



**SECURING PREY SOURCES FOR ENDANGERED
AQUILA HELIACA AND FALCO CHERRUG POPULATION
IN THE CARPATHIAN BASIN**

LIFE13 NAT/HU/000183



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„A veszélyeztetett parlagi sas és kerecsensólyom populációk zsákmánybázisának biztosítása a Kárpát-medencében”

“Securing prey sources for endangered Falco cherrug and Aquila heliaca population in the Carpathian basin”

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Securing prey sources for endangered Aquila heliaca and Falco cherrug population in the Carpathian basin

The project, co-financed by the European Union's LIFE+ programme, aimed to increase the populations of the (Aquila heliaca) and saker falcon (Falco cherrug) both being globally threatened and playing a key role in a European context. Both species are considered threatened bird species in Annex I of the EU's Birds Directive and the LIFE+ Nature, and their largest populations in Europe exist in the Carpathian Basin. Due to previous conservation efforts their populations have been growing steadily in the Carpathian Basin. However, populations of their important prey species such as the European ground-squirrel (Spermophilus citellus), hamster (Cricetus cricetus) and European hare (Lepus europaeus) have decreased gradually due to the loss and degradation of natural grasslands. For these reasons, the populations of southern birch mouse (Sicista subtilis) and Vojvodina blind mole rat (Nannospalax montanosyrmienensis), which play an important ecological role in grassland ecosystems, have also decreased. These processes threaten the results of the conservation work that had been done to protect the eagles and falcons. The continuously declining populations of the lesser blind mole rat and southern birch mouse represent exceptional nature conservation values on their own while the hamster and European hare are especially important key elements of the grassland food chain. In view of this,

the project strives to reinforce the populations of the aforementioned small mammals to help the effective conservation of rare raptors.

LIFE the European Union's financing instrument for environmental programs

The LIFE (L'Instrument Financier pour l'Environnement) program was established in 1992 to support the environmental policy of the European Union for which Hungary and Romania have been eligible since 1999. LIFE has been transformed several times since its launch. LIFE + of LIFE-Nature programs are designed to promote and fund the protection of Natura 2000 sites required by the Birds and Habitats Directives.

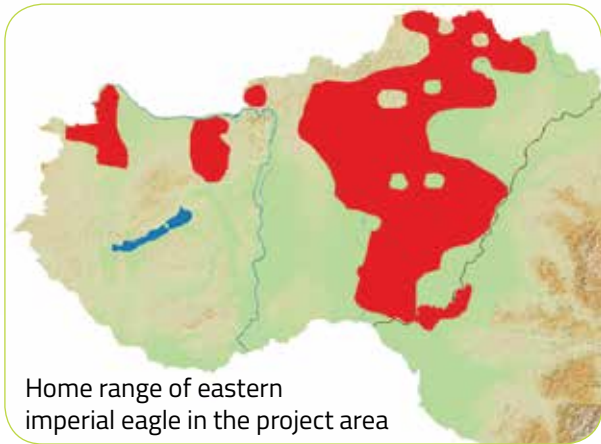
Natura 2000, the European Union's ecological network

The system of the Natura 2000 areas, a continuous ecological network established by the European Union aims to conserve biodiversity through the protection of natural habitats and wild, native plant and animal species. The network contains two types of areas; the Special Protection Areas are designated under the Directive on the Conservation of Wild Birds established in 1979, while Sites of Community Importance are defined in the Habitat Directive ratified in 1992. On Natura 2000 areas, different economic, social and cultural activities can only be undertaken with a sustainable environmental approach, while giving priority to nature conservation interests.





THE EASTERN IMPERIAL EAGLE
(Aquila heliaca)



Home range of eastern imperial eagle in the project area



The eastern imperial eagle belongs to the large eagles. The adults are dark-brown with golden nape and head and had white shoulder patches. Young individuals are yellowish acquiring adult plumage through several intermediate ones. The majority of the population exists in the Great Hungarian Plain, but a small proportion nest in Transdanubia as well. It prefers to breed within reach of grazed lands with high density of ground-squirrels and usually builds its nest in tree alleys or on a lone tree between agricultural parcels and grasslands. It used to feed primarily on ground-squirrels and hamsters, however, due to their sharp decline, the common hare and corvid species became its dominant food source. It occasionally also scavenges. The species has suffered a decline all over its distribution area, therefore its population increase in Hungary is of great importance. Today, poisoning and electrocution are considered to be the most important threats to the species. In 2018, the Hungarian population reached around 247 pairs while the Romanian population consisted of only one or two pairs. It is strictly protected in Hungary possessing a natural conservation value of one million forints (~3100 EUR) while in Romania it is also protected with a value of 2700 EUR.

Diet study of the eastern imperial eagle

The Hungarian population showed a significant increase during the project period, thus the number of breeding pairs reached 247 in 2018 from 152 pairs in 2014. The HELICON and PannonEagle LIFE projects fighting against illegal poisoning have also largely contributed to this increase. Within the framework of our project two birds were tagged with a satellite transmitter in Hungary and another two in Romania in order to find their foraging habitats. We also deployed camera traps at six eagle nests which enabled us to collect data about their prey they feed their chicks with. In parallel, a huge database of 36 years about the food composition of the species was also processed. Diet studies proved a drastic decline of both ground-squirrel and hamster populations since their presence among prey were only 0.03% and 7.42%, respectively, and their rate showed a continuous fall in the past 20 years. The eastern imperial eagle has disappeared from certain areas due to the decrease of its formerly common preys, while in other parts other species became its major food source. In many areas the common hare and pheasant became the most frequently hunted prey species creating a source of conflict with gamekeepers which resulted in the increase of illegal poisoning. All this shows how important it would be to strengthen the populations of the natural prey of the species.





SAKER FALCON
(*Falco cherrug*)

The Saker falcon is the largest falcon species in Hungary. Its head and back are brown, breast is white with longitudinal drop-shaped marking and light brown spots can be found on the wing and tail feathers.

The bulk of the population lives east of the river Danube in open lowland areas. In Transdanubia, Sakers live mostly in Fejér and Győr-Ménfőcsanak counties. Recently, the species settled in West Romania, in Partium and Banat areas. Breeding pairs usually remain in their breeding ground all year round. They breed in woods, alleys or solitary trees, if the habitat is appropriate. They do not build nest but occupy nests of other species. Nowadays the bulk of the Hungarian population nests in artificial nest boxes installed on pylons of high-voltage power lines. Their most preferred prey is the European ground squirrel, but they regularly hunt for hamster (*Cricetus cricetus*), common vole (*Microtus arvalis*), starling (*Sturnus vulgaris*) and feral pigeon (*Columba livia f. domestica*).

Saker falcon is a globally endangered species. Due to conservation efforts, its population increased in the past decades, however the population shows a moderate decline recently. The Romanian population is increasing. The largest threats are now the deterioration of habitats, decrease of prey populations, but also poisoning and electrocution are considerable mortality factors.

The estimated populations in Hungary and Romania are 142-165 and 25-30 pairs, respectively. The species is strictly protected in Hungary its established conservation value is 1 million HUF (~3100 EUR) per individual. Saker falcon is also a protected species in Romania with a conservation value of 2700 EUR.

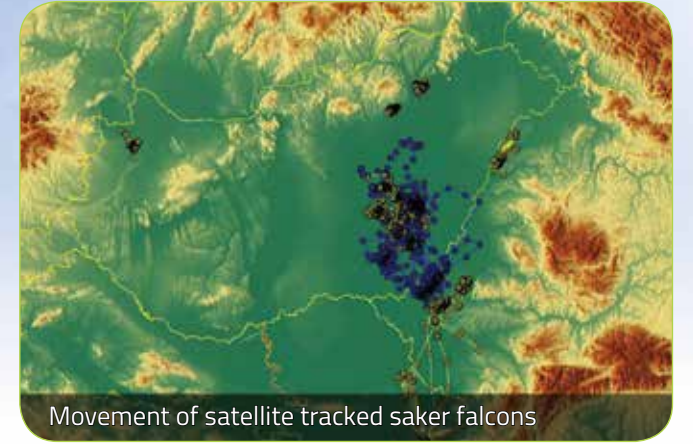


Home range of saker falcon in the project area



The diet of the Saker Falcon

During the project duration, the population of the saker falcon showed a moderate decline in Hungary, but the Romanian population pleasingly increased in the same period. In order to learn more about the diet of the species, we deployed camera traps at 67 and 13 nests in Hungary and in Romania, respectively. Results made clear that the proportion of the European ground squirrel – the favoured prey of the saker falcon – significantly decreased in Hungary in the last years. This may be one of the reasons for the moderate decline of saker falcon population. In the Romanian areas however, the European ground squirrel was presented in high proportion in the saker falcons' diet. In frame of the project, loggers were deployed on 16 falcons to learn about their feeding grounds. In addition, earlier satellite tracking data from previous LIFE projects were processed. Results suggest that saker falcons need relatively large area to breed successfully. They prefer to hunt for the European ground squirrels and if the species is present in their territory, they adjust their hunts to the seasonal activities and life cycle of the European ground squirrel. In case the density of a European ground squirrel colony falls under a critical number, falcons do not target that colony, even if it can be found relatively close to their nest. On the contrary, if a colony has a good density, saker falcons are willing to fly even 20-25 km (each way) to catch the European ground squirrel.

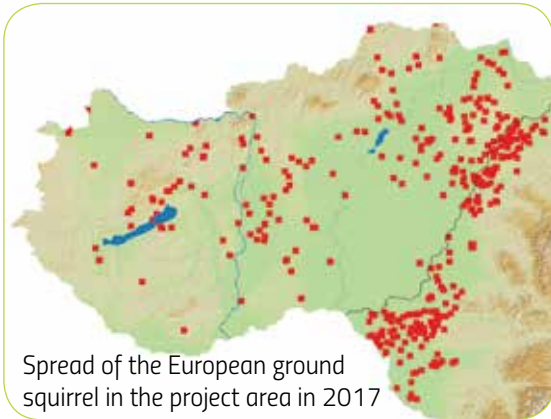


Movement of satellite tracked saker falcons





EUROPEAN GROUND SQUIRREL
(*Spermophilus citellus*)



Spread of the European ground squirrel in the project area in 2017



The European ground squirrel is a pale-brown small rodent inhabiting open grasslands and pastures. Ground squirrels are diurnal (day-active) mammals feeding on plants, but occasionally they also consume insects or eggs. Even though they live in loose colonies, each ground squirrel digs a personal underground burrow system which serves as a hiding place from its numerous predators. The burrow system has one inclined and several horizontal entrances, and all dug soil is deposited and flattened at the inclined entrance. The deepest point of the system is the grass-layered nest where the ground squirrel spends the winter in hibernation from August to March.

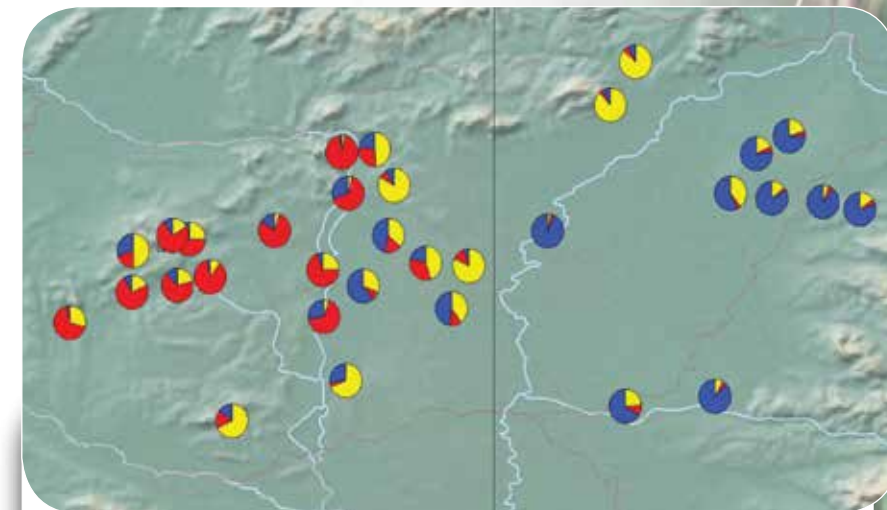
Ground squirrels were numerous and regarded as pests in Hungary a few decades ago, but their population was decimated by land use change in the last decades. Due to their central role in the steppe food chain they became protected. There are only a few healthy colonies inhabiting the Dunántúl and Danube-Tisza interfluve, and there is a general decrease in colony densities, too. The survival of the species may also depend on certain well-maintained grasslands, like grassy airports, where the short grass serves other purposes and predation is prevented by human activities.

The European ground squirrel is a key species in the steppe ecosystem. Its burrow system provides shelter for several insects, amphibians and reptiles and it is prey for several endangered predators with specialised techniques to capture ground squirrels, either above ground, like saker falcons and imperial eagle, or underground like the steppe polecat. The ground squirrel is a strictly protected species in Hungary valued at 250.000 HUF (~800 EUR). It is also protected in Romania, but with no nature conservation value attached yet.

Extending our knowledge

Genetic diversity of the ground squirrel population

Even though repatriation of ground squirrel colonies have been attempted for several decades in Hungary, the detailed genetic status of their population was not known. We collected genetic samples from all large colonies during this project, thus have a representative sample of the ground squirrels inhabiting different parts of the Carpathian Basin. Phylogenetic analysis of the samples indicated that our ground squirrels belong to the northern lineage of the species. Further population genetic analysis revealed that local colonies could have formed a meta-population until recently, as there are only slight genetic differences among the localities due to reduced gene-flow caused by fragmentation of habitats. Nevertheless, due to geographic segregation by the main rivers, three regional sub-populations can be distinguished. Independently of actual colony size, most colonies have a low genetic diversity and some level of inbreeding, indicating previous bottleneck events in recent decades.



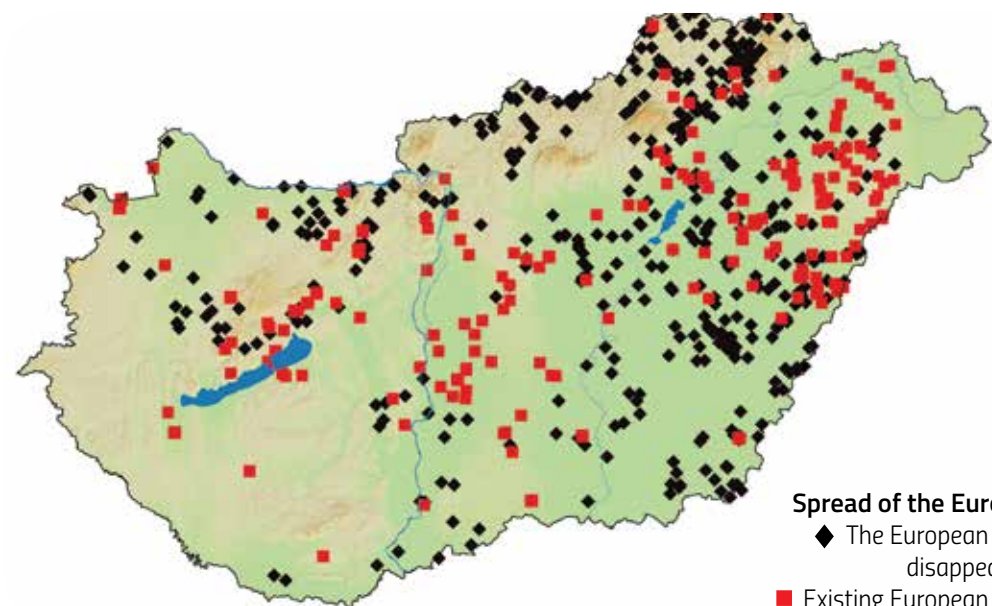
Result of genetic surveys

In the pie charts, the proportion of individuals with genetic characteristics of Transdanubia (red), the Danube-Tisza interfluve (yellow) and Transzisztisa (blue) can be seen in the examined flocks.



Recent trends in the ground squirrel population

We collected all available data on the recent occurrence of ground squirrels from a wide array of sources. Historical data show that two-third of the colonies disappeared in the last fifty years, even though one-tenth of these were especially large. The present survey indicates that at least 177 colonies still exist, and only 10 of them consist more than 1000 individuals. Population decrease was not even, there was a gradual decrease before 1995, but increased since then. There seems to be a stabilization from 2014, to which our project might also have contributed. There are regional differences in the trends, too. The earliest change was observed parallel to the abandonment of mountain slope grasslands, but severe decrease was later documented at the lowland grasslands in Pest and Békés counties. At the beginning of the period, the distribution area was shrinking, but recently the colony densities also decreased, especially at the Hortobágy. Conservation status of the European ground squirrel changed from being considered as pest to being protected in the last century and later to strictly protected due to the recognition of such dramatic decrease. Land use change, especially the abandonment of grazing, was the main cause of colony disappearance, and improved conservation efforts are necessary to stop and reverse these trends.



Spread of the European ground squirrel
 ◆ The European ground squirrel colonies disappeared in the last 50 years
 ■ Existing European ground squirrel colonies

Stress factors for ground squirrels

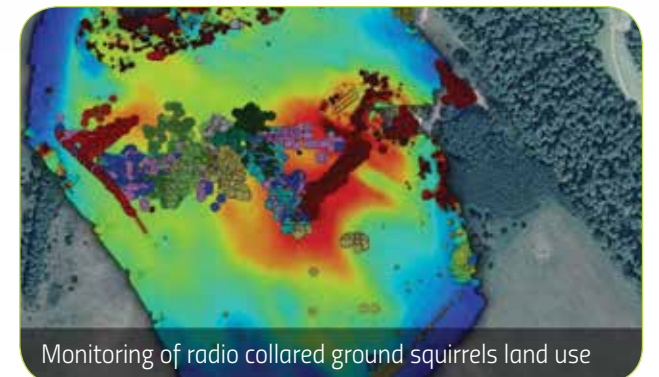
There are large regional differences in the direct human impacts affecting ground squirrels. Local disturbances are generally considered as stressors, and stress in colonies is reflected in their altered behaviour and physiology. We surveyed the conditions and stress status of major ground squirrel colonies and found local differences. In places of frequent human presence, such as at tourist areas, roads and barns, ground squirrels are seemingly tolerant but there is a high level of stress hormone produced by the animals. Instead of avoiding humans, the ground squirrels seem to choose places of frequent human presence. Animals aggregated around such places are less fearful of humans and can readily be approached. As their predators are more afraid of humans than they are, these areas provide shelter to ground squirrels. Such protection against predation may increase life span but also has disadvantageous consequences such as reduced immune status and decreased breeding capacity. To reduce human disturbance, the optimal human presence would only during the breeding season to improve breeding but still provide protection against predation during the rest of the year.

Habitat use of ground squirrels

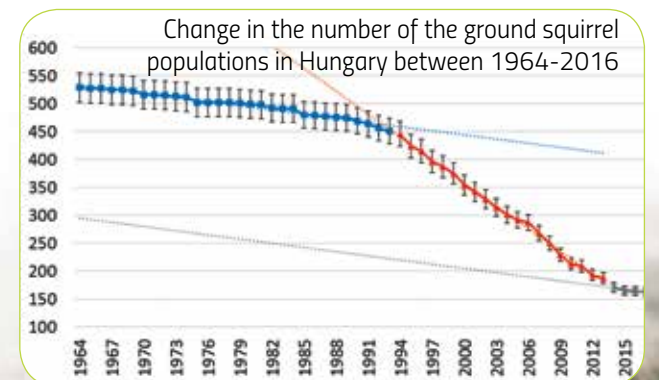
Habitat use of radio collared ground squirrels was monitored at three locations. In their active period, these animals spent a maximum of three hours above ground. Activity pattern was strongly affected by the weather, there was an even distribution of activities interrupted by 20 minute long underground resting bouts in sunny days, while rain suppressed the surface activity. Summer heat forced the animals to go deeper to the burrows and sleeping aboveground also occurred during the night.

Repatriated animals occupy their home range in several stages. They establish temporal burrows in the first days after release and may dig secondary or even tertiary burrows when more appropriate patches, sometimes 200m apart, are found. Animals may travel between these burrows before deciding on final settlement.

Ground squirrels start their hibernation in burrows dug at local elevations in August. It takes about 5 days - during which there is gradually less movement - to change from active to hibernated status, then they spend the next 7 months in an underground nest chamber.



Monitoring of radio collared ground squirrels land use





Captive breeding of ground squirrels

As we experienced a general decrease in the status of Hungarian ground squirrel colonies, we decided to start an ex situ conservation action aiming at breeding the species under controlled conditions. We established a laboratory breeding stock from animals of the Dunántúl region. They hibernated in our climatic chamber simulating natural winter conditions, then were successfully bred in captivity. The offspring were successfully raised by their mother then started to feed on plants before they were released to the wild. The animals readily occupied the new area, thus the initial success was not impaired by the laboratory breeding. Their long-term success will be evaluated later by recapturing them next spring. We were able to establish all necessary steps of a long-term breeding programme, which is a viable extension but is not a substitute of the in situ conservation efforts.

Establishment of new European ground squirrel colonies

The active protection of remaining ground squirrel colonies involves two main steps, first to protect and improve the remaining habitats and then to re-establish new colonies on formerly occupied habitat patches. Our intervention is a necessary supplement to natural recolonization, as the short grass steppe occurs in fragmented and isolated areas not allowing for natural recolonization from neighbouring areas. Thus, even optimal but isolated habitat patches would remain empty without intervention.

We should also consider the genetic status of the remaining colonies, the habitat requirements of the species, and the ownership and the future maintenance of the grasslands before the actual repatriation actions. We should strive for less fragmented areas with proper land use, preferable grazing, for establishing new colonies or protecting the existing ones.

In frame of the LIFE project, we initiated the re-establishment of 18 new colonies. The success of these actions can

only be evaluated after a few years, when the colony survives and successfully breeds in the area. As there are independent factors reducing the habitat quality, leading to a general reduction of ground squirrel population density even in optimally maintained areas, the future of the species is uncertain.

Integrated species conservation effort

The deteriorating conservation status of the Hungarian ground squirrel population and the increasing public interest necessitated the national coordination of diversified conservation actions. The RAP-TORSPREYLIFE project initiated the extension of the expert board serving the decision-making process of the Directorate of Environmental Protection at the Ministry of Agriculture. The newly established Expert Board for blind mole rat and ground squirrel protection now evaluates and approves a yearly action plan serving the coordination of national activities for both protected species. The Board also suggests recommendations on land use regulations to improve the habitat of the target species.

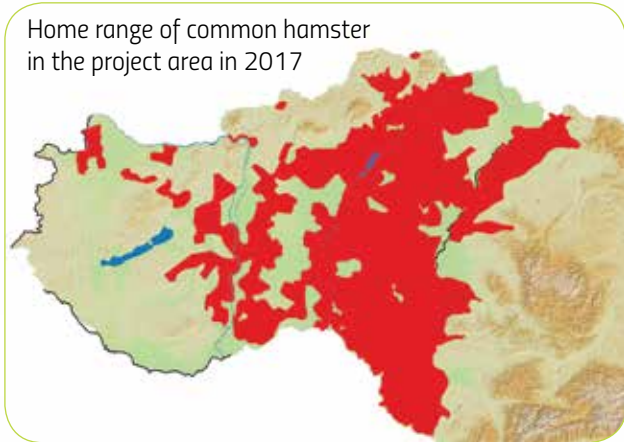
Integrating the previous experiences to new decisions, the Board also approved the Ground Squirrel Repatriation Protocol, based on the best practice. Future repatriation actions will only be permitted by the authorities if applicants adhere to this protocol.

As some of the healthiest colonies of European ground squirrel can be found at grassy airports, we published a plain booklet on grassland maintenance recommendations supporting the habitat requirements of ground squirrels. The booklet summarizes the common goals of airport and habitat maintenance and endorse practices supporting both regular functions of the airports and conservation aims.





THE COMMON HAMSTER
(*Cricetus cricetus*)

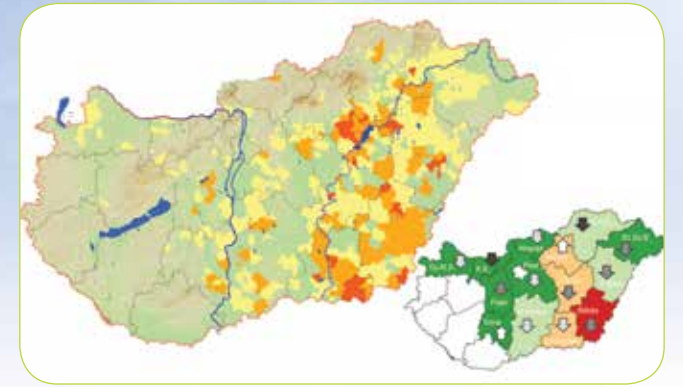


The common hamster is one of the most colourful rodents of the Carpathian Basin, with its rufous back, white and yellow facial stripes and black belly. It is fairly large, its body mass can reach half a kilogram. The hamster is rarely observed, as it mainly emerges from its burrow after dusk. Its underground burrow consists of a long tunnel system, with vertical sections. For winter, it is able to store large quantities of food in its underground chambers. While they are seemingly live colonially, hamsters lead a solitary life. Originally, the common hamster was a grassland species, but following the massive habitat loss, it was able to switch habitats, so that currently, it almost exclusively occurs in agricultural land. Besides arable land, hamsters also inhabit orchards, roadside verges, and they even enter settlements. Despite of its populations declining everywhere, it is considered a dangerous agricultural pest even now. In Hungary, it is especially rare in the western part of the Great Plain and in Transdanubia. Due to the intensively cultivated monoculture, the ploughing of roadside verges and the widespread use of modernized agricultural techniques, the size of their populations is constantly decreasing. The hamster plays an important ecological role. As a prey animal, it plays an important role in the survival of rare species such as the steppe polecat (*Mustela eversmanii*) and the imperial eagle. It is a protected species in Hungary, with a conservation value of 25 000 HUF (~80 EUR). It is also protected in Romania, with a value of 100 EUR.



Status of the hamster in Hungary and Romania

In Hungary, the common hamster is still treated as an agricultural pest, although its damage to agriculture occurs only occasionally. Since the 1970s, a gradual decline in hamster populations has been documented, which is also reflected in the regression of cyclical population outbreaks. Such an outbreak on national level last occurred in Hungary at the end of the 1990s. As a result of complex data collection within the framework of the project, the current distribution map of the species was prepared. According to the results of the survey, a general decline of hamster populations is happening in most parts of Hungary, and this is supported by food composition analyses of birds of prey. The hamster populations declined in almost every county, except Tolna, Pest and Heves, where it is stagnant. Despite the negative trend, it is still common in Békés County, and can be found in several places in Jász-Nagykun-Szolnok and Csongrád counties. In Romania, significant populations are still present in Banat and Crişana regions, certain areas of Transylvania, and the Romanian Plain. However, the proliferation of large-scale farming, the increased use of chemicals and the ploughing of roadside verges are, however, common practices in all plain areas of the country. This leads to a significant deterioration of the species' habitats, which probably causes a relatively slow, but general decline in Romania.



Establishing new hamster population

Formerly, some hamsters occurred in populated areas, but in course of the project it became clear that in a small region of Hungary, this has reached an unprecedented magnitude. At the same time, hamsters are getting rarer in arable land, and if the majority of the populations transfer to gardens, the hamster will no longer be available for the protected predators. Therefore, by capturing urban hamsters new colonies were created where protection could be insured, and which can also become accessible to predators. Our goal was to create new hamster populations, which are regulated by predators. As a result, the hamster re-appeared in the nearby breeding imperial eagles' diet.





HUNGARIAN BIRCH MOUSE
(*Sicista trizona*)



The Hungarian birch mouse is a small, mouse-like rodent with relatively long, semi-prehensile tail occurs exclusively in the Carpathian Basin. Nowadays it can be found only in Hungary, and its occurrence is restricted to a single site, the Borsodi-Mezőség Landscape Protection Area. Another population is known in Transylvania, however it is considered as a separate subspecies: the Transylvanian birch mouse (*Sicista trizona*). Until 2006, it was detected only from owl-pellets, but at less and less localities. The first live specimen was trapped after 70 years in 2006, and after 112 years in 2012 in Transylvania. Birch mice are omnivorous, consuming insects and arachnids, as well as seeds, fruit, bulbs, rhizomes, leaves, stems, and flowers. Once it was a widespread species of grasslands and pastures in the Great Hungarian Plain, but its distribution decreased drastically. Nowadays it is the rarest vertebrate species of Hungary and one of the most significant natural values of the country. Hungarian birch mouse is strictly protected in Hungary, its conservation value is 1 million HUF (~3100 EUR); protected also in Romania, but its value is not quantified.



Status of the Hungarian birch mouse in Hungary

While it subsisted only in a single location, the Hungarian birch mouse is on the brink of extinction. In the beginning of the project, the population size decreased drastically due to inadequate habitat management. By the recommendations made during the project, extensive grassland management by grazing was carried out in the habitats instead of mechanical mowing. As a result, the decline stopped and even a slight increase was observed. In addition to monitoring population size, we also put great emphasis on mapping the exact distribution during the project. Only three birch mouse habitat patches covering 68 ha were known in the Borsodi Mezőség which increased to six patches and 104 ha due to intensive surveys.



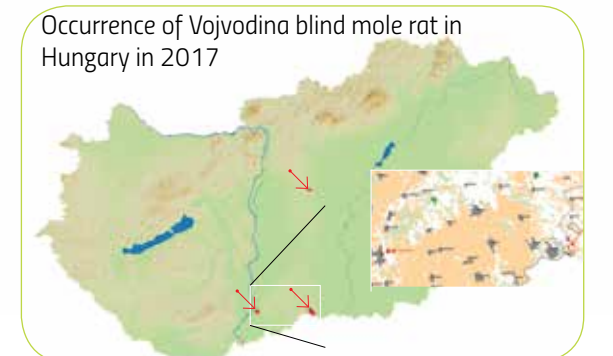
VOJVODINA BLIND MOLE RAT
(*Nannospalax montanosyrmensis*)

Blind mole rats are probably be the most peculiar mammals of the Carpathian basin. They spend their entire life underground without the need to come to the surface. This resulted in special morphology; they have long cylindrically shaped body, short legs, vestigial tail, no external ear and are completely blind. Their fur is greyish and surprisingly soft. Blind mole rats are digging borrows with their large incisors.

They have five, genetically distinct but morphologically indistinguishable, endemic species in the Carpathian basin. One of these species is the Vojvodina blind mole rat, which can be found only in the territory of Hungary and in the Vojvodina state of Serbia. Only four known populations remained and the total population are below one thousand individuals. Due to the low population number and the numerous threatening factors, the critically endangered Vojvodina blind mole rat can go extinct within decades without active help of nature conservation. It is a strictly protected species in Hungary and is valued at 1 million HUF (~3100 EUR).

Conserving the Vojvodina blind mole rat in Hungary

Vojvodina blind mole rat has three known populations in Hungary. Its isolated and fragmented population was found near Kelebia in 2008 with poor outlook for survival. The largest population of the species can be found near Baja, which (thanks to the results and efforts of our project) became protected in 2017. The third, small population near Albertirsa, just only have been discovered in 2017. In order to protect the decreasing and declining Kelebia population, in frame of our project, a new population was established nearby. Directly threatened individuals were saved from the Kelebia population and translocated to an area near Öttömös which was purchased for the project. The current small new population will hopefully start to significantly grow in the near future and populate the available 130 hectare sand steppe.



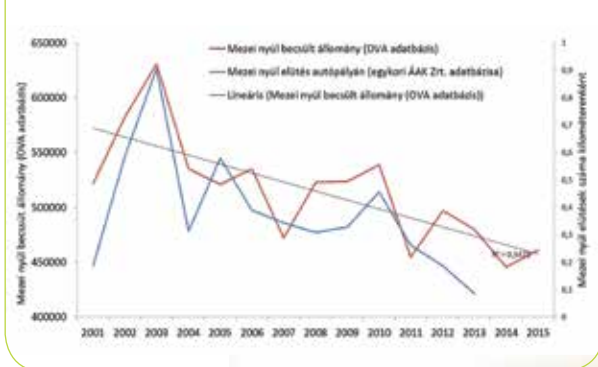


THE EUROPEAN HARE
(Lepus europaeus)

Home range of European hare in the project area in 2017



Changes of European hare's population



The European hare is a greyish-brownish coloured herbivorous mammal, with long black tipped ears and large sideways looking eyes. In Hungary, it can mainly be found in the Great and Little Hungarian Plain, but it is also widespread in the Romanian territories of the Great Plain. It can be found in various habitats, forests, pastures and agricultural areas alike. It is primarily active during the night. Its feeding place is adapted to the conditions of the countryside, which can even be a long distance from its daytime resting place. All edible plant parts can be found in its diet, including part of woody plants during the winter.

The European hare is the most important mammal species of small game management both in Hungary and Romania. Its importance in game hunting is high, but its population have shown a significant decline over the past decades. This trend can also be observed in Hungary and Romania. The cause of this is not well known, most often it is explained by the vulnerable negative effects of intensive agriculture. The hare is an important prey for many predatory animals, including the strictly protected eastern imperial eagle, therefore the decline of its population can also have a negative impact on our endangered natural values.

The status of the European hare in Hungary

According to the data of the National Game Management Database on hunting and the State Highway Management Company on animal road kill, the population of the European hare decreases both in the short and long term. Based on the available data, the status of the species has been deteriorating since the 1970s and the trend is likely to continue in the future. Unfortunately, the surveys and observations made during the project also support these findings. Several possible causes of the decline have been identified by various experts, the most important being the continuous decline or deterioration of the habitats of the species, over-exploitation (over-hunting), the more frequent extreme weather conditions, and the continuous growth of the population of fur bearers (fox, badger, and jackal). In course of the project, we tried to improve the status of the species through active interventions. We strived to restore and maintain the habitats of the species, and to encourage farmers to do the same. Through encouraging hunters, we aimed to reduce the highly proliferated fur bearer populations.





PRESERVATION AND RESTORATION OF HABITATS

Land purchase

For some habitats, it is very important that nature conservation interests are sustained during their management and utilization. In addition to the protection of an area, this can be assured through nature conservation asset management. Therefore, in frame of the project, in the area of Kiskunság and Nagykunság, nearly 135 acres of priority habitats were purchased for the conservation of endangered mammals, thus ensuring the preservation and proper management of grasslands.

Restoring the natural state of habitats

If the condition of a habitat for example in the absence of proper management deteriorates, it can lead to the reduction of natural grasslands. In the course of the project, we have restored the natural state of degraded habitats, so that they can once again be home to our precious steppe mammals. By setting up fences, we have prevented the wild boar from regularly digging up pastures, thus preventing the further weed infestation of the habitats. Fences also helped to keep fur bearers, the predators of these small mammals away. In the enclosed grasslands, the habitats suitable for the European ground squirrel were achieved through regular grazing and cleaning mowing. In frame of the project, we have purchased land that have been irregularly



utilized in recent decades, and where grazing was sometimes absent for years. This contributed to the spread of invasive, intensively spreading tree species, such as the silver berry, thereby suppressing natural grasslands. As a result, the habitat became unsuitable for the European ground squirrel and blind mole-rat. After removing the silver berry from the area, regular grazing of the area began, which enabled the regeneration of the habitat, making it suitable again for the European ground squirrel and blind mole-rat.

Ensuring connectivity of natural habitats

In landscapes dominated by agricultural land, mammals find less and less suitable habitats and shelter. Disappearing habitat patches, roadside verges, tree lines and earth holes lead to the disappearance of small mammals, and as such the prey of raptors. To stop this trend, we created vegetation strips consisting of grass and flowering plants of the legume, pea, or bean family in areas dominated by large agricultural land and tried to encourage farmers to do the same.

These green corridors or stepping stones were created partly in and between Natura 2000 sites. Not only did they provide connecting corridors between the remaining habitat patches, but due to the lack of agricultural activity they also provided habitats for small mammals living in the agricultural environment, such as the hamster and European hare. By developing these green corridors, we were able to facilitate the survival of some isolated hamster population. It was demonstrated to farmers how easily these agricultural habitats can be made more diverse, supporting the valuable small game population. Farmers participating in the program will be able to maintain these strips as part of the greening program in the future.





PUBLIC RELATIONS

The everyday life of a saker falcon family

Funding from the project allowed us, and the general public, to be able to observe the everyday lives of a saker falcon family nesting in a nest box atop a hydro pole. 24/7 coverage was provided on the homepage of the project and on the MAVIR website, which proved to be a great success. Hundreds of thousands of people from 140 countries showed interest by logging on and viewing the falcon family. Many people raised their concerns when the pair had a failed brood, but were exceptionally delighted when chicks were hatched successfully. The chicks were named by the general public and the name givers were able to attend when chicks were eventually ringed.



Mammal of the Year

Since 2014, in frame of the "Vadonleső Program" (www.vadonleso.hu) a "Mammal of the Year" is chosen each year. The goal of this initiative is to promote a native Hungarian mammal species in the given calendar year and plan scientific and conservation programs pertaining to it. In the past couple of years, two species involved in our projects have been chosen as the Mammal of the Year. In 2015, the European ground squirrel and in 2018 the blind mole-rat was chosen. During this time, we took part in countless events and programs including the 2-day annual Souslik and Blind mole-rat Gala organized by the Hungarian Natural History Museum.



European ground squirrel enclosures

The scope of this project included building three European ground squirrel enclosure across Hungary for the general public to be able to get a closer look at and learn about the characteristics of these delightful small mammals. One location was at the Budapest Zoo and Botanical Garden where animals can be viewed directly from the captive breeding establishment. Another exhibition was established in Túrkeve, at the Fekete István Education Centre run by the Nimfea Conservation Society, where visitors can observe the species in an open-air environment. The Lavender house in Tihany is home to the third observation area where visitors can gain insight into the lives of these little rodents through a touch screen system set up at the visitor centre. The images capture a Souslik colony near the Belső-tó, which is under video surveillance enabling the visitor to see the natural behaviour of this species. Thus, through the project we are not only able to provide the public with images of the species in the wild, to provide information on all the small mammal species involved in this project through interactive screens and pamphlets at each location.

International scientific conference

The results obtained during the course of the project were published to our peers as well. The conference was co-organized by our LIFE+ team and hosted over one hundred participants from 13 countries at the Hungarian Natural History Museum. The international European Ground Squirrel Meeting was combined with the Subterranean Mammal Workshop in 2018. Scientific research and practical knowledge was shared amongst the participants within the community over the course of a 5-day event.

Further information regarding the results of the project can be found in our pamphlets available at the Hungarian National Parks, our website (www.sakerlife3.mme.hu) or through the documentary video showing our work (<http://sakerlife3.mme.hu/hu/content/letoltes>).





RESULTS OBTAINED

Increased knowledge about small mammals in our grasslands

Through field work done in frame of the project, we were able to obtain a considerable amount of information about the European ground squirrel, the blind mole-rat, the hamster and the Hungarian birch mouse, which we hope will aid the further conservation efforts of these species. We have acquired extensive data about the distribution of the species, precise information about the number of populations, how their dynamics change over time and the factors that threaten the survival of these colonies. Furthermore, we have established just how important a role the proper management of grasslands plays in the sustaining ecological balance, as well as the impact of the saker falcon and imperial eagle on the populations of the studied species.

Deceleration in the decline of grassland small mammal populations

Since the initiation of the project we have seen a slow down in the decline of the European ground squirrel populations in Hungary. This achievement can partly be attributed to the exceedingly hard work done by the staff of the Hungarian National Parks in maintaining and protecting the grasslands inhabited by the small mammal species in our project, rehabilitation of degraded habitats and the critical attention they paid to the species in question. Furthermore, animals from stable populations in National Parks were used to establish new colonies in regions lacking these species.

Following the construction and implementation of grassland management strategies, it was evident that there was a cessation in the decrease of the Hungarian birch mouse population, in fact, by the end of the project, their numbers were on the rise.



Over the course of the project, an increase was seen in the number of Vojvodina blind mole-rat in the known populations in Hungary, as well as establishment of a new colony of this extraordinary species.

In light of our positive experiences throughout this project, we can establish that the actions in this program should be continued and even done on a larger scale in the country. Furthermore, management of grasslands must be prioritised at the time of application for changes in agricultural funding in order to avoid decline in the population of these species..

Initiation of a captive breeding population of the European ground squirrel

During the course of this project, a captive breeding population of European ground squirrel was successfully established. We hope that this achievement can be used as a tool in the future as the battle for the survival of the species continues. The first captive-born individuals were subsequently used to establish a new colony in the Fertő-Hanság National Park.

The basis for future conservation work

Through the work of the project, it was possible to compile the scientific information we obtained into professional materials, guidelines and action plans. Guidelines were implemented for habitat management, airports with grass runways, animal welfare of the European ground squirrels and for translocations. A working group was established for Soudk conservation, which coordinates activities involving the species, plans translocations and the creation of new habitats.

Public education

Handouts, posters, online tools, storybooks, colouring books, souvenirs, a documentary film, radio and television reports, and the "Mammal of the Year" program, in addition to special events have been used successfully over the course of our project to promote the species involved in the project to the public. Furthermore, initiative was taken to collaborate and stay in constant contact with members of the farming and hunting communities in order to maintain a good relationship and allow them to embrace the conservation of these grassland small mammals.





THE DATA OF THE PROJECT

The data of the RAPTORSPREYLIFE project:

Title: "Securing prey sources for endangered Falco cherrug and Aquila heliaca population in the Carpathian basin" ID: LIFE13 NAT/HU/000183. Period: 01.07.2014 – 31.12.2018

Budget:

Total budget:	2.894.178 €,
Financed by the European Union:	2.170.606 €, (75%)
Co-financed by the Hungarian Ministry of Agriculture:	194.208 € (6,7%)
Co-financed by the beneficiaries:	529.364 € (18,3%)

Coordinating beneficiary:

- Fertő Hanság National Park Directorate (FHNP), Magyarország

Associated beneficiaries:

- Bükk Mammalogical Society (BEKE), Hungary
- Balaton-felvidéki National Park Directorate (BfNPD), Hungary
- Budapest Zoo & Botanical garden (FÁNK), Hungary
- Kaposvári University (KAPOSVÁR), Hungary
- Kiskunság National Park Directorate (KNPD), Hungary
- Madárvilág Nonprofit Ltd. (MADÁRVILÁG), Hungary
- Hungarian Transmission System Operator Company Ltd (MAVIR), Hungary
- BirdLife Hungary (MME), Hungary
- Association „Milvus Group” (MILVUS), Romania
- Nimfea Environment and Nature Conservation Association (Nimfea), Hungary
- Órség National Park Directorate (ÖNPD), Hungary
- Environmental Protection Agency of Satu Mare County (EPA SM), Romania

For further information, read the downloadable documents of the project at

<http://sakerlife3.mme.hu/en>

Or watch our project film at the website: <http://sakerlife3.mme.hu/hu/content/letoltes>

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