rare in Europe and it also shelters large stretches of habitats that have also become rare.

European ground squirrel | Photo: Wild Wonders of Europe / Konrad Wothe / WWF

NATURA 2000 HABITATS IN THE TURJÁNVIDÉK

- Pannonic sand steppes
- Pannonic inland sand dune thickets
- Euro-siberian steppic oak woods
- Alluvial forests of common alder and European ash
- Alluvial meadows of river valleys
- Molinia meadows
- Mesic calcareous fens and sedge meadows

PLANT SPECIES OF COMMUNITY IMPORTANCE

- Ladybell (*Adenophora liliifolia*)
- Sand saffron (*Colchicum arenarium*)
- Sand iris (*Iris humilis* ssp. *arenaria*)
- Small-flowered thistle (*Cirsium brachycephalum*)

ANIMAL SPECIES OF COMMUNITY IMPORTANCE*

- Narrow-mouthed whorl snail (*Vertigo angustior*)
- Desmoulin's whorl snail (*Vertigo moulinsiana*)
- Hungarian long-horned grasshopper (*Isophya costata*)
- Hungarian ground beetle (*Carabus hungaricus*)
- Great capricorn beetle (*Cerambyx cerdo*)
- Flat bark beetle (*Cucujus cinnaberinus*)
- Stag beetle (*Lucanus cervus*)
- *Bolbelasmus unicornis*
- *Euplagia quadripunctaria*
- False ringlet (*Coenonympha oedippus*)
- *Arytrura musculus*
- Large copper (*Lycaena dispar*)
- Scarce large blue (*Maculinea teleius*)
- European mudminnow (*Umbra krameri*)
- Weatherfish (*Misgurnus fossilis*)
- European bitterling (*Rhodeus sericeus amarus*)
- Spined loach (*Cobitis taenia*)
- Danube crested newt (*Triturus dobrogicus*)
- European fire-bellied toad (*Bombina bombina*)
- European pond turtle (*Emys orbicularis*)
- Hungarian meadow viper (*Vipera ursinii rakosiensis*)
- Geoffroy's bat (*Myotis emarginatus*)
- European otter (*Lutra lutra*)
- Lesser mouse-eared bat (*Myotis blythii*)
- Greater mouse-eared bat (*Myotis myotis*)
- Bechstein's bat (*Myotis bechsteinii*)
- Barbastelle bat (*Barbastella barbastellus*)
- Eurasian ground-squirrel (*Spermophilus citellus*)

* Some species has no equivalent in English. In these cases only the Latin name is used.



The ladybell is strictly protected | Photo: Sándor Bérecs



We can also meet the capricorn beetle | Photo: György Verő



European pond turtle is also protected | Photo: Wild Wonders of Europe / Ruben Smit / WWF

THE HISTORY OF MILITARY USE

Military use of the area of the Táborfalva Military Shooting Range and Training Area dates back to almost one and a half centuries. As in many other such places in Europe, the presence of the army contributed remarkably to the preservation of natural habitats.

The area was purchased by the Military Treasury in 1875 and 10 years later it was already known as the Barrack Encampment. During the 140 years, cavalry, the fusilier regiment of the Soviet and even the armoured corps of the USA have exercised here. During the time of the Austro-Hungarian Monarchy, the area was predominantly used for testing artillery equipment and from the 1930s onwards, the Training Corps for Riding-masters and Coachmen of the Hungarian Royal Army used the range for shooting and horsemen training. After the war, the Soviet Army carried out artillery training here with T-55 tanks and the remains of the facilities constructed back then can still be found scattered throughout the range. The effective force of the troops has been decreasing since the 1990s but still, diverse exercises take place in the range. As of today, the main form of use is tactical exercises of units stationed nearby as well as preparation of troops for international missions.



Soldiers of the 24th hunting battalion section in Örkény, 1927 | From Gábor Juhász

Ever since the shooting range became part of the Natura 2000 network, besides the aspects of home defence and training, the army has devoted attention to lessen their impact on local wildlife. Nature conservation constraints are integrated into the utilization regulations of the shooting range and training area. For example, temporal constraints are in place for the dusty helicopter landing plot that imitates desert conditions so as to prevent disturbance to a nearby raptor's nest.

The military range is divided into three large parts: the foreground is the training range or 'manoeuvre site', live-fire exercises are carried out in the middle part, while the background, the northernmost part is a safety buffer or protective zone where unauthorized trespassing is also forbidden as well as hazardous.



Practice-firing in our days | Photo: Csaba Búz



The training range is used for diverse exercises by the army | Photo: Csaba Búz

THREATS TO THE NATURAL VALUES

Despite the relative inaccessibility and legal protection, there are several threat factors potentially impacting the wildlife of the area. On launching our conservation project, we set out to avert the following threats:

DRYING-OUT OF HABITATS, WATER DEFICIENCY

The central and north-western parts of the project site used to be contiguous mesic fens. However, canals typical of the Great Hungarian Plain built earlier criss-cross this region, too, draining the water constantly away from here. Besides, climate change offsets the earlier patterns of precipitation more and more bringing about water shortage as well as warmer temperatures. Drainage and global warming thus result in a drop of the water table level as well as in the decrease of the duration and spatial extent of surface water cover. Because of this, valuable hygrophilous habitats (such as alder fens) and species have declined. Furthermore, droughts increased the risk of wildfires during military activities.

SPREADING OF AGGRESSIVE INVASIVE PLANTS

Invasive plants dominating huge areas are among the most threatening enemies of nature in the military area. Invasive alien species are brought in accidentally or deliberately from other continents, and having no natural enemies puts these new-comers at the top of their game. Within the project site, the most frequent invasive plant species were the tree-of-heaven, the hackberry, the false indigo, the Russian olive, the black locust, the box-elder and the common milkweed (locally called wild tobacco).



Prevention of fire is the most important | Photo: Annamária Csóka

DECLINE OF THE HABITATS OF THE HUNGARIAN MEADOW VIPER

Conversion of grasslands to ploughfields has drastically decreased available habitat for vipers and other protected species such as the great bustard. The remaining patches of grassland that still provide shelter for the viper were intensively mowed for a long period of time. This led to the collapse of the population as the snakes were unable to find cover from predators in the short sward. Also, the amount of insects available for the vipers as prey diminishes due to the management by mowing.

KNOWLEDGE GAPS AND IGNORANCE

It is hard to protect natural values if we do not even know about them. Ignorance may lead to a whole host of illegal land uses. Before the onset of the project, little information was available on the natural values of this amazingly rich site either among the local populace or the military units using this unique area. Also for the academic circles, the available data about this particular region were quite scarce.



Sandy grassland invaded by common milkweed | Photo: Annamária Csóka

GOALS OF THE PRESENT PROJECT

IMPROVING WATER SUPPLY

Even though such a small-scale project cannot restore landscape scale dry-out that threatens the whole Great Hungarian Plain, but we can still do a lot to improve water supply of the alder fens and mesic meadows of the project site. Our goal was to transform the canal system in order to retain most of the winter precipitation for the spring and summer months. The construction of water management facilities will prevent dry-out in the future, as well as improving the ecological condition of alder-ash forests and mesic meadows.

CONTROLLING INVASIVE PLANTS

Our primary goal was to eliminate invasive plants from more than 1,100 hectares of sandy grasslands and juniper-poplar thickets within the shooting range. Secondly, we aimed at increasing the area of natural dry forests by removing plantations of black locust or pine wedged in with native woods. Additionally, in order to improve the efficiency of the fight against invasive plants we targeted to create a knowledge base by gathering the experience and know-how of the topic within Hungary and across Europe.

RECONSTRUCTING HABITATS OF THE HUNGARIAN MEADOW VIPER

We aimed at expanding the habitat for this strictly protected snake by substituting mowing with grazing animals – that is, cattle. This kind of grassland management shall be beneficial for vipers, as it allows arthropods to thrive by re-creating the tussocky structure of the sward where taller clumps of grass provide shelter. In order to achieve this goal, we set out to reconstruct ploughfields that fragmented the continuity and connectivity of grasslands. Besides, we also planned to remove locust plantations from ridge tops, as these higher reliefs are ideal for the vipers to winter.

GATHERING AND DISSEMINATING INFORMATION

We aimed at raising awareness about the special values of the Turjánvidék, and at the same time preventing unauthorized access by vehicles and illegal dumping. Another specific goal of the project was to provide the military troops using the shooting range with resources specifically tailored to their needs so that they can learn how to contribute best to the protection of natural values within the range. Still another project objective was to gather information on protected species and to monitor the impact of our conservation-oriented interventions with scientific methods and then disseminate that knowledge.



Collecting data on the sandy grassland | Photo: György Verő



We found a young Hungarian meadow viper | Photo: György Verő



Bird watching from the top of the jeep | Photo: Péter Henez

COOPERATING PARTNERS



The **Duna-Ipoly National Park Directorate (DINPD)** has been charged with nature conservation tasks within Pest, Fejér and Komárom-Esztergom counties since 1997. Its most important roles are to plan and implement nature conservation management of protected areas, organizing research activities, awareness raising and management of state properties. Its main function is to preserve characteristic landscapes, prevent the disturbance of wildlife, sustain biodiversity and clear waters, protect forests, soil and other renewable natural resources besides cultural historical values. The Directorate is the nature conservation manager of the Táborfalva Military Shooting Range and Training Area, and the trustee of the Dabasi Turjános NCA. The DINPD is the lead partner and coordinating beneficiary of the Turjánvidék LIFE project.

The **Defence Economic Bureau of the Ministry of Defence** carries out the environmental and nature conservation tasks within the responsibility of the Ministry. Its priority task is the complete operative management of all the environmental issues of the Ministry of Defence and the Hungarian Army, the implementation of EU-financed projects and nature conservation and environmental programmes of the sector connected to the National Environmental Programme. Within the present project, the Defence Economic Bureau

ensures the cooperation with the corps using the Táborfalva Military Shooting Range and Training Area. It is also responsible for the construction of water management structures within the military area.

The **Budapest Forestry Company (BFC)** is the manager of state-owned forests and grasslands that belong to the home defence forces. Its main activities are forest and game management, recycling of forestry side-products, tourism, community recreational facilities, sustaining protected geological and natural values, preserving natural and cultural heritage. Most of the project site belongs to the Dabas Forestry Directorate that manages about 10,000 hectares. The BFC's most important responsibility was the elimination of invasive plants and forest management.

The mission of **WWF Hungary** is to reach a future in which people live in harmony with nature. The NGO's Hungarian organization focuses on forests, rivers, wetlands, climate change and large carnivores. The main objective of WWF Hungary is to improve the conservation status of habitats and species and to support and spread sustainable resource management and land use practices. In the Turjánvidék LIFE project, the NGO was responsible for communication and awareness raising besides contributing to the exchange of scientific know-how.



Nature conservationists, foresters and soldiers work together for the protection of the Turjánvidék | Photo: László Gálhidy

ACTIONS AND OUTCOMES OF THE TURJÁNVIDÉK LIFE PROJECT



For the mitigation or prevention of damage to wildlife complex and varied interventions were needed. Below, we present what we did as well as the results that we achieved.

CONSTRUCTION OF WATER MANAGEMENT AND WATER RETENTION FACILITIES IN THE DABAS TURJÁNOS

These fen habitats were heavily impacted by water deficiency that we targeted by a 2-component solution. On the one hand, we had controllable sluice gates built at three locations on the canals (originally created to drain the land) that connect the area with the Danube-Tisza Canal. By closing the sluice gates, winter and spring precipitation can be retained in order to supply wildlife and the water table as the canals will not drain the water too early into the Danube.

On the other hand, by modifying the canal and sluice system, we opened up the opportunity to drive the water into the opposite direction, if need be. This way, the alder fens could be inundated by water from the Ráckeve Branch of the Danube. To achieve this, a pump station capable of housing a mobile pump was built at the end of the Danube-Tisza Canal. Interestingly, the last 1,200-metre section of the old canal needed for water-supply was completely overgrown by alders. To spare these trees, we did not dredge this section but created a new pathway for water – which is thus lined with alders.

Actively supplying the protected area with water may be needed in years of low winter precipitation that results in the fen drying out by spring, even though it should be under water until the middle of the summer. Eventually, this can result in the fen getting scorched. In such years, actively supplying water to the area for a few weeks at maximum in spring, such damage to the fens and the die-off of alder forest can be prevented. In years with normal amounts of precipitation, it suffices to retain the water naturally covering the fen by closing the sluices.

Thanks to favourable weather conditions, active water supply measures were not needed in Dabas for the first three years of the operation. The sluice gates completed in 2015 have been retaining the water in the forest and on the meadows dotted with orchids and irises. This provides sufficient water levels in years of normal precipitation.

As a result of water retention, the water regime over 32 hectares of especially valuable alder fen and 39 hectares of meadows has been improved. The amount of water retained is monitored by gauges checked by DINPD staff. This is necessary for the impact assessment of the intervention, but data must be collected over a long period of time. Precipitation varies largely among years thus making any short-term analysis inconclusive.

CONSTRUCTION OF A WATER RETENTION SYSTEM ON THE SHOOTING RANGE

The protective zone of the Táborfalva Military Shooting Range and Training Area as well as the central part used for live-fire exercises is dominated by purple moorgrass meadows, however this area is also criss-crossed by drainage canals. To resolve problems caused by water deficiency, four medium-sized sluices and ten smaller water retention facilities were built onto the canals. This system is capable of retaining the abundant waters of springtime within the live-fire area thus improving water regimes over about 1,400 hectares.

In the spring of 2018, this water retention system was in full operation and we have already experienced that more water makes everyone happier. More water is beneficial for the army, as the lush vegetation lessens the risk of wildfires during shooting trainings. For the forestry it is advantageous to have better water supply in the nearby forests. And farmers were happy as more water means more grass for their livestock. Nature conservation staff was also grateful, as the water remaining in the area throughout the vegetation period opens up new perspectives for hydrophilus species again. For example, the retention of spring precipitation is essential for newts and frogs to successfully complete their reproductive cycle.

The staff of the DINPD and the Hungarian Army regularly monitor the gauges installed onto the sluice gates. Observations and records will be fed back into the system so that both the operational rules and the water levels to maintain can be planned based on the experience of the first year of operation.



Sluice gates for water supply under construction | Photo: Tamás Gruber



The water retention system in operation | Photo: György Verő



Fish examination in the Dabasi Turjános | Photo: György Verő



Strictly protected giant plantain | Photo: DINPI



The European tree frog also needs water for reproduction | Photo: Sándor Bérces

CONTROL OF INVASIVE PLANTS IN THE MILITARY AREA

Both spatially and temporally, one of the most extensive actions was the elimination of invasive plants. On-site interventions were preceded by careful field assessment of the amount of tree-of-heaven, Russian olive, black locust, box-elder, hackberry, false indigo and the constantly re-sprouting milkweed to be removed. After that the Budapest Forestry Company eliminated these invasive species from more than 1,100 hectares of previously infested sandy grasslands.

For such a huge area, this kind of job could only be done efficiently by carefully applying selective herbicides, so that is exactly what we did. In case of the invasive alien tree species growing here, simply cutting them results in aggressive sprouting from the root system or the stump, and it only aggravates the situation. In order to avoid this, the herbicide is directly injected into the trunk. After the injected tree specimen dries out, it can be cut without risking re-sprouting.

The elimination of the milkweed is also a difficult task. The herbicide must be smeared onto the leaves by brush so as to prevent any damage to the surrounding native vegetation. For a successful intervention, the treatment must be repeated over two or three years in the same site until the last specimen is gone, as that could re-start the invasion from anew.

During the seven-year period, aggressively spreading tree-of-heaven, black locust, false indigo, Russian olive and common milkweed populations were eliminated from sandy habitats within the training range. Consequently, the reconstructed patches of grassland can now be re-conquered by protected species, rare elsewhere but relatively numerous within this site, such as the sand saffron, the sand feather grass, the sand iris, the dyer's alkanet and others.

From a 51-hectare alder-ash forest situated at the edge of the live-fire shooting range, we also removed invasive plants – mostly hackberry and box-elder.



CONVERSION OF ALIEN TREE PLANTATIONS TO NATIVE FORESTS

In some instances, altogether covering some 50 hectares across the shooting range and training area, black locust and pine plantations were located in places where their spread (both by seedlings and by sprouts) could potentially impose a threat to nearby grasslands in good conservation status. For this reason, the project aimed at converting these stands by planting native trees. In the first year of the project, – as preparation of conservation management tasks – the schedule of forest management was created, locally collected black poplar seeds were genetically tested for future planting, and the ammunition discharge plan was prepared for the concerned military area.

AMMUNITION DISCHARGE

On military areas ammunition treatment is necessary, if the intervention involves soil disturbance – such as in the case of afforestation. Ammunition treatment can be exclusively carried out by the specialized forces of the Army, by means of a specific detector. Within the shooting range, remnants of ammunition can be found practically everywhere and once even a live mortar grenade was found, what warrants special precautions on behalf of anyone working here.

Following ammunition treatment, a plantation consisting of alien trees was completely removed from 26 hectares and the staff of the forestry afforested the area with native black and grey poplar. Black poplar saplings were produced in the nursery of the Dabas Forestry from seeds collected within the military area. The seeds collected from old trees were genetically tested first, in order to assure that they had not hybridized with other poplars but are true black poplar propagules.

During the course of detailed forestry planning, it turned out that only about half of the planned area should be reforested by native trees following the removal of alien plants. Over the remaining area, about 26 hectares, only the invasive trees had to be removed and the resulting sandy grassland preserved.



Clearing the sandy grassland of the tree-of-heaven | Photo: György Verő



The sand feather grass is a sign of good conditions | Photo: Annamária Csóka



Professionals are searching for ammunition | Photo: Eszter Forgács



Collected bullets | Photo: Gábor Kovács

PROTECTION OF THE HUNGARIAN MEADOW VIPER AND RECONSTRUCTION OF ITS HABITATS

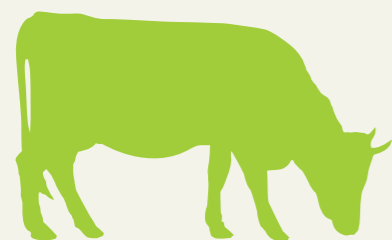
The first step of viper conservation measures was to find out whether this extremely rare venomous snake is still present within the Dabas habitat patch, since the last live specimen had been seen in 2009. Our field trips were successful: we have recorded not only adult but also juvenile individuals in several consecutive years. This signals population viability that is the snakes can still reproduce here.

In order to improve actual – and not only potential – viper habitats, the land use of these mesic meadows previously based on mowing had to be changed. Luckily for the project, lease contracts between the trustee of these state-owned properties and the tenants had just expired. New contracts were based upon the condition that the tenants engage in pastoral animal husbandry.

Thanks to this change, most of the viper habitats (about 1,000 hectares) are now grazed by cattle instead of being mowed. Grazing is expected to create diverse vegetation structure on these pastures that would in turn provide the Hungarian meadow vipers as well as their staple prey (locusts, crickets, grasshoppers) with shelter. The contracts of lease were prepared concerning another 1,500 hectares and grazing can thus take place there from 2018 onwards.

In order to expand potential viper habitats, grassland reconstruction was carried out in two fields wedged in between semi-natural grasslands. One of these fields is located along the Dabasi Turjános NCA and covers 19 hectares. It used to be privately owned and the DINPD bought it at the beginning of the project period. Another, 55-hectare ploughfield belongs to the trusteeship of the BFC.

A routinely applied method of grassland reconstruction is sowing medic (alfalfa). This process takes several years allowing natural vegetation to emerge gradually from under the sowed, dominant culture while the alfalfa can be mowed and used for fodder for several years. In the smaller lot, characteristic meadow-grasses appeared right away, without having to sow medic at all, grassland species spontaneously re-appeared. On the other ploughfield, a specific technology was applied besides sowing alfalfa. When it started to become sparse

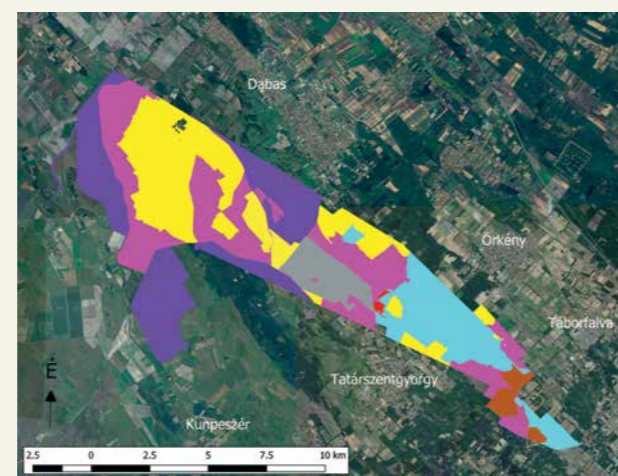


after several years, we deliberately planted 43 plant species typical of natural grasslands. By sowing more than 250 kg of seeds and planting 1,500 nursery plants, we could achieve that species that could not have spread naturally to the abandoned field from the neighbouring grasslands also colonized the area. Monitoring the long-term success of this novel procedure will be carried out by the experts of the Centre for Ecological Research of the Hungarian Academy of Sciences.

HARMONIZING HOME DEFENCE AND NATURE CONSERVATION

We took several approaches to inform the army about natural values of the area they use for military purposes and to motivate them to protect those as much as their service allows it. As a first step, we compiled a short online material, targeting the units that use the shooting range and training area, on the objectives and tools of nature conservation, the valuable habitats and protected species of the Táborfalva military site and about the current nature conservation regulations.

The most important element of harmonizing home defence and nature conservation is the preparation of the management plan for the Táborfalva Military Shooting Range and Training Area that also involves a zoning plan. The zones are marked in the field by clearly visible landmarks so that it is straightforward which part can be used for what activity, and which military activity can take place where, within the several-thousand-hectare large range. Some zones do not fall under any kind of restriction while in others the use of fire or caterpillar type vehicles is prohibited in order to protect vulnerable wildlife. The management plan, as well as the zoning map was prepared during the course of several rounds of discussions and negotiations with the military units. The map of the zones has also been produced in a mobile phone application format adapted to field use. On account of foreign troops also using the range, this application has an English version besides the Hungarian one.



Zoning map of the Táborfalva Military Shooting Range and Training Area. Each zone has its own regulations.



Hungarian meadow vipers can be identified from photos due to their unique pattern | Photos: to the left: György Verő, to the right: Tamás Konez-Bisztricz / Varázslatos Magyarország



Grazed grassland is an ideal habitat for the Hungarian meadow viper | Photo: György Verő

COLLECTION OF BEST PRACTICES FOR THE CONTROL OF INVASIVE PLANT SPECIES

The second biggest threat to our natural environment after habitat loss is the spread of invasive species. This is supported by the results of a questionnaire survey among the stakeholders of conservation management of nationally protected areas (researchers and park rangers among many others). Based on their answers, invasive species are a problem over 97% of Hungarian protected areas.

In order to disseminate know-how concerning the control of invasive plant species, we organized two conferences. The first one, in 2013, targeted Hungarian national park directorates, state forestry companies and other specialized governmental bodies as well as plant protection companies and entrepreneurs. The knowledge and experiences shared by the conference participants were later included in a handbook published by the DINPD titled Practical Experiences in Invasive Alien Plant Control. The second workshop was attended by more than 100 experts and technicians of 15 European countries. This event also reinforced the fact that the control of invasive plants is among the main challenges for nature conservation and protected area management organizations across the continent.

Invasive plants are also present within our settlements, in public areas as well as in private gardens. The risk they impose on biodiversity, however is little known if at all among people and thus their control have not called for much attention. In fact, many invasive alien plants are planted deliberately for decorative or other purposes. In order to raise awareness about the issue, we prepared a layman's booklet on the invasive plants most commonly seen in our gardens that threaten our natural environment. The booklet is available from the website www.turjanvidek.hu and it contains advice on the DIY removal techniques of these species as well as their replacement with species that are equally decorative but harmless to our native wildlife.

RESEARCH AND MONITORING

In order to track the effects of conservation interventions, 20 sample plots were designated within which invasive plant removal and afforestation can be monitored by the experts. Based on the observations, it can be decided for example whether a treatment must be repeated or further saplings should be planted. All in all, it can be concluded that the interventions were successful. Besides the above plots, six more were designated within Hungarian meadow viper habitats for monitoring the effect of grazing and another six to monitor naturalness of forests. Observations so far indicate that beneficial processes have started, but to achieve spectacular results, more time is needed.

Besides monitoring, specific research efforts targeted the exploration of local wildlife. Primarily, experts on plants, arthropods and birds surveyed the site, but snails and small mammals were also sampled. Botanical surveys shed light on the presence of several protected species that had not been expected here such as *Scilla vindobonensis* and two fern species, the adder's tongue and the common moonwort.

Above all, experts specifically investigated the behaviour of beetles, that is the strictly protected Hungarian ground beetle, which still has a significant population on the sandy areas of the training range. In order to get to know this species better, the experts of the DINPD started a capture-mark-recapture study by which 3,333 specimens were individually marked. Whenever a marked specimen is caught again in a trap, useful information about population size, life expectancy or home range size can be gleaned. Furthermore, some individuals were fitted with a radio transmitter as a first-ever trial within Hungary of its kind, which is an almost unparalleled technology worldwide.

Several species of birds of prey breed within the military area, who apparently thrive in this bountiful foraging range. Ornithologists have often observed white-tailed eagles, Montagu's and hen harriers, kestrels and buzzards hunting here. Many chicks hatched here were ringed by experts so that they can be identified in future at an individual level anywhere in the world. This global scale of observation makes up an international network of information that allows certain conclusions about bird migration routes and behaviours.

ÖRS, THE SHORT-TOED EAGLE

One of the main sensations was a nesting by a pair of short-toed eagles within the site, since it is a rare case in lowlands. This species typically nests in mountainous regions. The chick that hatched here was christened Örs and fitted with a GPS-transmitter. The juvenile eagle spent the first half of winter in the Middle East and in the spring of 2018, it headed back north. Its route can be tracked online:

http://satellitetracking.eu/inds/showmap/?check_334=334



Studying the insects with sweep netting | Photo: Tamás Németh



Hungarian ground beetle with radio transmitter | Photo: Ármin Csipák



Montagu's harrier is the bird of spongy, marshy wetlands | Photo: Péter Csonka



Örs, the short-toed eagle chick fitted with a GPS-transmitter | Photo: Márton Árvay

COMMUNICATION AND DISSEMINATION OF INFORMATION

In order to inform the public about the natural values of the Turjánvidék as well as about the conservation management interventions concerning the site, we made use of the following communication tools:

- The project website is regularly updated both in English and Hungarian: www.turjanvidek.hu.
- Representatives of the media were escorted into the restricted area once at the beginning of the project and once at the end of the implementation period.
- Information boards were installed in the nearby settlements as well as at the entrances of the military base both for military units and the local populace.
- The boundary of the Natura 2000 site was marked by the well-known oval sign of nature conservation. Trespassing the military area is not only forbidden but also dangerous on account of the remaining ammunition. For this reason, 40 entrance bars were installed onto the dirt roads crossing the shooting range and training area.

- Field trips were organized for interested youths and for local school kids so that they can visit the only publicly accessible area of the military range: the Betyár Hill education trail near Táborfalva.
- We presented at 13 national and international conferences targeting scientists and professional audiences to demonstrate project activities and results.
- The Duna-Ipoly National Park Directorate published the 10th volume of the Rosalia series (*Nature conservation and research on the northern Turján region*) compiled from the results of decades-long ecological research amounting to almost a thousand pages. Each article of the book can be downloaded from the project website.
- A special issue of the quarterly newsletter of the Duna-Ipoly National Park Directorate (*Cincér*) was published as well as another one of the semi-annual magazine of WWF Hungary.
- The film *Táborfalva – The natural shooting range* demonstrating the project and the natural values of the Turjánvidék was shown on national television channel M5. Film making was subcontracted to the renowned producer Szabolcs Mosonyi, who fell in love with the natural riches of the area and, consequently, produced a longer documentary as well, titled *Forbidden zone – Wildlife on the Battlefield*.

THE RESULTS OF THE TURJÁNVIDÉK PROJECT IN NUMBERS

- We improved water regimes over about 1,400 hectares by the construction of 7 medium-sized and 10 smaller water management facilities
- We eliminated invasive plants from 1,172 hectares of sandy habitats
- We planted native trees to establish a forest on sand in place of alien plantations over 37 hectares and reconstructed 26 hectares of grassland
- We eliminated invasive plants from 51 hectares of alder-ash forest and converted 2 hectares of poplar plantation to a forest by planting native ash species
- We reconstructed 74 hectares of grassland from ploughfields thus extending the habitat for Hungarian meadow vipers and great bustards
- We introduced grazing instead of mowing over 1,000 hectares of mesic grassland
- We installed nest boxes for birds (rollers, owls and kestrels)
- We updated the management plan for the entire area of the Táborfalva Military Shooting Range and Training Area
- We collected more than 27,000 new records on about 300 protected species
- We published 500 copies of the forthcoming Rosalia volume full of studies
- More than 200 participants attended our technical conferences on invasive plants
- We produced 15 scientific publications and conference presentations
- We printed and disseminated 37,000 thematic project publications
- Our home page was visited 75,000 times over seven years
- We installed 8 information signs, 20 Natura 2000 signs, 81 additions to shooting range signs and 40 bars at entrances across and around the project site
- We presented the details of our nature conservation work by over 160 media clippings with several appearances on television among them
- The 25-minute project film was shown on TV and was published in 100 copies on DVD
- About 200 children and adults attended our guided tours



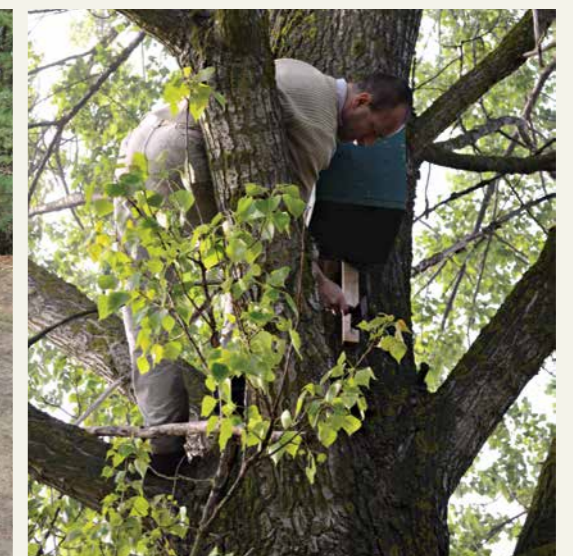
Journalists could go around the shooting range on the top of caterpillar type vehicles | Photo: György Verő



Isolation helps to conserve the natural values | Photo: Sándor Bérecs



Betyár Hill education trail is available to visit alone or in groups | Photo: Klára Kerpely



We help birds' nesting with nest boxes | Photo: György Verő

HOW TO PROCEED FROM HERE?

In order to maintain and develop our achievements, the project consortium has various tasks ahead even after the completion of the project. Luckily, the partnership has brought about a beneficial cooperation among the different sectors during a relatively short period of time on which nature conservation can build upon in future.

One of the most important tasks is the integration of the management plan into the military routine. The units arriving on site shall be informed about it so that the exercises can be designed considering the zone system.

The habitats that have been freed from invasive plants must be monitored in future so that any early warning signs can be detected and action can be taken. Even if a few plants re-sprout, it is better to extirpate them immediately than to wait until they spread again and cause more serious damage to nature.

The water retention system in the Dabas area shall be operated by the Duna-Ipoly National Park Directorate, while the Ministry of Defence is in charge of the facilities within the shooting range. Pastures must be maintained by grazing in order to sustain the Hungarian meadow viper populations. This shall be ensured by the long-term contracts with the tenants.

Even though we may have informed wide audiences about the natural values of the Turjánvidék, the area remains a closed zone accessible only with permission. Unauthorized entry to the military area is not only illegal and thus lead to prosecution but can also be hazardous. The Dabasi Turjános NCA is a strictly protected area and for this reason can only be entered with a permission of the nature conservation authorities.

The good news is that the Betyár Hill education trail is open to the public and the six information boards lead the visitors through the sandy habitat types from forests and poplar-juniper thickets to grasslands, presenting information about the local wildlife. The trail can be accessed from the village of Táborfalva towards Örkény-Tábor, and from the last garrison outwards, signs indicate the right direction. For those interested in fens, the Selyem-rét education trail is also available from the nearby settlement of Ócsa. Another route ('Education trail into the Turján') starting in Ócsa takes the visitor into the realm of orchids. The best time to take this trail is in April and May.

The project website (www.turjanvidek.hu) and resources available for download (articles, educational material and photographs) remain accessible in future so as to disseminate knowledge about the area and the scientific result of the researches.

ACKNOWLEDGEMENTS

The nature conservation interventions presented here were only made possible by the active cooperation of many people and organizations. We wish to thank all the colleagues, volunteers, consortium partners and subcontractors, as well as the relevant units of the Hungarian Army, the staff of the LIFE Fund, the EASME and the Ministry of Agriculture for their help and support throughout the duration of the project.



The dyer's alkanet is blooming massively | Photo: Sándor Bérces



The flat bark beetle is under European level protection | Photo: Tamás Németh



Old abandoned tanks are excellent nesting grounds for the Eurasian hoopoe | Photo: Péter Csonka



THE HIDDEN TREASURE OF THE GREAT HUNGARIAN PLAIN

LIFE-NATURE PROJECT FOR WILDLIFE
PROTECTION IN THE TURJÁNVIDÉK
2011-2018

