Ochrana přírody

2025 Czech Nature Conservation

Fifty Years of the SPA Landscape

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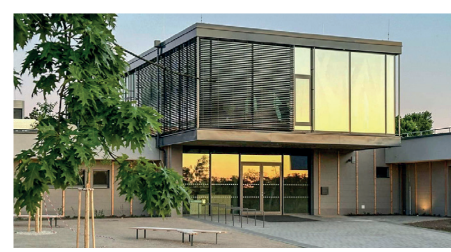
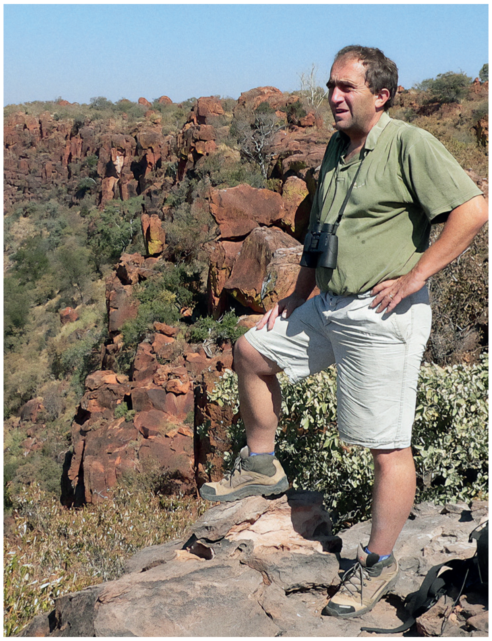
Summary



Cover Photo: Kokořínsko-Máchův kraj/Mácha's Country Protected Landscape Area © Zdeněk Patzelt



Dear readers, colleagues, friends,

You are getting into your hands the sixth annual special issue of the Ochrana přírody/Nature Conservation Journal. The 80th anniversary of the first issue of the journal is approaching and the world has changed dramatically in that time. Despite efforts to protect and conserve both terrestrial and marine natural ecosystems, there has been enormous damage to them. We have destroyed a third of all rainforests and degraded another one third. The planet's human population has grown from 2.3 to 8 billion today. Despite the partial successes in nature conservation, the negative trend is clear and raises the question of whether our efforts are worthwhile. We have not succeeded in halting the negative trends, but we have at least contributed to weakening them. This and partial local successes oblige us. From a geo-evolutionary point of view, it does not matter whether the rainforest, rhinos or the European rhinoceros beetle will fully disappear in 20 or 50 years. Nevertheless, from the point of view of the human community, it definitely matters! We have been creating a valuable time for decisions to be made by ourselves and, more importantly, by those who come after us. They, too, should have the choice of whether to follow the path of sustainable development or to prefer short-term benefits and continue to destroy the biosphere. The search for space-based life forms and the settlement of other planets is scientifically exciting, but it must not give us the impression that we can destroy the Earth, because there are possibilities to settle elsewhere. Therefore, in this context, our activities make more sense than ever.

The European Union's Nature Restoration Law and the Biodiversity Strategy provide a framework for ambitious improvements in the protection, conservation and management of the natural environment. However, they face a number of challenges. Russia's aggression in Ukraine, which can also be seen as the terrifying product of a deranged perception of values, is not helping to eliminate them. Euro-Atlantic society is far from perfect, causing itself many problems, but the Russian approach is perverse. The ongoing war is contributing not only to the destruction of human lives and property, but also to huge environmental damage on a regional and global level.

Last year also brought news in nature conservation in the Czech Republic. These include the designation of the Soutok/Confluence Protected Landscape Area, which will enable much better to protect, conserve and manage the unique floodplain forests and river floodplains over an area of 125 km^2. The declaration of a fifth national park, Křivoklátsko, and the transformation of species protection to conserve biodiversity more effectively are in the process of being approved. Complex negotiations are also underway to establish a large protected landscape area, the Krušné hory/Ore Mts. Although it is not possible to predict the outcome at this moment, the fact that the legislative process has been there cannot be considered bad news.

In this anthology, we present a representative overview of selected articles and summaries of other contributions over the past year. This gives even foreign readers a basic insight into the activities in nature conservation and landscape protection in the Czech Republic. I wish you a pleasant and inspiring reading.

František Pelc

Director of the Nature Conservation Agency of the Czech Republic

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AGENTURA OCHRANY PŘÍRODY A KRAJINY ČESKÉ REPUBLIKY

Decaying Wood – A World of Wilderness

Pavel Hubený

"Mess in the forest! Who has ever seen such a thing, leaving so much wood to rot uselessly!" Such words have been heard in the Šumava/Bohemian Forest Mts./Bohemian Forest Mts. for over thirty years. Fortunately, less and less frequently. Anyone who visits the Šumava/Bohemian Forest Mts. will certainly notice the striking amount of dead wood in the forests, tree rows, on the edges of fields or balks, and in abandoned meadows. Dead wood is primarily produced by nature, but in Specially Protected Areas in the Czech Republic it is also deliberately created by nature conservationists. Wood that has been cut into pieces or possibly debarked, shining in the green of the bilberry bushes, may not seem particularly conservation-oriented, yet it is worth considering why such wood is better than none at all.

Dying tree trunks are sources of life for the next generations of trees. © Pavel Hubený

Dead trees are part of the wilderness

Šumava/Bohemian Forest Mts.' Holocene nature has always been predominantly forested. And in the natural wild forest, wood not only grows but also dies; whole generations of trees grow and perish. Were it not for fungi and certain insect species that can break down cellulose, the Šumava/Bohemian Forest Mts. landscape would today be covered by several metres of dead trunks. In the past, it was almost like that in some places! Let us delve into the knowledge of those who experienced it: *"Then we will also see hundreds, even thousands, of uprooted trees, their trunks lying here individually or in piled heaps, covered with moss and lichen, overgrown with clumps of heather and bilberry, and interconnected by myriads of roots and plant tendrils..."* (Klostermann 1890). In the even older Joseph II's cadastre, we read that: *"Here, one can see many fully grown and large trees, which actually only root in old, completely rotted windthrows. However, they do not reach the actual forest soil and are thus left to perish in all windstorms. And thus, one windthrow piles upon another, giving the impression of a wasteland, devoid of use and culture."*

Water reservoir

For dried wood, which is not exposed to precipitation in the long-term, water constitutes about 12% of its weight. Višňová (2017) studied the dynamics of nutrient release from dead spruce wood on Mt. Trojmezná. Among other findings, she demonstrated that dead wood is a significant water reservoir. The still compact wood of recently dead Norway spruces (*Picea abies*), when most of the trunk is still covered in bark and a nail can be pressed in by hand to a depth of no more than 2 cm, has an average water content of 39%. At the next stage of decay, when the wood is partially decomposed and a nail can be pressed in up to 5 cm by hand, the water content is nearly 58%. Subsequently, wood that shows signs of complete decay and is soft is made up of more than 70% water. At this stage of decomposition, we even find trunks in which the water outweighs the dry matter. Based on experience from across the entire Šumava/Bohemian Forest Mts. National Park, most trees are found in the first two categories about 10 to 20 years after death. Most trunks, especially those lying on the ground and in vegetation, which have been dead for more

In the Boubín Primeval Forest, fallen trunks have been accumulating in layers over decades. © Pavel Hubený

Drama in mountain spruce forests: windthrow and European spruce bark beetle. © Pavel Hubený

Trunks decay over decades. And they continue to affect the future of the local forest. © Pavel Hubený

Red-belted brackets (*Fomitopsis pinicola*), stem-decay fungi, inhabit most of the bark beetle-damaged dry trees. © Pavel Hubený

than 20 years, fall into the "soft wood" category – and thus have a very high water content in their decaying tissue. The experiments carried out by Chromčák (2022), which monitored the ability of dead wood to gradually evaporate water as it dries, showed that even with about a month of no precipitation, while the outer edge of the wood dries to around 11% water content, the inner part of the wood retains around 25% water. He also found that wood 2 to 3 years after death has a moisture content ranging from 18% to 53%, depending on temperature and precipitation. Wood and water in the Šumava/Bohemian Forest Mts. form an inseparable pair – decaying wood continuously increases the water content, thus effectively enhancing water retention throughout the entire ecosystem. Unlike living trees, dead wood does not actively evaporate water, and thus transforms into life-giving biomass similar to soil.

Will it burn?

So far, it seems that the risk of fire, the development of which is accelerated by dead wood, is relatively low. The CzechGlobe FireRisk web project considers water content in dead wood below 15% to be a fire risk. As we can see from the moisture levels described above, such a risk is posed only by freshly dead wood, which is at most a few years old. Older dead wood can also be risky, but only after more than a month of exposure to drought. Such a situation is still relatively rare in the Šumava/Bohemian Forest Mts.; in 2023, it occurred only in August when, in some areas, water saturation dropped below 15% for an uninterrupted period of approx. 25 days. At most stations in the FireRisk network in the Šumava/Bohemian Forest Mts., it was mainly a case of short-term droughts lasting 5 to 10 days. It seems that soils behave in a similar manner to dead wood. Research by Šamonil (2023) indicates that, while soils with 50–80% skeleton content were more sensitive to water shortages, the majority of the assessed soils were highly water-retentive. The range of available water capacity in the profile was between 118 and 340 mm. This allows vegetation moisture requirements to be met for several tens of days in the absence of water supply, with approximately 40–60% of this capacity being allocated to the main root zone (to a depth of about 30–40 cm). It is true that the soil surface dries out more quickly during dry periods. However, if it is largely covered by dead wood, the risk of desiccation is reduced.

How much of it is lying there?

A ten-year measurement on permanent monitoring plots in a part of the National Park, where no management takes place and the forest is left to spontaneous development, revealed that, on average, there are 82 m^3 of dead trunks of various dimensions per hectare. A more detailed analysis of the degree of waterlogging in their decayed parts, lying in the area for 20 to 25 years, showed that approximately 60% of their volume consists of water. Nearly 50 m^3 of water per hectare! Around 70% of this water is fixed in the trunks, which appear as compact solid logs. The amount of water retained in the trunks increases with the extent of their decay. It is essentially influenced by the time that has passed since their death and the extent of contact with moist ground (Čížková 2016). If we try to imagine how much water the trunks of dead wood will retain in the same forests in another 20 years, we arrive at a value of around an additional 70 m^3/ha.

In some forest stands, nearly the entire stand stock has died. More than 600 m^3 of wood per hectare is gradually decaying. In a few decades, this volume will consist more of water than wood. The decaying wood provides a nutrient-rich environment for the development of organisms, will become a structure supporting the growth of new trees, and will protect the soil from drying out.


Many dead standing trees remain for more than two decades. © Pavel Hubený

The trunks prevent water runoff

In an area left undisturbed for 15–25 years after a European spruce bark beetle (*Ips typograhus)* outbreak, an average of 420 windthrow trees per hectare lie in various stages of decay. Around 150 trees per hectare form an obstacle to surface water runoff, meaning they lie roughly at contour level and are in full contact with the ground. The average length of such an obstacle is 4 m, and the average height is 33 cm. In approximately 55 obstacles per hectare, we observed an effect on vegetation change, in that it allows the growth of sphagnum mosses at the contact point between the ground and the obstacle. The effect of surface water retention there is thus long-term. In 40 obstacles per hectare, we observed a change in vegetation at the contact point between the trunk and the ground, favouring shade-loving forest species, such as the Hair moss (*Polytrichum* sp.), Greater wood-rush (*Luzula sylvatica*), and the Wood sorrel (*Oxalis acetosella*). More than half of the fallen trunks that slow down runoff directly affect the vegetation in their immediate vicinity, and more than a third of these fallen trunks clearly function as retention elements; small wetlands with sphagnum mosses are formed at the contact point between the obstacle and the ground (Čížková 2016).

A million barriers

When we restore peatbogs, we usually divide drainage channels into smaller sections with a large number of artificial dams, which are then filled with soil previously dug up. Dead wood does something similar on a vast area. Since no trunk stands forever, most dead trees eventually fall to the ground, and their trunks break into shorter sections. As decomposition progresses and the individual trunks and their fragments become heavier with the absorbed water, they increasingly submerge first into the vegetation, and later into the leaf litter and soil. On the ground surface, a network of structures forms of varying heights and water saturation, whose surfaces absorb and capture rainfall as well as melting snow. Subsequently, the number of small shadows and damp corners reduces evaporation and allows for greater water absorption throughout the entire ecosystem. Ultimately, this entire network becomes permeated by fungi, covered by lichens and mosses, creating a unique connection between living trees, vegetation, and the soil.

An age-old ecosystem is restored.

Windthrow as a reservoir

At the end of the 19th century, Czech female writer Eliška Krásnohorská wrote about the Šumava/Bohemian Forest Mts. (Šubert 1895): *“Uprooted trees lay about in chaotic heaps, forming marvellous pyramids, towers, and gateways here and there; elsewhere, an entire slope descending to the plain was covered by a wide, long band of pale-coloured wood, as if a torrent of fine ice shards were cascading down the hillside… An immense number of trunks have been burned, felled, and hauled away, as the vast, almost empty spaces bear witness. Yet in remote and inaccessible places, thousands of tree corpses still decay in their airy graves – some with their unearthed roots thrust skywards, others raising the skeletal remains of their crowns into the stormy winds that splinter and topple them, until at last they all lie flat, like those already around them, overgrown with lush lichen and ringed by bilberries.”* After hurricane Kyril in 2007, many parts of the Šumava/Bohemian Forest Mts. looked much the same. Thousands of trunks lay piled atop one another in broad swathes; many were broken, but most had been uprooted. The slopes were darkened by a vast number of exposed root plates. And at that moment, a conservationist may have thought to themselves that the tractor ruts they had recently fined someone for were a mere trifle in comparison to this. But over time, we came to understand that there is a major difference between windthrow and tractor ruts. Under

Uprooted trees gradually turn into piles of organic debris, altering both soil structure and terrain. © Pavel Hubený

the wheels of heavy machinery, the soil becomes compacted, making life more difficult for soil microorganisms. Kilometres of tractor skid trails scarred the landscape and did, in fact, lead to its drainage. They always ran downslope, and over time their grooves turned into small streams, drawing water off the entire hillside. Windthrows, however, as it turned out, have quite the opposite effect. Their pools, often several metres wide, collect water, concentrate it, and allow it to infiltrate into the exposed soil and debris. It became clear that Šumava/Bohemian Forest Mts. forests are full of these depressions, and some of them date back as far as a thousand years. Based on analyses of windthrows from the Boubín Primeval Forest and other Šumava/Bohemian Forest Mts. sites, Phillips and Šamonil (2021) ultimately concluded that it is precisely windthrow dynamics that have a fundamental influence on soil formation and diversity, as well as on the differing infiltration of water into the subsoil. And all of this, in the end, leads to a different geomorphological development of the entire Šumava/Bohemian Forest Mts.mountain landscape, in which the spruce and its repeated uprooting are not only the drivers of high soil moisture but also creators of their own optimal living environment.

Future soil

Dead trees gradually become part of the soil environment. This process usually takes several decades, depending on the size and species of the tree and on the character of the site. Undoubtedly, it also depends on the abundance of fungi present in the area. According to analyses by Vrška (2018), trunks in the Boubín Primeval Forest break down over a period of 55 to 90 years. However, fragmented tree trunks can, in some cases, survive for more than a century. In the Šumava/Bohemian Forest Mts., one can find remnants of wood beneath the stilted roots of spruce trees over a hundred years old, from which they originally grew. As the wood decays, nutrients that the tree absorbed during its life are gradually released. In spruce forests, approximately two hundred kilogrammes of calcium and around thirty kilogrammes of magnesium are fixed per hectare. As wood decomposes, the chemistry of the soils and the water running off it gradually changes. Probably due to the accumulation of dead wood in the Plešné Lake catchment area, after a period of strong acidification its aquatic environment restored faster than originally expected. Due to collaboration with fungi as dead wood continues to decompose, it accumulates additional nutrients from the surrounding environment, primarily nitrogen and phosphorus. In contrast, calcium, magnesium, and potassium decrease in the wood as it breaks down. These nutrients are consumed by other organisms throughout the ecosystem, with the most significant consumption occurring by the growing living trees.

Diversity

Decaying wood is a world of wilderness. Various stages of deadwood remain an integral part of Šumava/Bohemian Forest Mts. forests. In fact, it is mainly the presence of deadwood that evokes the true "impression of wilderness" in us. But it does not only affect us. I often hear that to achieve high species diversity it is better to have open land. However, this mainly concerns plants and insects. A wild forest full of dead wood also has high species diversity, especially in fungi and insects that depend on decaying wood. In the Boubín Primeval Forest, on just 47 hectares, hundreds of species of wood-decomposing fungi can be found, some of which are extremely rare. Without the long-term presence of a large number of decaying trunks in various stages of decomposition, we would not have such gems there as the bracket fungus *Amylocystis lapponica*, *Phellinidium pouzarii*, or *Dentipratulum bialoviesense* which was recently discovered by Jan Holec. A large number of dead spruces in the Šumava/Bohemian Forest Mts. National Park has enabled the rediscovery of the Large flat bark beetle (*Peltis grossa*) and confirmation of a large population of the longhorn beetle, the Hairy pine borer (*Tragosoma depsarium*). Without dead wood, these species would not have survived until today. And without a large amount of new dead wood, they might have soon become completely extinct in the Šumava/Bohemian Forest Mts.

And so, we can conclude with the words: Hail the dead trees! Hail the wilderness! ■

The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

Fifty Years of the spa Landscape

Jindřich Horáček

The Slavkovský les/Slavkov Forest Mts. is a beautiful area with a rich cultural heritage, where humans have been coexisting with nature since ancient times. Previous generations declared the area between the West Bohemian spas a Protected Landscape Area (PLA); this was in 1974. Today, it feels like a distant history, spanning half a century. What has happened since then? Was it the right thing to do? What has been protected there?

Serpentine outcrops in the Křížky/Little Crosses National Nature Reserve, with the Upolínová louka/Globeflower Meadow below the Křížky/Little Crosses and the plateau of the Slavkovský les/Slavkov Forest Mts. behind them. On the horizon, the highest peaks in the area – Mt. Lysina (on the left) and Mt. Lesný. © Přemysl Tájek

Granite boulders in the Kynžvart Chateau Park. © Přemysl Tájek

The beginning: the spa towns

The first known impulse to protect the spa landscape is from 1948. It is mentioned in a report by the nature conservationist from the town of Mariánské Lázně/Marienbad, Jaroslav Gotthard (1903–1961). The keen geologist and secondary school teacher persisted in his efforts and, seven years later, submitted a preliminary proposal to the Ministry of Culture recommending the area for protection.

Landscape protection in the West Bohemian Spa Triangle became a prominent theme again at the turn of the 1970s and 1980s. In the northern part of the Slavskovský les/Slavkov Forest Mts., a proposal was made to establish PLA in the Karlovy Vary/Carlsbad region, including designation of protected parks and gardens in the spa town. At the parliamentary level, the Health and Social Committee of the Czech National Council declared protection of the spa area to be necessary and recommended that appropriate measures be taken to this end. The District of Cheb/Eger and of Karlovy Vary/Carlsbad eventually dealt with the issue themselves; the so-called "Petition of the Five Seals" was drawn up. The spa towns of Františkovy Lázně, Jáchymov, Karlovy Vary/Carlsbad, Lázně Kynžvart, and Mariánské Lázně/Marienbad asked the State Monument Care and Nature Conservation based in Prague to establish the Slavkovsjý les/Slavkov Forest Mts. PLA. The spa resorts collectively demanded maximum nature conservation and argued for a harmonious environment in which all the requirements that make comprehensive spa treatment possible were aesthetically balanced. The result was the Decree of the Ministry of Culture of the Czech Republic of 3 May 1974 establishing the Slavkovský les/Slavkov Forest Mts. PLA. This created the first and, to this day, only PLA in the Czech Republic whose mission is to ensure the integrity of natural healing resources.

The 1970s: building a solid foundation

In September 1974, the PLA Administration started working. It was based in the town of Mariánské Lázně/Marienbad in the modest conditions of Svatý Jiří/Saint George House and from 1976 in the City House. Within a few years, its five professional employees were surrounded by an unprecedented phenomenon – supporters of the Slavkovský les/Slavkov Forest Mts. It was a team of almost a hundred people of various professions and social groups, who built the then unique Smraďoch (1976), Kladská (1977), and Křížky (1979) educational paths/nature trails. In those days, the magazine *Arnika* was equally unique, with its first issue published in 1976. The conceptual framework of the 1970s did not have time to grow old. On the contrary, both the educational paths/nature trails in the centre of the Slavkovský les/Slavkov Forest Mts. Forest and Arnika magazine have still been a key tool of communication with the general public to this day.

The beginnings of PLA activities were built largely on voluntary enthusiasm. It was not easy for the Administration staff, who represented a state-established institution. The State Nature Conservancy operated under the Ministry of Culture of the Czech Republic and was based on twenty paragraphs in a vague legal framework from 1956. If they wanted to achieve something, their natural authority and subtle diplomacy was the decisive factor. In today's business speak, we would say they used the right persuasion techniques. And they were successful. They were able to exclude large areas of wet meadows from drainage at a time when the State strongly favoured the opposite, namely systematic land reclamation. Later, their successors declared these saved meadows and wetlands as Nature Reserves and Nature Monuments. Among many of them, we can mention for example Upolínová louka/Globeflower Meadow (1990), Mokřady pod Vlčkem/Wetlands under the Vlček/Little Wolf Ridge (1995), and Rašeliniště U myslivny/At Gamekeeper's Lodge Peatbog (2006). After almost forty years, the purpose of their work was further fulfilled in 2012, when the wetlands of the Slavkovský les/Slavkov Forest Mts. achieved international recognition. The vast area within the central part of the Slavkovský les/Slavkov Forest Mts. and the adjacent Tepelská vrchovina/Teplá Highlands in the PLA was included in the list of the world's outstanding wetland areas, *i.e.* Wetlands of International Importance, protected by the Ramsar Convention under the designation "Springs and mires of Slavkov Forest".

The 1980s: collaboration with the Ministry of Health and the burden of pollution

1981 was an important milestone in the history of the PLA as an institution; an agreement with the Czech Inspectorate of Spas and Mineral Springs on cooperation and mutual representation was concluded. This was valuable interaction with the Ministry of Health of the Czech Republic. It was a significant act, one that was far from just a formal procedure. For more than a decade, it fundamentally strengthened the State Nature Conservancy's decision-making position in the Slavkovský les/Slavkov Forest Mts. in the most essential aspect: the harmonious connection between living and non-living nature, and linking the local biota with the spa and its natural healing resources. Specifically, in the infiltration area of the Mariánské Lázně/Marienbad spring structure, which stretches from the southern edge to the centre of the Slavkovský les/Slavkov Forest Mts., as well as in its northern part, which influences the formation of the Karlovy Vary/Carlsbad thermal spring.

However, the 1980s also saw the culmination of a serious and now largely forgotten reminder; the mountain range there is one of the first places in the Czech Republic where the effects of air pollution were documented. Thousands of hectares of forest stands were damaged by air pollution, mainly from industrial and mining enterprises around the Slavkovský les/Slavkov Forest Mts. An example is the Kladská Forest Management Unit (1983–1993), where all the stands were classified as special purpose forests, in the subcategory of air pollution damage. With the exception of the summit of Lesný, total dieback never occurred; the Slavkovský les/Slavkov Forest Mts. did not suffer the fate of the Krušné hory/Ore Mountains. Good rainfall

The Jelení Skok/Red Deer's Jump view point above the spa of Karlovy Vary/Carlsbad. In the valley by the Teplá River, the Hot Spring Colonnade, with the beech forests of the recently declared Karlův hvozd/Charles Deep Forest Nature Reserve in the background. © Přemysl Tájek balance at that time and the fact that the Norway spruce (*Picea abies*) is a native woody plant species in the upper parts of the Slavkovský les/Slavkov Forest Mts. probably had a favourable influence. Forestry operations supported by the PLA Administration never ceased to strive for natural regeneration in forest growths. This was the case even during the peak of the air pollution disaster, when the so-called replacement tree species, such as the Blue spruce (*Picea pungens*), were used in the neighbouring Krušné hory/Ore Mountains. Thanks to the greening of air pollution sources, especially desulphurisation in coal-fired power units, air pollution chemical concentrations have been on a downward trend since the late 1980s. The Slavkovský les/Slavkov Forest Mts. coped with the very difficult period and the mutual respect of foresters and conservationists at that time clearly contributed to the preservation of native woody plant/tree species, even in the highest parts of the Slavkovský les/Slavkov Forest.

The 1990s: a time of major changes

Large-scale drainage of waterlogged soils has had a major impact on the Slavkovský les/Slavkov Forest Mts. landscape. And often there were no sound reasons for it, unless we are referring to the implementation of the state plan. With the turn of the century, these activities ceased and water retention in the landscape began to be promoted. This was a positive change, although in many places it came too late; for example, it failed to prevent the disappearance of the Black grouse (*Lyrurus tetrix*) from their historical lekking sites. Arable land heavily enriched with nitrogen fertilisers was also disappearing. The change was triggered by the new economic situation in agriculture. It was a significant qualitative shift; potato fields on the plateaus in the Slavkovský les/Slavkov Forest Mts. were replaced by grassy pastures. Permanent grassland may be perceived as a monotonous habitat, but in the conditions of the Slavkovský les/Slavkov Forest Mts. it is now the best matrix for agricultural landscape management with the shallow genesis of mineral springs.

Every era leaves its mark, and it is no different in the history of the Slavkovský les/Slavkov Forest Mts. PLA. The first twenty years of its existence established a very solid foundation for the dynamic changes that occurred after 1992. At that time, the revolutionary new Act on Nature Conservation and Landscape Protection strengthened both species and territorial protection. This was a fundamental change, which brought the social importance of nature conservation into a whole new 'orbit'. In contrast to the past, the status of the PLA Administration also changed – it began to function as a true Public/State Administrtaion authority. It was granted new powers, undertook new activities requiring relevant professional support, and finally received much-needed staff reinforcement. Finally, after years of theoretical discussions, it was possible to start a systematic declaration of small-size Specially Protected Areas, such as Údolí Teplé/Teplá River Valley Nature Reserve (1992), Prameniště Teplé(Teplá River Soring Nature Reserve (1993), and Podhorní vrch Nature Reserve (1998). The first broader scientific studies of natural sites were also launched, which enriched existing knowledge of the Slavkovský les/Slavkov Forest Mts. On the other hand, enthusiastic volunteering started disappearing, giving way to a more transactional 'give and take' approach.

Turn of the century: active landscape management and care of visitors

The turn of the century marked a significant shift in the protection, conservation and management of the Slavkovský les/Slavkov Forest Mts. The PLA Administration got a new tool – management of selected sites. It had space for targeted activities, the financial means to do so, and was making full use of it. These were a wide range of special measures to stabilise and improve the quality of local natural habitats, which are now being implemented. Sheep grazing returned to serpentinite sites. Wet meadows that had lain fallow for decades were regularly mowed. Water runoff slowed down in the Kladská Peatbogs and drainage channels created during the military forestry period by ammunition were sealed off. Mineral springs that had not been maintained for years were cleaned and covered. New lines of trees were established in the open landscape and European silver fir (*Abies alba*) trees planted in forests beyond the scope of the forest management plan. The flower meadows, which had not been maintained for over forty years, was freed from continuous encroachment. Small water bodies were built, often extensive systems of pools in the source areas of key catchments/river basins. The impact on the nature of the Slavkovský les/Slavkov Forest Mts. became apparent quite early on. A textbook example is the stabilisation of the flagship species of wet meadows, the Marsh fritillary (*Euphydryas aurinia)*; this is an endangered species at the pan-European level and within the Czech Republic, being currently found only in the western part of Bohemia.

For the guests of the world-famous local spa resorts, the Slavkovský les/Slavkov Forest Mts. provide a natural therapeutic backdrop. For the PLA Administration, this means an exceptional mission, one that comes with responsibility. In addition to the spa forests, the traditional hunting village of Kladská is a common destination for spa guests, for which the PLA Administration continuously maintains the necessary infrastructure. The number of visitors to Kladská and its surroundings has grown exponentially over the years, especially after 2000. Therefore, in 2010, the boardwalk leading around the lake to Kladská Peatbogs National Nature Reserve was extended and enhanced with new stops. The credit for this goes to the foresters, a permanent and reliable partner of the PLA Administration. Cooperation with Forests of the Czech Republic, state enterprise, continued in 2012, when the Slavkovský les/Slavkov Forest Mts. House of Nature was opened at Kladská. A visitor centre was built where guests can find both relaxation and information in a well-equipped facility and can use a two-kilometre-long circuit on boardwalks leading to the inaccessible wetland of the Kladská peatbogs. This is a key destination point in the Slavkovský les/ Slavkov Forest Mts., which requires a perfect partnership between State Nature Conservancy authorities, forest management body, and the spa town to operate. A positive fact is that Kladská is not the only site where similar cooperation has been established, all to the benefit of nature and its visitors.

The vision of the spa towns has been implemented

It has been fifty years since the spa towns in western Bohemia wished to protect the spa landscape. Today, they can be fully satisfied. Their wish has come true and their shared vision has been significantly elevated; in 2017, a new Agreement on Mutual Cooperation was concluded with the Ministry of Health of the Czech Republic and the Czech Inspectorate of Spas and Mineral Springs. It has defined new cooperation between the State Nature

Conservancy authorities and the needs of spa towns, at the level of Public/State Administration, joint projects, and provision of data and information. In July 2021, the Slavkovský les/Slavkov Forest Mts. landscape was inscribed on the UNESCO World Heritage List. For the first time, the local landscape is officially designated as therapeutic. Karlovy Vary/Carlsbad and Mariánské Lázně/Marientbad, together with Františkovy Lázně, are included in the prestigious list of eleven European spa towns in seven European countries under the title of the Great Spa Towns of Europe. In the declaration itself, emphasis was placed on the spa landscape context. Therefore, buffer zones were established to appropriately cover the forests, which reasonably circle around Mariánské Lázně/Marienbad and Karlovy Vary/Carlsbad. Targeted cooperation between the State Nature Conservancy and National Heritage authorities has also enabled designation of the Kladská Landscape Conservation Zone (2020). Thus, protection of the landscape scenery/character in the central part of the Slavkovský les/Slavkov Forest Mts. has been significantly strengthened.

A significant event in recent times has been obtaining climatic spa status for Mariánské Lázně/Marienbad (2023). The climatic spa now covers the core part of the PLA, as well as the UNESCO World Heritage Site buffer zone and the Kladská Landscape Conservation Zone. It is another example of the uniqueness of the nature in the Slavkovský les/Slavkov Forest Mts. and the interplay of landscape values and the interests of individual ministries/sectors. With a bit of exaggeration, it can be said that the Slavkovský les/Slavkov Forest Mts. PLA is a recognised healing resource. What more could a visitor and nature conservationist ask for!

There is a saying that nature can do without us, but we cannot do without nature. That is why, even in times of prosperity, we should be able to recognise the small links and not succumb to "ostrich syndrome". This is what those who started nature conservation activities fifty years ago did. They were consistent, did not stay entrenched and, instead, offered appropriate solutions. Compared to today, they had a modest background, but despite that, they succeeded and deserve deep respect for it.

Let us hope that the next fifty years will be at least as kind to the Slavkovský les/Slavkov Forest Mts. as the past years have been. ■

Granite rocks in Svatošské skály/Svatoš Rocks National Nature Monument. Together with the surrounding predominantly beech forests, they are part of the Kaňon Ohře/Ohře River Canyon Bird Area, i.e. Special Area of Conservation under EU Birds Directive. © Přemysl Tájek

The Krušné hory/Ore Mountains Protected Landscape Area?

Petr Krása, Lenka Libichová & František Pelc

One of the tasks in the Programme Statement of the Government of the Czech Republic issued in March 2023 is the preparation of documents for the designation of the Krušné hory/Ore Mountains (also known as Erzgebirge) Protected Landscape Area in cooperation with the municipalities and regions concerned. So to what extent has the commitment been fulfilled just now when the Ministry of the Environment of the Czech Republic has announced its intention to designate the Krušné hory/Ore Mts. Protected Landscape Area as a public decree, and how long is the way to really achieving this goal?

Velký močál/Great Fen open raised peatbog in the central SW part of the mountain range. © Petr Krása

Peaty habitats are a typical part of the Krušné hory/Ore Mountains ecosystems. © Petr Krása

Natural values

The Krušné hory/Ore Mountains are an approx. 120 km long mountainous area extending from the Jindřichovická vrchovina/Jindřichovice Highlands near the town of Luby in the southwest to the Nakléřovická hornatina/Nakléřovice Uplands near the village of Petrovice in the northeast. Due to Alpine rock folding, the south-eastern margin of the range was formed into a linear edge made by steep slopes of tectonically lifted plates or fault block. Over short distances, altitude differences often exceeding 600 m were created. The fault blocks are inclined to the northwest, where they gradually descend to lower positions. The state border with the Federal Republic of Germany is situated roughly on the range axis. The main ridge is flattened, creating plateaus with faint peaks of over 900 m in altitude. The highest part of the range is concentrated in the southwestern third, where it rises into a part with more prominent peaks exceeding the 1000 m mark and culminates in the Klínovec massif with Fichtelberg (1,214 m) as its highest peak in Germany and Klínovec (1,244 m) in Czechia. Towards the northeast, the ridge abruptly falls 200 m down to an adjacent peneplain. The peaks often show rock formations like rock walls and frost blocks, which are sometimes supplemented by more extensive block fields.

The Krušné hory/Ore Mts.' climate is influenced by a prevailing westerly flow. Annual precipitation exceeds 1,000 mm and the mean annual temperature fluctuates between 4 and 6 °C, in the Mt. Klínovec area even lower. The range is mostly drained by streams which use transverse faults perpendicular to the long axis of the mountain ridge. The Saxon part is drained into the Mulde river, the Czech one into the Ohře/Eger and Bílina rivers. The shape of the plateau has given rise to large spring areas in the shallow floodplains of the upper streams and, together with the humid climate, has preconditioned the formation of peatbogs on the impermeable layers of the prevailing granite bedrock.

Raised peatbogs cover a total area of about 4,000 ha. Their character and extent are comparable to the iconic peatbogs of the Šumava/Bohemian Forest Mts. range. Raised peatbogs with dwarf pine, most often *Pinus ×ascendens* nothosubsp. *skalickyi*, prevail. Open peatbogs with ponds and gullies are less frequent, but are one of the best-preserved habitats there. The peat layer exceeds several metres in depth, and a depth of even 10.5 m has been measured in the Pod Novoveským vrchem peatbog. The typical raised-peatbog flora also includes relict occurrence of the Marsh Labrador tea (*Ledum palustre*), the Dwarf birch (*Betula nana)*, and the Bog rosemary (*Andromeda polifolia*). The margins of the Velký močál pond are inhabited by the English sundew (*Drosera anglica*) and rarely also *D. ×obovata*. The bog sedge (*Carex limosa*) and more

Mountainous landscape with scattered buildings in the surroundings of the village of Nové Hamry. © Petr Krása

rarely also the Rannoch-rush (*Scheuchzeria palustris*) are typical of gully vegetation. The raised bogs are bordered by boggy and waterlogged spruce forests of various quality, often forming extensive complexes. Sporadically, the Interrupted clubmoss (*Lycopodium annotinum)* grows there, even more rarely also the Lesser twayblade (*Listera cordata*). Boggy forests in shallow non-forest depressions are accompanied by many transitional peatbogs and spring fens. There the Common butterwort (*Pinguicula vulgaris*) rarely grows, in the more mineral-rich springs also for example the felworth *Swertia perennis* and the Hairy stonecrop (*Sedum villosum*), the Water blinks (*Montia fontana* subsp. *Amporitana*) grows scattered in grassy spring fens.

Whereas peatbog habitats are concentrated in the western and central parts of the peneplain at the mountain ridge, the eastern half is much more covered by grassland communities, with habitats of montane oatgrass (T*risetum* spp.) meadows and mesic button-grass (*Arrhenatherum* spp.) meadows prevailing at lower elevations. Valuable mountain meadows are however found all over the range. Typical species growing here include the Bald money (*Meum athamanticum*), a locally common plant, further the Black rampion (*Phyteuma nigrum*), the Broad-leaved meadow-grass (*Poa chaixii*), and the Wild pansy *Viola tricolor* subsp. *polychroma*). On the other hand, the steep slopes heading eastwards to Krušné hory/Ore Mountain basins are mostly covered with extensive beech forests accompanied by oak and oak-birch forests, especially in contact with the Ohře/Eger River in the central part. Acidophilous beech forests are the most widespread type of beech forest there. Part of them are among the best-preserved and largest beech stands of the Bohemian Massif, *e.g.* those in Jezerka National Nature Monument and Točník-Kapucín Nature Reserve. They include fragments of montane sycamore-beech forests often with typically twisted trees, while herb-rich beech forests grow at lower elevations. The species composition of the herb layers in broadleaved stands is very rich. Depending on habitat characteristics, the Martagon lilly (*Lilium martagon*), the Perennial honesty (*Lunaria rediviva*), the Bird's nest orchid *(Neottia nidus-avis)*, and the Large white buttercup (*Ranunculus platanifolius*) can be found growing there.

Spruce forests, from cultural to reed grass (*Calamagrostis* spp.) stands occur throughout the mountain range, in the Mt. Klinovec massif also climactic mountain fern stands are found. The Alpine coltsfoot (*Homogyne alpine)* is a frequent plant species, while the Hard fen (*Blechnum spicant*) and the Clasping twistedstalk (*Streptopus amplexifolius)* are locally scattered. A rare plant to be mentioned is the One-flowered wintergreen (*Moneses uniflora*).

As the current vegetation is largely influenced by extensive mining activities in the past five centuries, vegetation of anthropogenic habitats is typical of the Krušné hory/Ore Mts., *e.g.* shrub communities of secondary heaths on spoil heaps, slag dumps, stone mounds, and larger areas abandoned after removing the surface cover for mining there. Rare species growing at such sites are the Wolf's bane (*Arnica montana*) and several alpine clubmosses like *Diphasiastrum alpinum*, *D.* ×*issleri*, and *D.* ×*zeilleri*. A unique historical work of our ancestors is the Blatná water ditch, now a National Cultural Monument, which used to bring locally scarce water to the mine industry at Horní Blatná, at a distance of 20 km. Its course is inhabited by the strongly endangered Alpine pondweed (*Potamogeton alpinus)* occurring there almost continuously for several kilometres, probably being the species' largest population in the Czech Republic.

An important specific environment linked to the mining history is the unimaginably vast underground of mined ore tunnels and large chambers together with surface phenomena such as sinkholes. Deep depressions in the surface look like a mountain karst environment in morphology and microclimate, although these habitats are species-poor. It is the shady and damp habitat of the depressions harbouring the Alpine blue-sow-thistle (*Cicerbita alpine*). The underground itself reveals the geological structure and is the proof of the Krušné hory/Ore Mts.' mineralogical diversity linked to the mined ore wealth. This environment is also the winter habitat for more than 12 bat species, the rarest ones being the Northern bat (*Eptesicus nilssonii)*), Bechstein's bat (*Myotis bechsteinii*), Geoffroy's bat (*M. emarginatus*) and the very rare Pond bat (*M. dasycneme*).

The Grey wolf (*Canis lupus*) has regularly appeared over almost the entire length of the mountain range for several years and its current population can be considered stabilised there. On the Saxon side of the mountain range, a gradual reintroduction of Eurasian lynx (*Lynx lynx*) is being carried out.

Although the Western capercaillie (*Tetrao urogallus*) has probably disappeared finally from the mountains, the population of the related B**lack grouse (***Lyrurus tetrix) seems to be stable over the long term. It* is now regarded to be the largest in the Czech Republic despite that originally young substitute stands in clearings, which were suitable for the grouse, are disappearing and decaying, and the size of the Krušné hory/Ore Mts. local sub-populations are declining in many places.

The relict Dwarf birch (*Betula nana*) is one of the rarest species. © Petr Krása

Extensive heaths are typical habitats in the mining-altered landscape of the Krušné hory/Ore Mountains. © Petr Krása

Landscape values

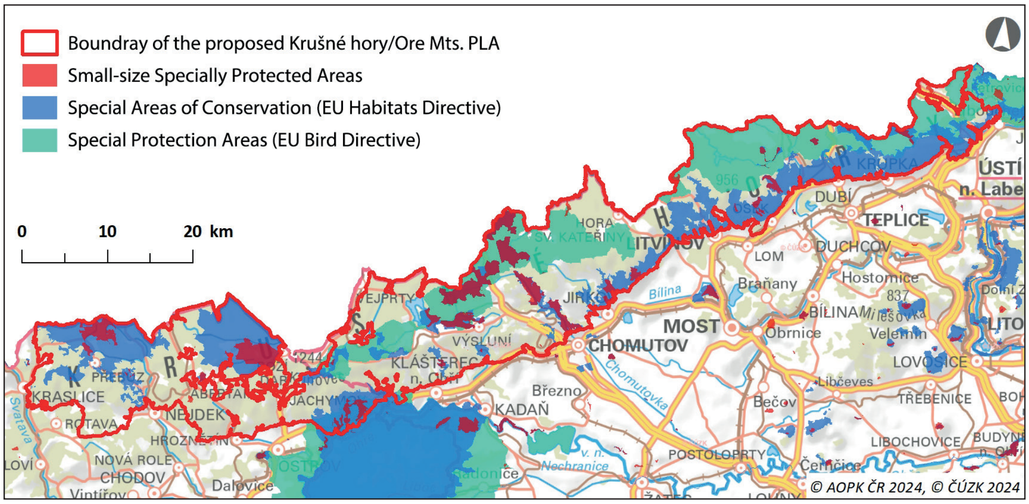
Besides its high natural values, the landscape of the Krušné hory/Ore Mts. landscape displays a distinctive imprint of the past, making it picturesque and unique.

Eight hundred years of almost continuous extraction of polymetallic ores and minerals have given the Krušné hory/Ore Mts. their unique appearance. The combination of geographically variable mineral production, topography, and a predominantly state-controlled mining system has determined the exploitation of the landscape: mining, water management and transport, ore processing, settlement, forestry, and agriculture. The extraction of minerals has had a major impact on the form of settlements

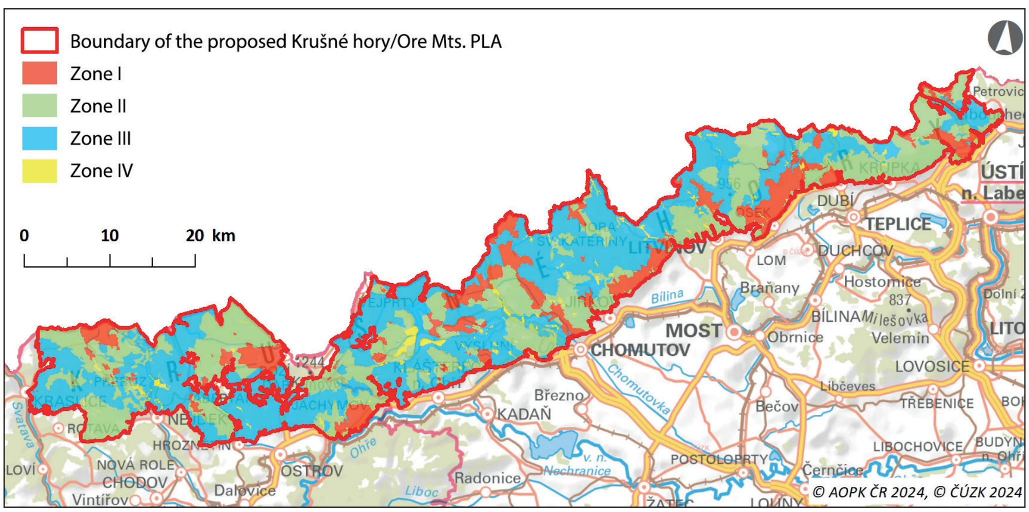
Black grouse (*Lyrurus tetrix*) male. © Petr Šaj

and landscape structure. Mining towns were initially mainly built unrestrainedly, and developed along with the mines. Later, in the 16th century, they were founded at greater distance from the mining areas and often as Renaissance towns with a large square-shaped square and streets and housing blocks in a chessboard arrangement (*e.g.* the municipalities of Horní Blatná, Mikulov, Výsluní, and Hora Svatého Šebestiána). In its most representative form, the Krušné hory/Ore Mts. landscape with remains of historical mining exploitation has been preserved and protected as a set of landscape conservation zones having been registered under the name Erzgebirge/Krušnohoří Mining Region as a UNESCO World Heritage Site since 2019. We can find there a range of specific features on the surface, mainly placer-mining and panning sites (groups of small mounds of sand and gravel formed by piling overburden material), surface outcrops (surface/open-pit quarries, depressions, sinkholes, *etc*.), shaft and gallery mouths, tailings, slag heaps, and spoil tips, but also under the ground, mainly galleries, tunnels, shafts, pits, and underground workings. Various mining objects, ore processing and smelting plants and mining water management facilities, including some unique well-preserved navigation channels, are also visible in the landscape.

In the lower parts of the Krušné hory/Ore Mts., the settlement and landscape structure typical of local agricultural colonisation in the 12th to the 14th centuries has been preserved, *i.e.* villages with long strips of land (*plužiny*) running from farmsteads roughly perpendicular to the longitudinal axis of the village, from the valley up the wooded hills. Colonisation proceeded mostly upstream of watercourses forming the axis of the settlement, perpendicularly connected to large fields and pastures. This pattern has been preserved in many villages to this day. The course of the *plužiny* is often documented by walls, the so-called agrarian mounds created by collecting stones from the fields and depositing them on boundaries. Their form is varied, from loose stone banks through constructed stone banks and walls to clay or stone-clay terraces. Depending on local conditions and declining utilisation, they have usually become overgrown with trees and specific vegetation, and are distinctive linear vegetation elements and habitats for a range of wild animal and plant species. They provide the landscape with distinct aesthetic and make it one of the Krušné hory/Ore Mts.' most valuable landscape types.



The proposed Krušné hory/Ore Mts. PLA and areas with enhanced nature conservation. © Jan Vrba



Preliminary Zonation Proposal of the Krušné hory/Ore Mts. PLA (2016) Divided into four zones based on natural and landscape characteristics. Expert basis for discussion with municipalities and land managers. © Jan Vrba

The Krušné hory/Ore Mountains from the nature conservation perspective

Large-scale protection of the Krušné hory/Ore Mts. has been under discussion for decades. One of the reasons why preparation of the designation of a protected area started only in 2022 is probably 'bad reputation'. The mountain range was situated in a region strongly affected by industrial air pollution and mining industry, and some of the dead forests have been restored in an ecologically questionable way (soil preparation with bulldozers, massive planting of non-native tree species). In spite of this burden, extraordinary landscapes and natural phenomena have been preserved there. This is supported by the fact that more than half of the range is protected in some form, *e.g.* Sites of European importance (SEI, pursuant to Act No. 114/1992 on Nature Conservation and Landscape Protection, as amended later, the term for Site of Community Importance, SCI, later Special Area of Conservation, SAC, under the European Union's Habitats Directive), Bird Areas (pursuant to the above act, the term for Special Protection Area, SPA under the EU Birds Directive), National Nature Reserves, Nature Reserves, Nature Monuments, and Nature Parks. The Krušné hory/Ore Mts. are also part of a protected natural water accumulation area. Nevertheless, they are the last large border range lacking comprehensive nature conservation in the Czech Republic, *i.e.* the mountain range as a whole is not a large-size Specially Protected Area. Pursuant to Act No. 114/1992 on Nature Conservation and Landscape Protection, as amended later, Site of Europena Importance, SEI is the term for Site of Community Importance, SCI, later Special Area of Conservation, SAC, under the European Union's Habitats Directive), while Bird Area (BA) is pursuant to the above act, the term for Special Protection Area, SPA under the EU Birds Dirctive.

Progress in preparation of Protected Landscape Area designation

During the past two years, basic documents for the Protected Landscape Area (PLA) have been completed: a proposal for the delimitation of an area approx. 1,220 km^2 in size, a classification of the PLA into zones, and other analytical materials. The original PLA delimitation proposal and indicative zonation proposal are shown on Map 3. Zone I occupies approx. 13% of the PLA territory and overlaps with Natura 2000 network core areas, generally composed of robust peatland communities and extensive close-to-nature beech forests and mixed forest stands. The original proposal for Zone IV, where built-up and developable areas are concentrated, accounts for approx. 2.5% of the proposed PLA territory. The PLA boundaries and zone delimitations are being modified following discussions with local governments/municipalities and farmers.

Most common concerns and opinions

During the negotiations, several hundred questions and objections were raised. Most of the often repeated questions and answers (access to forests, forest fruit collection) are published at the website of the Nature Conservation Agency of the Czech Republic (NCA CR). We here comment on four conceptual suggestions in more detail: urban development in villages, renewable energy sources, especially wind farms, forest management, and the appropriateness of protecting the area as a PLA.

1. Urban development. Fears that it would not even possible to build a henhouse in the PLA have mostly been allayed. However, to limit these concerns, it was necessary to expand Zone IV and some settlements, and to exclude developable areas from the PLA based on land-use/territorial and spatial plans, although the opposite would certainly be better for

Rock gate in a beech forest on steep slopes near the Jezerka National Nature Reserve border. © Radek Fišer

The English sundrew (*Drosera anglica*) occurs at a few raised peat-bogs only. © Petr Krása

cultivating the urbanisation of the complicated area. However, the complex negotiations have also provided the State Nature conservancy authorities with feedback on the direction of their activities within the area, particularly the emphasis that should be put on the regulatory elements of land-use/territorial and spatial plans and the thoughtful use of the institute of general measures, the content of which will be factually discussed with the municipalities. This will lead to a reduction in individual assessments of construction plans, most often in residential areas, which are of most interest to their residents and municipal representatives. Although these adjustments could be interpreted as too big concessions, they are rather a rational response to the development of social demands and a search for State Nature Conservancy's priorities in landscape protection.

2. Renewable energy sources (RES). The approach to the development of wind energy is contradictory on the part of the municipalities. A critical view used to prevail, but this has changed during the two years of negotiations, *e.g.* in view of changes in opinion in the municipal councils. It must be emphasised that a PLA itself is not and cannot be an absolute barrier, but an area where public interest in the installation and development of wind power technology (WPT) must be unbiasedly assessed and weighed against other public interests, such as nature conservation and landscape protection. This has already been happening now, including reflection on the impact on the European Natura 2000 network. On the other hand, logically no protected areas are included into the so-called Acceleration Zones for RES development. One of the basic documents for the PLA management plan is a preventive landscape assessment study, identifying landscape segments where WPT development is acceptable from the perspective of nature conservation and landscape protection, and areas where this is inappropriate. The PLA management plan will then be the starting point for the preparation and updating of land-use/territorial and spatial planning documents.

3. There will be primeval/virgin forest everywhere. There is no rational basis for the fear that the PLA will lead to the creation of large areas covered by primeval/virgin forest like stands left to spontaneous development. PLAs are not established with this aim. The local forests have undergone a complex historical development, during which considerable areas have been planted with monocultures of (especially Norway spruce) trees, which were destroyed by heavy air pollution in the second half of the last century, and unfortunately partly also by ecologically questionable forest management in an attempt to restore them. Establishment of the PLA would certainly contribute to more nature-friendly management as a whole, including the valuable (mainly beech) forests on mountain slopes, and to restoration of other forest stands (either stands of substitute trees, or spruce monocultures) towards a more natural species and spatial diversity. Of course, as is already the case now, we cannot not rule out designating forests suitable for spontaneous development in appropriate places. The question whether local spruce stands will survive is not causally linked to the existence of a PLA, but will depend primarily on the approach of the foresters and development in climate.

4. What is better, a National Park or contractual protection? With regard to the effort to improve the management of the Krušné hory/Ore Mts.' landscape and natural environment as a whole, including their cultural and historical values, a Protected Landscape Area is clearly the only relevant category of territorial protection. The fragments of close-to-nature communities are not large enough to designate a National Park therre. Its protection will be provided with appropriate PLA zonation, particularly by Zone I, the strictest protection regime. Contractual protection is completely irrelevant because of the protected area's extent, its ownership and administrative structure and objectives, and any attempts to employ this tool would not result in improved nature protection, conservation and management under the local conditions,

but in endless negotiations and a subsequent bureaucratic collapse. Contractual protection is appropriate in the case of relatively small to medium-sized segments of the natural environment with a low number of landowners, where ensuring purposeful management is essential for nature conservation. However, in relatively extensive areas, public law contracts under the provisions of Section 68 of the Act on Nature Conservation and Landscape Protection may be applied, which can appropriately replace contractual protection.

More than 100 meetings held during document preparation

In 2023 and 2024, about a hundred meetings on the planned designating a PLA were held with representatives of local governments (67 municipalities and 2 regions) and other interest groups (especially foresters). Although these were part of the preparation of technical documents and not primarily aimed at hearing the municipalities' attitudes, it can be tentatively concluded from the discussions that most entities rather accept the intention declaring a PLA, while less than half did not express an opinion, and a minor part has fundamental reservations or disagree (however, the proportions are dynamic and have changed over time). For example on July 1, 2024, an important meeting was held between the NCA CR and representatives of local governments in the central part of the mountain range (Jáchymov, Loučná pod Klínovcem, Abertamy, Kovářská, Kryštofovy Hamry, Pernink, and by proxy also Horní Blatná), where several demanding negotiations led to a compromise acceptable to both parties instead of the originally negative opinion. Some other municipalities *(e.g.* Blatno, Hora Svatého Šebestiána, and Kalek), covering around 12% of the planned PLA's territory, initiated the establishment of the Krušné hory/Ore Mountains Protected Landscape Area themselves, continually support it, and demand intensive activities on its preparation. A positive approach by the municipalities was also reflected in the requests to modify the zonation in favour of nature conservation, and finally, the Protected Landscape Area was even expanded according to an initiative by some municipalities to include the area around the village of Petrovice, which is separated by the D8 motorway but undoubtedly deserves to be part of the PLA.

Protected area development strategy in national and international context

The designation of the Krušné hory/Ore Mts. Protected Landscape Area (approx. 1,200 km^2) would also be a major contribution to the fulfilment of the Czech Republic's international and European Union obligations. According to the EU Biodiversity Strategy, the Member States should apply territorial nature protection on 30% of their territory (currently 22% in the Czech Republic) and strict protection should be implemented on one third of that, *i.e.* 10% (currently approx. 4%), by 2030. Designation of the Krušné hory/Ore Mts. PLA would also support better nature protection, conservation and management, as well as to a simplification and streamlining of public/state administration in nature conservation and landscape protection, as the whole area would be managed by one State Nature Conservancy authority, *i.e.* NCA CR, instead of 11 (8 municipalities with extended competence, 2 Regional Offices, and the NCA CR), and that even without an international context.

What would be the benefits of the PLA?

In a broader context, declaring the PLA would certainly be beneficial to the region, which has long been considered the most devastated in the Czech Republic, but having been still harbouring unique natural and cultural-historical sites that need better protection, conservation and management. The topic was also addressed by a conference held in collaboration with the Jan Evangelista Purkyně University in Ústí nad Labem in June 2024, and also discussed with municipalities and other partners. The whole region is currently undergoing an economic transformation and is looking for a new form after phasing out industry and brown coal/lignite mining. The declaration of the PLA would, besides better protection, conservation and management for the local nature and landscape, would also provide long-term economic stimuli there, offering long-term incentives to economy. In addition to a more effective use of public resources, the PLA would also be a suitable space for sustainable business in ecotourism and related branches. As it has already been mentioned, state administration in nature conservation would also be simplified. The Krušné hory/Ore Mts. PLA Administration, as part of the NCA CR, would have two accessible offices and one contact point. Having some new 30 professionally highly qualified jobs would be important for the region. In addition, facilities for visitors would be built *(e.g.* two Houses of Nature, information centres, and nature trails/educational paths).

We do not want to claim that the PLA will suddenly solve all the region's problems, but it would certainly be a long-term benefit. On the other hand, the designation of the PLA will certainly not be a brake on the economic development of the region, nor is that its aim.

Will we live to see a PLA?

On July 29, 2024, the Ministry of the Environment of the Czech Republic announced its intention to designate the Krušné hory/Ore Mts. Protected Landscape Area by a public decree. What is to follow? All affected municipalities were informed of the step and asked to publish it on their official notice boards, so that the municipalities as well as landowners and local farmers could make official comments and objections to the intention in three months. The comments will be processed over the following months in accordance with the Administrative Code and the procedure defined in the Act on Nature Conservation and Landscape Protection. Along with the announcement, a proposal for the internal zonation of the PLA, *i.e.* the delimitation of four zones with a graduated protection regime, was sent for comments. After concluding these proceedings, the Ministry will distribute the necessary documents for inter-ministerial discussion. Final approval of the PLA establishment is in hands of the Government of the Czech Republic, which will assess the progress and possibly include it in its Decree. The timeframe of the processes and the outcome are difficult to predict given the many factors involved. However, in view of the discussions so far and the efforts to find an acceptable solution, we can express at least a certain degree of optimism. The Krušné hory/Ore Mountains undoubtedly deserve increased interest and protection, and although many compromises had to be made in the proposal, the Protected Landscape Area is the most appropriate solution there. ■

The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

Dolní Kralovice Serpentinites – Restoring a Botanical Gem

Hana Pánková

The Dolní Kralovice serpentinites are located in the eastern part of the District of Benešov (Central Bohemia). The serpentinite body is relatively extensive, being 3.5 km long and 1 km in width. About half of the area is protected as the Hadce u Želivky National Nature Monument (NNM) and the Želivka Site of European Importance (SEI, pursuant to Act No. 114/1992 on Nature Conservation and Landscape Protection, as amended later, the term for Site of Community Importance, SCIs, later Special Area of Conservation, SACs, under the European Union's Habitats Directive), while the other half is part of a commercial forest. Since 2016, restoration of the entire site has been underway, with the aim of harmonising management both within the above Specially Protected Area and beyond it. Discussions are also ongoing with the owner, Forests of the Czech Republic, state enterprise, regarding transfer of land outside the SEI to special purpose forests.

Peri-Alpidic pine woodland in the Hadce u Želivky National Nature Monument is characterized by a high occurrence of lichens. © Hana Pánková

At sites where grazing was not possible, alternative management was introduced – mowing. © Hana Pánková

Serpentinite as a distinctive rock type

Serpentinites are metamorphosed ultrabasic rocks that contain significant amounts of iron and magnesium, trace amounts of heavy metals (nickel, chromium, cobalt), but a lack of essential nutrients, including calcium. The high presence of magnesium and heavy metals can have a toxic effect on plant growth (Homer *et al.* 1991). Serpentinites are dark in colour, making them highly heat-retentive. They are also characterised by very slow weathering, which is why exposed ridges, sharp rock outcrops, and steep rocky slopes are often found there. The soils are typically very shallow and skeletal, quickly draining water, which easily flows away over the parent rock. This leads to increased erosion, nutrient leaching, and a more pronounced influence of the parent rock's chemistry. As a result, plants are also exposed to another stress factor – drought (Lazarus *et al.* 2011). Due to their specific properties, such as toxicity, nutrient deficiency, and drought, serpentinite sites provide an inhospitable habitat for plant growth. However, certain plants have managed to adapt to these conditions (*e.g.* Brady *et al.* 2005; Anacker 2014; Arnold *et al.* 2016). There, many (sub)endemic plant species can also be found, such as the sandwort species *Minuartia smejkalii*, the Sandwort-leaved mouse-ear (*Cerastium alsinifolium*), and the Serpentine knautia (*Knautia serpentinicola*), as well as subspecies of the Alpine cinquefoil (*Potentilla crantzii* subsp. *serpentini*) and the Carthusian pink (*Dianthus carthusianorum* subsp. *capillifrons*). The vegetation there is different from its surroundings, with transitions that can sometimes be very abrupt (1–2 metres).

Species richness of the Dolní Kralovice serpentinites

The Dolní Kralovice serpentinites are among the most important serpentinite sites in the Czech Republic. On the serpentinite outcrops, we can encounter the endemic sandwort species *Minuartia smejkalii*, which has become an area's flagship species. Among other critically endangered species found there are, for example, a subspecies of the Alpine cinquefoil (*Potentilla crantzii* subsp. *serpentini*), the Narrow-leaved forget-me-not (*Myosotis stenophylla*), the Short-winged bitter milkwort (*Polygala amara* subsp. *brachyptera*), and the Carthusian pink. In addition, several critically endangered species (C2) occur there, such as the Serpentine spleenwort (*Asplenium cuneifolium*). Of regional (subnational) importance, the Alpine pennycress (*Thlaspi montanum*) and the Moravian bedstraw (*Galium valdepilosum*) are also worth mentioning. Particularly unique is the coexistence of several contrasting vegetation types: crevice vegetation of serpentinite rocks and screes on steep slopes, and serpentinite peri-alpidic (biogeographically related to the periphery of the Alps) *Sesleria* pine woodlands. On the slopes with a northern to western aspect, which are more shaded and humid, the *Sesleria* pine woodlands are dominated by the Blue moor grass (*Sesleria caerulea*), with the Alpine pennycress occurring in great abundance. On the south- to south-east-facing, directly sunlit rocks, pine woodland occurs with abundant xerophytes, often dominated by grasses such as the Sheep's fescue (*Festuca ovina*), Meadow oat-grass (*Helictotrichon pratense*), and

Vegetation on the steep slopes in the Hadce u Želivky National Nature Monument is formed by peri-Alpidic pine woodland. © Hana Pánková

the Purple-stem cat's-tail (*Phleum phleoides*). On the driest open patches, terrestrial lichens form more extensive stands. A total of 156 species of lichens and lichenicolous fungi have been recorded in the area, including the critically endangered Star-tipped reindeer lichen (*Cladonia stellaris*). The site is a rich habitat for fungi, with particularly important communities associated with oligotrophic, basic soil substrates – for example, species of the genus *Cortinarius* (webcaps). Also noteworthy is the occurrence of 29 butterfly species and 194 moth species. The most interesting findings include the Wood white butterfly (*Leptidea sinapis*), which is associated with glades in open serpentinite pine woodlands. Of the recorded xylophagous species, the discovery of the critically endangered 'primeval forest relict' *Nothorhina muricata* (a longhorn beetle) is particularly significant. This very rare species depends on sunlit trunks of old pine trees growing outside closed forest stands.

Adverse impacts caused by human activity

The most significant human impact was the construction of the Švihov Water Reservoir, which flooded most of the rocky outcrops, along with the building of the D1 motorway through the most valuable site's parts. A working serpentinite quarry is also located on the periphery of the area. Despite these negative impacts, high-quality serpentinite communities have been preserved across most of the site. Unfortunately, these human activities have resulted in the artificial fragmentation of the site into several separate sections. With the ban on woodland grazing and the subsequent intensification of forestry, the forest stand became denser and the herbaceous layer increased in cover. Before restoration began, the area had heavily been overgrown with self-seeding woody plants, the serpentinite surface was covered by a layer of humus, and serpentinite species were rapidly retreating and declining there.

Site management

Given the different vegetation characteristics and the fact that the area must be viewed as an 'island', the Management Plan requires a detailed understanding of the site's history, as well as the biology and ecology of the target species. On all habitats, however, one aspect is crucial: preserving the original chemistry of the serpentinite soils and maintaining open vegetation with minimal competition among species. The restoration of the serpentinite pine woodlands began in 2016, in close collaboration with the Nature Conservation Agency of the Czech Republic (NCA CR), the Czech Union for Nature Conservation (CUNC) Vlašim Local Chapter, and the Institute of Botany of the Academy of Sciences of the Czech Republic (IB CAS) within the NNM. The second phase followed outside the NNM. In both cases, key collaboration with the landowners was essential, namely Forest of the Czech Republic, state enterprise, Vltava River Basin Management Authority, state enterprise, and the Municipality of Bernartice. The third phase involved the 'reclamation' of abandoned parts of the Bernartice quarry, in cooperation with the mining company HSB Ltd.

All implemented management measures are being monitored in the long term. The impact on both the target communities and the populations of *Minuartia smejkalii* is being assessed. The presented results come solely from the NNM; data from other areas are too short-term but suggest similar trends. Data gathering across all areas will continue, and the data will be subsequently evaluated for all sites.

Opening up the vegetation

As part of habitat management, we started with removing self-seeding woody plants. In younger pine stands up to 40 years old, we opened up the vegetation significantly, creating smaller gaps or glades in places. During the course of the project, it became evident that cutting alder buckthorns (*Frangula alnus*) led to its rapid regrowth, so it was pulled out manually. As opening up primarily targeted the lower vegetation layers in the stand, its overall impact was not very high (up to 15%). At sites with a deeper soil horizon, stand opening led to the expansion of the Wood small reed (*Calamagrostis epigejos*), Purple moor-grass (*Molinia caerulea*), and the Black bent (*Agrostis gigantea*). As a result, mowing and woodland grazing by sheep were subsequently introduced there. The second issue associated with opening up was moss layer development. In the peri-Alpidic pine woodlands on steep south-facing rocks, we abandoned further opening up because it became evident that serpentinite species were suffering from drought due to prolonged dry conditions and high temperatures. In the context of expected climate change, it is advisable to support natural regeneration of Scots pines (*Pinus sylvestris*) in these areas as it would at least partially provide shade.

Topsoil removal and soil chemistry restoration

At sites where the serpentinite horizon was covered by a thicker layer of humus or vegetation, it was necessary to remove the layer to restore the soil's chemical properties and patterns. To protect the tree root systems, a combination of manual scraping and mechanical scraping with an excavator was used. Monitoring results showed that if the humus layer is not completely removed down to the serpentinite soil horizon, or if only small areas (2 × 2 m) are scraped, the site is quickly colonised by ruderal species. Serpentinite vegetation has developed gradually on the scraped areas. Initially, early successional species develop there, with dominance of the Annual meadow-grass (*Poa annua*), Scarlet pimpernel (*Anagallis arvensis*), and the Self-seeding spruce (*Picea*). In the second and third years, tall grasses and common meadow species dominate, such as the Tufted hair-grass (*Deschampsia caespitosa*), Hop trefoil (*Trifolium campestre*), and the Common bird's-foot trefoil (*Lotus corniculatus*). Examples of forest species or forest edge species include the Common dog-violet (*Viola riviniana*) and the Common centaury (*Centaurium erythraea*). Stable serpentinite vegetation begins to establish itself by the fourth year after scraping, with dominant species such as the Alpine cinquefoil, Sheep's fescue, and the Field wood-rush (*Luzula campestris*).

The rock outcrops are inhabited by endangered species, such as the Alpine cinquefoil (*Potentilla crantzii* subsp. *serpentine*). © Hana Pánková

Mowing and woodland grazing

In the stands with tall grasses, mowing was initiated twice a year, followed by woodland grazing (only in the NNM). A comparison between mowed and unmown areas showed that mowing has the greatest impact on reducing the red grass coverage and decreasing the amount of old grass. The impact on black bent was initially minimal, which may be due to its good vegetative reproduction; however, it is now almost absent from the site. Additionally, a reduction in the occurrence of self-seeding woody plants was observed there. The suppression of alder buckthorn was, however, achieved through manual uprooting; after mowing, it would quickly regrow. Mowing had a positive effect on typical species of calcareous pine forests, such as the Blue moor-grass, Sheep's fescue, Lady's bedstraw (*Galium verum*), and the Alpine pennycress. A slight positive impact was also observed on the Serpentine knautia. At the same time, mowing led to an increase in the amount of moss at the site.

Grazing took place only between 2019 and 2021 with a small number of sheep, so no significant difference in vegetation composition was observed between grazed and mown areas. However, a difference was recorded in moss layer coverage, where areas with higher sheep presence showed the creation of bare patches without vegetation.

Restoration of forest stands

A major issue has been high pressure from forest game animals (the Fallow deer *Dama dama* and the Roe deer *Capreolus capreolus*), which almost entirely prevents natural regeneration of the pine forest. Therefore, it was necessary to install protective fencing around young growths. Key to the pine forest restoration on serpentinites is to proceed in small areas of 2–5 ares to prevent excessive opening up, which leads to the immediate expansion of species such as the Wood small reed. This approach is more akin to restoration in beech or fir forests. This comes at the cost of poorer

In the past, the forests were used for grazing, which kept the vegetation open. For this reason, woodland grazing is also the primary management approach in the area. © Czech Union for Nature Conservation Vlašim Local Chapter archive

Due to strong pressure from forest game, sites for both natural and artificial forest regeneration need to be enclosed within fencing. © Hana Pánková

regeneration of young pines due to less light. However, this allows serpentinite plant species to become established at the edges and gradually in the centre, almost from the beginning of restoration, while expansive species do not spread into the older stands.

Detailed and accurate management is essential

The restoration of serpentinite pine forests in the Dolní Kralovice serpentinites took place both within the NNM (according to the Management Plan) and outside the Specially Protected Area (commercial forest). In both types of areas, a combination of opening, mowing, and woodland grazing was used along with the removal of the upper soil horizon. The aim was to unify the management approach across the entire serpentinite area. Thanks to good cooperation with the landowners, the unification has been successful.

The results of monitoring the impact of management measures have shown that their planning must consider broader contexts, including climate change. Although serpentinite species require an open canopy, we do not recommend opening up on south-facing slopes. Opening up the canopy also increases the risk of wood small reed expansion, and must therefore be followed by mowing or, ideally, grazing. One of the key measures – whether to support serpentinite species or natural forest restoration – is the removal of the upper soil layer. These measures, however, need to be implemented decisively so that the exposed patches are large enough and not rapidly overgrown by vegetation. However, serpentinite species spread slowly, so their occurrence in the target areas can only be expected from the fourth year onwards. It is therefore important to create a varied mosaic of habitat conditions as habitat patches at the site, from which both trees and serpentinite species can benefit. To support serpentinite species, it is advisable to establish these exposed patches outside of pine mast years and before the first seeds ripen. In contrast, if our aim is natural pine restoration, it is best to scrape the soil in a mast year before seed dispersal. A major issue is browsing by forest game animals, which primarily focus on herbs while avoiding coarse grasses such as fescues, oat-grasses, and reed grasses. As a result, some serpentinite species, including the sandwort species *Minuartia smejkalii*, are unable to produce seeds at certain sites, leading to a significant decline in their populations. Game animals also hinder forest restoration, making it necessary to fence off all stands. ■

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The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

Landscape Policy of the Czech Republic

Martin Bílý & Linda Stuchlíková

In the Czech Republic there may seem to be a wide range of conceptual, strategic and other documents focused – either primarily or as part of a broader spectrum of interests – on nature conservation and landscape protection.

Farmland/agricultural landscape structured by landscape elements is key to sustainable land management and biodiversity conservation. © Linda Stuchlíková

For successful adaptation to ongoing climate change, it is essential to protect existing natural systems due to their inherent ability to withstand extreme fluctuations such as droughts or floods. © Linda Stuchlíková

Individual components of the landscape – agricultural, forest, aquatic ecosystems, human settlements and technical infrastructure – should be balanced and coexist in synergy. © Linda Stuchlíková

These include international documents such as the Global Biodiversity Framework, the European Landscape Convention, and the Nature Restoration Regulation, which is hopefully nearing final approval and will serve as the basis for the National Nature Restoration Plan.

Among national documents, the most prominent include the Strategy on Adaptation to Climate Change in the Czech Republic, the related National Action Plan for Adaptation to Climate Change, and the National Biodiversity Strategy of the Czech Republic. Assessing the success of implementing these documents and their objectives as well as the effectiveness of the measures taken would be a topic for a separate article – or even several. However, when looking at the Czech Republic's landscape on a broader scale, the picture is far from encouraging. Although a number of local improvements can be found – resulting from various types of restoration measures or shifts towards more nature-friendly forestry and agricultural practices – the overall state of the landscape is not improving; if anything, it is deteriorating.

The landscape in the Czech Republic as a whole is overly homogeneous, lacking features that would enhance its ecological stability, help retain greater volumes of water, and prevent or at least mitigate soil erosion. There has been a long-term decline in biodiversity at all its levels. The condition and resilience of the landscape and its individual components are such that they are easily susceptible to negative external influences (drivers). A prime example of this was the European spruce bark beetle outbreak (*Ips typographus*) in forests a few years ago, which clearly demonstrated that adaptation to climate change is not a long-term vision, but an immediate necessity. It is essential not only to maintain and enhance landscape stability and health, but also to prepare it for a range of difficult-to-predict events related to ongoing and probably accelerating climate change, as well as for a number of new demands on land use. It is also necessary to mention the expected unprecedented development of renewable energy sources, associated with the planned transition to a carbon-free economy in the coming decades.

Restoration of the Rokytka Rivulet in Prague – a natural floodplain with active retention – an area designated for the harmless overflow of high water which, conversely, slowly drains from the floodplain during dry periods. © Linda Stuchlíková

Origins and emergence of landscape policy

The demand for landscape planning has been evident for a long time. However, views differ on what exactly this term entails. Opinions are polarized, ranging from the idea of an all-encompassing, almost idyllic resolution of conflicts between economic interests in the land and those of nature conservation and landscape protection, to the strengthening and enhancement of expertise in land-use/territorial spatial planning tools, all the way to a more sceptical view that sees landscape planning as just another study for the study.

The Ministry of the Environment of the Czech Republic (MoE) is aware of its role in the strategic and methodological grounding of landscape planning. Tasks aimed at defining this concept are already included in the above National Adaptation Strategy approved by the Government. The connection with the European Landscape Convention, which the Czech Republic signed in 2002 and which came into force in 2004 is also clear. Each contracting party to the Convention commits to introducing and implementing landscape policies focused on the landscape protection, management, and planning.

To achieve sufficient technical/expert support and capacity, the MoE has included the topic of landscape planning in the reforms of the National Recovery Plan, which is a European Union's economic instrument designed for reforms and investments in its Member States to revive the economy after the COVID-19 pandemic and to support green and digital transformation. The reform activity in the National Recovery Plan – preparation of the Landscape Policy strategic document – was approved by the Government in Decree No. 437 on June 14, 2023. A wide range of expert institutions is collaborating with the MoE on the preparation of the Landscape Policy, particularly the Nature Conservation Agency of the Czech Republic, the Silva Tarouca Research Institute for Landscape and Ornamental Gardening (now the Research Institute for Landscape), as well as CzechGlobe, the Global Change Research Institute of the Czech Academy of Sciences.

Intensive preparation of the document began at the start of 2024. Six expert working groups were established to develop the supporting materials (Biodiversity, Water, Forestry, Agriculture, Settlements and Culture, Infrastructure). The working groups were composed not only of MoE staff but also of representatives from other ministries, various research institutions, non-governmental organisations, and business associations, ensuring a broad range of opinions within the groups and that all significant and legitimate interests related to land use were considered. In the first phase of preparing the Landscape Policy, its analytical part will be developed, which will describe problems and challenges within the landscape. This will be followed by the proposal part, with the outcome of the definition of specific goals and tools for effective planning and use of the landscape in the Czech Republic.

The above-mentioned reform under the National Recovery Plan is to be completed by 2026 at the latest. However, it is expected that the Landscape Policy document will be approved by the current Government through its resolution as a Decree, as it was this Government that commissioned it from the MoE by the Decree already referred to. Approval should therefore ideally take place no later than autumn 2025. Before final approval of the entire document, a public consultation process is also planned.

Landscape policy objectives

The aim of the Landscape Policy is not to create new tools for landscape planning, but rather to identify the landscape's priority needs and assess existing tools for achieving them. It has long been evident that the main problems facing the landscape in the Czech Republic do not lie in the absence of such tools, but rather in their suboptimal design and, consequently, inefficiency of their use. In this context, we can mention tools from the framework of several legal regulations. Under the Act on Nature Conservation and Landscape Protection, a Territorial System of Ecological Stability (TSES), *i.e.* multi-level ecological network across the whole country, is defined, which still plays an irreplaceable role in nature conservation and landscape protection. However, it needs to be better aligned with current scientific knowledge, as well as with the evolving demands on land use mentioned earlier. The same applies to Significant Landscape Elements (SLEs), which can undoubtedly be regarded as a key tool for the general area-based protection and conservation of nature and the landscape. However, its application in practice often shows shortcomings, partly due to insufficient methodological guidance from the MoE. Tools of other ministries also play an important role in landscape planning, particularly those of the Ministry of Regional Development of the Czech Republic and the Ministry of Agriculture of the Czech Republic. The MoE considers land-use/territorial or spatial planning tools to be absolutely essential. An example of successful cooperation between the two ministries can be seen in the development of a methodology for the application of spatial landscape studies, which can currently be funded for the administrative districts of municipalities with extended powers under the Operational Programme Environment. Better methodological guidance is certainly warranted for the concept of landscape organisation as part of land-use/territorial or spatial plans. In addition to the mentioned land-use/territorial or spatial planning tools, tools from the Ministry of Agriculture will also be analysed, e.g. comprehensive land replotting/land consolidation or reparcelling, interventions and conditions of the Common Agricultural Policy, and forestry planning.

Landscape planning methodology

The development and elaboration of the Landscape Policy should be immediately followed by the development of the Landscape Planning Methodology. It should not be an action plan for Landscape Policy, but rather a guide for the effective use of planning tools, land use, conservation, and landscape management in practice. For this tool to be practical and effective, it will be necessary to link it with existing frameworks, or possibly modified ones, provided by specific legal regulations. The focus there will primarily be on the necessary connection with the above land-use/territorial or spatial planning documents. The term landscape planning has been appearing in various technical/expert documents for some time; however, it has not yet been clearly methodologically defined and, most importantly, connected with legislative tools. Therefore, one of the key tasks of landscape planning will thus be linking documents of different hierarchical levels, which currently does not function optimally in practice.

Connections with other strategies

Currently, other strategic documents in nature conservation and landscape protection are being prepared, or are starting to be prepared. In connection with the expected approval of the Nature Restoration Regulation, preparation of the National Restoration Plan (NRP) should also begin in the near future. This will be a tool whose foundations will be shared in certain areas with the Landscape Policy, particularly in the topics of biodiversity conservation. The difference between the two documents will primarily be in the specific scope, with the NRP proposing implementation of specific indicators according to the individual articles that the Nature Restoration Regulation directly mandates for EU Member States, or which Member States choose from a broader set of indicators. Together with the Landscape Policy, an update of the Biodiversity Conservation Strategy is also being prepared, which is expected to be valid from 2026. The preparation of such a large number of documents will certainly be challenging, and great emphasis will need to be placed on optimally linking them.

Landscape planning as a broad discussion

We cannot expect the Landscape Policy document on its own to solve all the problems, difficulties and challenges of the landscape in the Czech Republic; at the same time, we do not want to have a wishful thinking strategy, which we will, at most, distribute at seminars in an effort to spread goodwill. The Landscape Policy is being developed in cooperation of ministries, will be approved by the Government of the Czech Republic, and may thus assign specific tasks to individual ministries. The MoE is guided by the aim to foster a constructive debate with economic sectors during the development of the Policy and to strengthen the role of tools that will help align the interests of nature conservation and landscape protection with those of its economic use. We live in the human-modified, cultural landscape, and in the context of ongoing climate change and its negative impacts, the role of natural systems has been becoming increasingly important. The protection and conservation of existing aquatic and terrestrial ecosystems as well as the restoration of those damaged into naturally stable and resilient ones is key to reducing the vulnerability of landscape and its economic use in the Czech Republic. ■

The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

Ecologically Significant Elements (Landscape Elements) as Part of the Ecological Network

Pavel Pešout

The Czech Republic's ecological network consists of a system of large core areas (protected areas, biocentres) interconnected by linear ways or routes (biocorridors) or stepping stones. It is thus a spatial network of landscape elements ensuring the preservation or improvement of the state of species populations and habitats, and thereby the health of ecosystems, including the processes taking place in them. It essentially strengthens the resistance and resilience of the landscape structure, and the sustainability of renewable natural resources during ongoing climate change.

In the Czech Republic, ecological network is a multilayered system including the entire biological infrastructure – view of agricultural landscape from Svatý Kopeček/Sacred Little Hill near the town of Mikulov (South Moravia) with landscape elements of various categories. © Pavel Pešout

According to the Government Decree, Ecologically Significant Elements also include landscape orchards (in the photo: old orchard in Džbány-Žebrák Nature Park, Central Bohemia). Unlike other ESEs, these are non-productive areas and therefore, they are not tax-exempt. Support for their maintenance falls under the specific AECM (Agri-environment-climate Measures) subvention programme/subsidy scheme of the Common Agricultural Policy. © Pavel Pešout

In the Czech Republic, nature conservation and landscape protection and land-use/territorial planning use a wide range of complementary tools used to establish and maintain the ecological network, however unfortunately often separately. The Czech Republic's ecological network is shaped as a multi-layered system including the entire biological infrastructure, *i.e.* all areas of different protection levels and management types, from Specially Protected Areas to non-forest greenery. A large proportion of network segments overlap and perform multiple functions at the same time. They are often territories designated for the biodiversity conservation, natural water accumulation, buffer zones of natural mineral water and healing sources, protective forests, anti-erosion elements, and recreation areas or sites for holiday-making. The network must therefore be understood holistically, because it can only fulfil all its functions as a coherent network of mutually supporting elements. The total area of all ecological network elements covers 56% of the Czech Republic's territory (Pešout & Hošek 2012).

A landscape element may also include an object of small sacral architecture – the village of Částrovice, Podblanicko Region (Central Bohemia). © Pavel Pešout

The structure of the set of ecological stability elements is constantly changing in space and time. These changes may be both ecologically positive and negative and can be caused by human activities as well as natural processes. If these changes did not alter at least the initial state of the ecological skeleton of the landscape, one could speak with some satisfaction of 'stability'. Unfortunately, the long-term trend is a worsening of this state (Petříček & Plesník 2012).

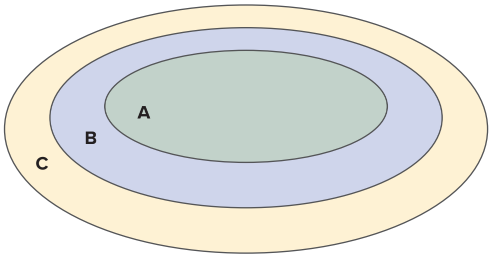
What are Ecologically Significant Elements?

Act No. 252/1997 on Agriculture, as amended later, defines a part of the landscape elements in the agricultural landscape, *i.e.* non-forest greenery, rock outcrops, and wetlands, as the so-called Ecologically Significant Elements (ESEs). According to the Act, an ESE is a continuous area of non-agricultural land with non-productive functions, or another formation which is part of or immediately adjacent to agricultural land. Government Regulation No. 307/2014 [determining details of land use records according to user relations, as amended] defines the following ESE types: balks, terraces, grassy thalwegs, copses, allées, solitary trees, landscape orchards, ditches, wetlands, and rockeries (see Box 1). ESEs are registered by the National Agricultural and Intervention Fund (NAIF) at farmer's request as part of the land- use register under the Agriculture Act in the Public Land Register (PLR) [https://eagri.cz/public/app/lpisext/lpis/verejny2/plpis/].

NAIF registers ESEs if the landscape element is part of or directly adjacent to agricultural land. ESEs can be internal or external. An internal ESE must be completely surrounded by agricultural land registered in PLR (Gimunová *et al.* 2015). These are usually wetlands, stone mounds or various non-forest greenery elements, *i.e.* solitary trees and hedges in fields. Landscape elements not fully surrounded by registered farmland are regarded external ESEs. These may be allées or ditches on the margin of agricultural land or balks dividing a field or meadow.

ESE protection

The Act does not explicitly imply any obligations for a farmer or landowner to protect ESEs. Thus, selected ESEs or parts of them can 'only' be protected with nature conservation instruments,



In the Czech Republic, a skeleton of the ecological network is formed by the **Territorial System of Ecological Stability, multilevel ecological network** *sensu stricto* (A) supplemented by protected areas of all categories and a part of the Ecologically Significant Elements (B). These elements, together with all other close-to-nature areas providing ecosystem services in the landscape, form the green infrastructure (C). © Pavel Pešout & Michael Hošek

particularly in the case of trees growing outside forests and habitats of Specially Protected Species. ESEs are, however, protected against damage or destruction as part of the basic conditions (Standards of Good Agricultural and Environmental Soil Conditions) which farmers must comply with to qualify for agricultural subsidies under the EU Common Agricultural Policy (CAP). The basic rules of cross-compliance are regulated by Government Decree No. 73/2023, establishing rules for cross-compliance of payments to farmers.

Farmers are not allowed to damage registered ESEs, but neither unregistered landscape elements located on PLR-registered land or in their vicinity which could theoretically be registered as ESE (*i.e.* meet the definition of one of the types of ESE).

Specifically, farmers have to protect ESEs by preventing them "*from a reduction in acreage or damage to the vegetation or rock or stone cover of a landscape element, from drainage operations, soil stockpiling or storage of organic material, mechanically damage to the above- and belowground parts of trees, and application of fertilisers, plant protection agents, and treated sludge*". The conditions for wetlands and rockeries do not apply to interventions carried out with consent of the respective State Nature Conservanvy authority For details, see Methodological Manual for Cross-compliance https://eagri.cz/public/portal/-q304687---FFeG7cUk/metodicka-prirucka-pro-pravidla.

ESE potential

ESEs are fundamentally different from established common nature conservation tools, i.e. particularly under the Territorial System of Ecological Stability (TSES) and Significant Landscape Elements (SLEs). Whereas constituent parts of the TSES and the SLEs (whether registered or the so-called 'by law') and their functions are subject to legal protection, ESEs lack such protection, as outlined above. Whereas constituent parts of the TSES are according to the methodology (Bínová *et al.* 2017) defined by authorised persons with high expertise and approved within the complex process of land-use/territorial or spatial planning, and SLEs are defined directly by the Act on Nature Conservation and Landscape Protection or registered by a State Nature Conservancy authority in an administrative procedure, an ESE is 'simply' registered at the NAIF *ex officio* or at the request of a farmer (or landowner or anyone else) after verification of its status in PLR (with an orthophotograph), rather exceptionally in the field. In the case of ESEs, targeted legal protection is thus missing, but they excel in simplicity and their registration being up to date. However, the greatest benefit of the ESEs is that, unlike the registration or approval of the designation of a TSES or SLEs constituent part, ESEs can be registered at the will of the landowner or farmer. Farmers are interested in registering ESEs to preserve a landscape element in the so-called managed area and then obtain all flat-rate/blanket subsidies (direct payments, agri-environmental-climate measures AECM,

TYPES OF ECOLOGICALLY SIGNIFICANT ELEMENTS:

Landscape orchard – Area evenly planted with fruit trees (medium- or tall-stemmed) at a density of min. 50 viable individuals per hectare and with herbaceous cover between the rows. Its primary purpose is not fruit production, but preservation of the landscape, landrace diversity, cultural heritage, agricultural scenery, or elements of rural urbanism.

Balk – Continuous, mostly linear landform mainly for reducing erosion, usually defining the boundary of an agricultural block section. A balk may include shrubs and trees, stone mounds, stone walls, and grassland. A separate stone mound or stone wall can also be a balk.

Terrace – Continuous sloping linear landform consisting of terrace steps for the reduction of water and wind erosion and moderating the angle of part of the slope in an agricultural block section, usually defining the boundary of a block section. Shrubs and trees, stone mounds, and stone walls may be part of a terrace.

Grassy thalweg – Rugged, sloping formation for the reduction of water and wind erosion, determining the path of water runoff from a block section, including arable land. Shrubs and trees, stone mounds, and stone walls may also be part of a grassy thalweg.

Copse – Continuous non-linear landform consisting of minimally two woody plant individuals and with a maximum area of 0.3 ha. Woody vegetation performing a forest function according to Section 3 of the Forestry Act is not considered to be a copse. Copses may include stone mounds or stone walls.

Allée – Continuous linear landform consisting of minimally five individuals of woody plants and regularly repeating elements. Allées may include stone mounds or stone walls.

Solitary tree – Isolated tree with a crown diameter of 8 m^2 or more, growing in an agriculturally managed landscape/farmland outside a forest. Solitary trees may include stone mounds or stone walls.

Ditch – Linear landform of max. 6 m in width, the main function of which is to interrupt a slope lengthwise by capturing water and leading it away or absorbing it.

Wetland – Separate non-linear landform of minimally 100 m^2 in size, ensuring water retention in the landscape for the purpose of maintaining natural conditions for organisms of aquatic and wetland ecosystems.

Rockery – Surface of natural outcrop of rocks or minerals with the aim of protecting geomorphological and geological phenomena. A rockery may have the character of separate stones or a larger rock formation, and may include woody or herbaceous vegetation.

Various wetland types including pools with a minimum area of 100 m^2 can be registered as a non-productive 'Wetland' Ecologically Significant Element and thus, *inter alia*, apply for property tax exemption. © Pavel Pešout

etc.). Another strong incentive for registering ESEs is property tax exemption. The potential of ESEs is thus considerable and will increase with the development of the instrument, which is currently discussed in a joint working group of the Ministry of Agriculture of the Czech Republic (MoA) and the Ministry of the Environment of the Czech Republic (MoE) (see below).

ESEs as part of the ecological network

Most of the ESEs consist of landscape elements which in the ecological network theory, particularly the Territorial System of Ecological Stability, can be classified as interactive elements. These are important near-natural wild plant and animal habitats. Their role is to support the interrelations between organisms in the landscape and between organisms and the environment they inhabit (Míchal & Petříček 1988). Typical interaction elements are traditionally transitional habitats of forest margins, hedgerows, copses, solitary trees in agricultural landscapes, small springs, communities on balks, stony substrates, and agrarian terraces, high-stem orchards, riparian vegetation, parks, and allées. They are usually isolated patches and are mostly smaller than TSES biocentres and biocorridors, to which they do not have to be connected, so that they create a finer landscape structure. Interactive elements are often managed as farmland. Their aesthetic value remains an accompanying but (from the landscape perspective) essential characteristic (Kasalický 2010).

Example of an Ecologically Significant Element of the 'Wetland' type registered in spring 2024 at a site of inundated arable land near the town of Třebíč (southwestern Moravia). The flooding happened through a rise in water level caused by Eurasian beavers *(Castor fiber)* damming a stream. Source Nature Conservation Agency of the Czech Republic

Interactive elements are not explicitly mentioned in any legal rules and do therefore – in contrast to biocentres and biocorridors – not have to be visualised in land-use/territorial or spatial plans. Regarding the striking coincidence of the list of typical interactive elements and ESE types, and the codification of this institute in agricultural legislation, interactive elements on farmland can be replaced by ESEs. Including them in the ecological network was already considered more than ten years ago (Pešout & Hošek *l.c.*), but the ESE register was a marginal tool at that time, so these considerations were not further developed. Given the ESEs' significant development potential, it is appropriate to take this step now.

Proposal

The basis of the Czech Republic's ecological network will continue to consist of a system of protected areas, the TSES, and selected parts of SLEs and nature parks. These areas have their managers, are protected in a graded manner, their target state is usually defined and their management is differentiated. Their designation is based on expertise and proposals are made in a process set by law. ESEs registered by the NAIF at the proposal of farming entities or other proposers, or due to an PLR update will be included into the ecological network or Green Infrastructure in the agricultural landscape.

To fully exploit the potential of ESEs, it is necessary to include external ESEs into farm areas for direct payments under (not only) the CAP, to expand the ESE register for non-farmers (their motivation being exemption from property tax), and to elaborate methods for the management of particular ESE types (to be prepared by the Nature Conservation Agency of the Czech Republic). To implement these and other steps, a joint MoE-MoA working group has been established. The MoA has also included support for the creation and maintenance of landscape elements as a priority in the medium-term plan of the National Programme Environment of the State Environmental Fund of the Czech Republic. ■

The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

Czechoslovak Army Large-scale Mine/ CSA Quarry: the Ever Biggest Ecological Restoration Project in the Czech Republic

Pavel Pešout & Michal Porteš

Brown coal or lignite surface/open-pit mining, together with subsequent infrastructure and industry, has damaged the landscape in the region below the Krušné hory/Ore Mountains (northwestern Bohemia) over an area of over than 300 km^2, including structural changes in the human settlement pattern. Today, as the brown coal energy industry is in decline and the end of mining is approaching ever more rapidly[1], individual large-scale mines/quarries having been gradually closed in the Sokolov and Most basins. In 2024, several years ahead of the original estimate, the Czechoslovak Army Large-scale Mine/CSA Quarry will terminate mining. If we are talking about the largest mining operation in terms of area, which is associated with the devastation, degradation and destruction of nature, there is an opportunity to implement the largest Czech ecological restoration project after the mining operation is completed.

Brown coal/lignite mining at the Czechoslovak Army Large-scale Mine/CSA Quarry will be completed in 2024. Currently, reserves are being replenished at two locations. © Pavel Pešout

The archaeophyte tumbling saltbush (*Atriplex rosea*) forms rich growths in the Czechoslovak Army Large-scale Mine/CSA quarry. However, it has almost disappeared in the rest of the Czech Republic due to intensive changes in synanthropic habitats and is therefore classified as a critically endangered species. © Pavel Pešout

Remediation and technological reclamation plans have been prepared for all brown coal mines/quarries. The more progressive plans designate 10% of the area for ecological restoration, where the use of natural processes is envisaged. The Ležáky, Medard-Libík and Chabařovice large-scale mines/quarries have already been rehabilitated and reclaimed just in this way. In others (*e.g.* Vršany, CSA), significant areas of dumps have been technologically reclaimed[2].

The financially demanding technological hydric, forestry and agricultural reclamations have opened the question of their economic efficiency. It is not only that their implementation is extremely costly (paid for by mining companies), but also their subsequent maintenance is quite expensive (paid for by the state), see for example Lake Most or Lake Milada (Pešout *et al.* 2021). The result of technologically reclaimed areas is an artificial landscape without habitat diversity with low resistance and resilience, and thus with questionable sustainability.

Long-term monitoring of the technical reclamation and reclamation effects using ecological restoration methods has repeatedly confirmed that ecological restoration at incomparably lower input and subsequent maintenance costs allows the development of valuable habitats colonized by endangered species (Bejček & Tyrner 1980, Hodačová & Prach 2003, Hendrychová 2008, Tropek & Řehounek 2011, Vojar *et al.* 2012, 2018, Jongepierová *et al.* 2018). The gradual colonization of the area after mining maintains a mosaic of various habitat patches and provides suitable living conditions for various guilds of species. As the temporal and areal onset of the various successional stages depends on local conditions (geological substrate, carrying capacity, slope, waterlogging, *etc.*), which are highly variable in the post-mining area, a diverse mosaic of vegetation is created there. It consists of sites without vegetation, sites partially overgrown with space gap herbaceous or shrub vegetation to areas continuously overgrown with already developed shrub layer and scattered trees. Self-established forest stands also often display higher biological activity in the soil, more efficient decomposition of dead organic matter, and produce more woody matter, usually already during around the 25th year of their development (Frouz *et al.* 2008, 2015).

The above knowledge logically generates the search for a more efficient, and more importantly, more sustainable solution for the remaining quarries/mines. Given the extraordinary size of brown coal quarries/mines, the issue has been addressed directly by the Government of the Czech Republic, systematically since 2017 (see box on the next page).

Pilot project in the Czechoslovak Army Large-scale Mine/CSA Quarry

The Nature Conservation Agency of the Czech Republic (NCA CR), scientific institutions and NGOs have long been striving for a wider use of ecological restoration in the reclamation of post-mining areas. These efforts began to be included into national and regional (= sub-national) strategic documents and policies a decade ago (Pešout *et al. l.c.*). In specific cases, ecological restoration has so far only been applied on a small scale (*e.g.* Jongepierová *et al.* 2018, Hendrychová *et al.* 2020). Therefore, in 2018, the NCA CR initiated negotiations with the Palivový kombinát/Fuel Combined Company Ústí nad Labem, state enterprise (now part of the DIAMO, state enterprise), and the energy group Sev.en Energy on the delineation of larger areas left to spontaneous development in the Czechoslovak Army Large-scale Mine/CSA Quarry and the Vršany Large-scale Mine/Quarry. After one year, a mutual co-operation agreement was concluded (Pešout *et al. l.c.*).

The agreement was successfully fulfilled and gradually a large continuous area was identified in the Czechoslovak Army Large-scale Mine/CSA Quarry, which has been spared technological reclamation so far, with exceptional biodiversity and the presence of endangered species, most of which is state property. The advantage of the selection is the low percentage of agricultural and forest land temporarily

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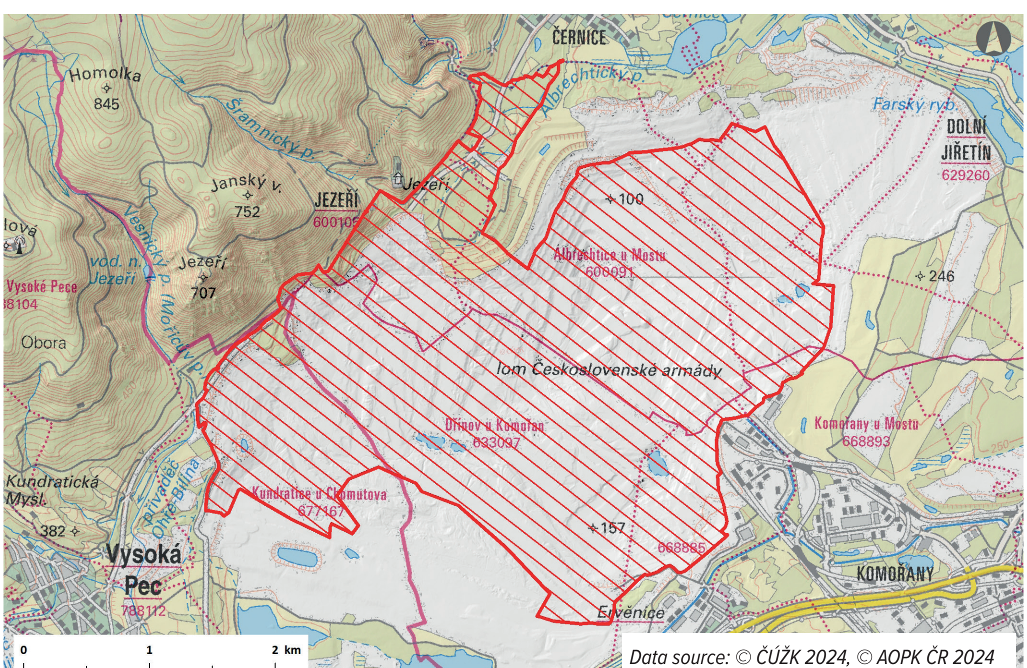
1 While, based on the recommendations of the so-called Coal Commission, the termination of active brown coal mining was estimated between 2036 and 2038, followed by a discussion of 2033, it is now clear that the economics may approach the termination horizon before 2030.

2 Non-productive habitats supporting the overall functioning of the landscape and favouring ecological functions (alleys of trees, hedgerows, balks, forest edges, spontaneously evolving patches, sandbanks, wetlands, *etc.*) make up less than 9% of the already reclaimed brown coal quarries/mines and dumps in the Most Basin (Hendrychová *et al.* 2020).

taken out from agricultural and forest management there, as most of the large-scale mine/quarry area had been covered by Komořany Lake, Dřínov Lake respectively. An important fact is, of course, the imminent termination of mining in the Czechoslovak Army Large-scale Mine/CSA quarry.

In 2020, the Ministry of the Environment of the Environment had the proposal of the NCA CR, supported by a feasibility study (Hendrychová *et al.* 2020) and discussed with partners in the area, taken into account in the document to be submitted to the meeting of the Government of the Czech Republic. Therefore, after decades of discussion, ecological restoration has become an equivalent option for the restoration and use of large parts of the post-mining landscape within the Ústí nad Labem Region. The NCA CR in co-operation with the DIAMO, state enterprise and representatives of the mining company (Sev.En) subsequently delineated the area more precisely. After several meetings of the inter-ministerial working group, in 2023 (see box on the next page) the Government instructed the Minister of the Environment to submit a proposal for a National Natural Monument (NMP) on most of the as yet technically unreclaimed areas within the internal spoil heap of the Czechoslovak Army Large-scale Mine/CSA Quarry, provided that several conditions were met (*e.g.* the Specially Protected Area must not complicate the possible output of electricity to be generated from renewable sources in the remaining part of the spoil heap in the dismantled large-scale mine/quarry).

On the slopes of the pit there are numerous springs, particularly at the foot of the Krušné hory/Ore Mountains slopes. Around them, from a point of view of nature history valuable wetlands are formed. © Pavel Pešout



The proposed Czechoslovak Army Large-scale Open-pit Mine/CSA Quarry National Nature Monument.

The delineation of the Czechoslovak Army Large-scale Mine/CSA quarry National Natural Monument in the announced intention to be designated. Depending on the outcome of the objection hearing, there may still be slight changes. Source Nature Conservation Agency of the Czech Republic

Czechoslovak Army Large-scale Mine/CSA Quarry National Nature Monument

The proposal for the new Czechoslovak Army Large-scale Mine/CSA Quarry National Nature Monument (NNM) was announced by the Ministry of the Environment of the Czech Republic on April 29, 2024. The total area of the declared NNM is 1,230 hectares, making it one of the largest Specially Protected Areas in this category in the Czech Republic (map left on this page)).

The main reason for processing the project is to protect a unique complex of varied non-productive patches of lowland treeless habitat, valuable for specific biodiversity of great scientific importance, serving, *inter alia*, as a refugium for species of the cultural landscape. The environment is specific due to its physical and chemical features, geological and hydrogeological conditions, and the abundance of micro-habitats with rugged topography. The extent and development of the successional stages following surface/open-pit brown coal mining make it an area of supra-national importance.

Natural ecosystems linked to the post-mining area in all their developmental stages, active landslides at the foot of the Krušné hory/Ore

Mountains and especially the populations of two flagship species - the Tawny pipit (*Anthus campestris*) and the Northern wheatear (*Oenanthe oenathe*), and particularly in view of the need for special management also the Jezeří Arboretum, are listed as the main objects of protection in the NPP proposed.

With regard to the objects of protection, more detailed protection conditions of the NNM are set. The area will be freely accessible to the public after the declaration. The use of boats, lighting fires, mass events with over 100 participants and the entry of motor vehicles (except for the Integrated Rescue System/Emergency Services and other authorised organisations) are subject to the prior approval by the State Nature Conservancy authority. It is not possible to place buildings and landfills in the area, change the water regime, use chemicals, change the land-use, *etc*. without permission.

The anticipated effective date of the Czechoslovak Army Large-scale Mine/CSA Quarry National Nature Monument's declaration is July 1, 2025. The locally and materially competent nature protection authority will be the AOPK ČR, to which, according to the resolution of the Government of the Czech Republic, the state land in the NNM's territory is to be transferred from the DIAMO, state enterprise.

Natural history significance of the NNM

The territory of the Czechoslovak Army Large-scale Mine/CSA Quarry National Nature Monument is a preserved refugium reminiscent of the extensively used agricultural and cultural landscape (fallow fields, balks, abandoned areas, rubble site/waste grounds, barren areas), which has almost disappeared from the Czech Republic due to chemicalization and intensification of agricultural production. The successional stages of dry and sunny barren habitats created by mining activities are supplemented by periodic and permanent water areas with variously formed littorals, which sometimes turn into wetlands on variously vertically modelled areas created during the establishment of the spoil heaps. Due to its size and diversity of micro-habitats, the unreclaimed Czechoslovak Army Large-scale Mine/CSA Quarry's territory hosts a number of wild animal endangered species, particularly birds, amphibians, beetles, hymenopterans and butterflies.

To date, 227 specially protected or red-listed species have been documented in the proposed area (birds: 83, amphibians: 12, mammals: 14, invertebrates: 94, plants: 24; AOPK ČR, CZU 2022). Some species do not occur elsewhere in the Czech Republic (with the exception of the remaining brown coal/lignite open-pit mines/quarries in the Ústí nad Labem Region) or have over 90% of their national population there. These are mainly the objects of protection of the Tawny pipit (estimated population in the Czech Republic 120-150 pairs, of which in the Czechoslovak Army Large-scale Mine/CSA Quarry approx. of one third the population) and the Northern wheatear (estimated population in the Czech Republic 200-250 pairs, of which in the Czechoslovak Army Large-scale Mine/CSA Quarry approx. one third of the population). Both species with their habitat requirements are umbrella species covering habitat conditions for most of the other endangered species among amphibians and reptiles, hymenopterans, dragonflies, butterflies or beetles. The remnant of the original arboretum at the Jezeří Castle with a valuable entomofauna of saproxylic beetle species is also very specific.

THE MAIN STEPS LEADING TO THE DECISION TO DECLARE A NATIONAL NATURE MONUMENT AT THE BROWN COAL/LIGNITE CZECHOSLOVAK ARMY LARGE-SCALE MINE/CSA QUARRY:

2017 – *Resolution of the Government of the Czech Republic No. 441 of June 14, 2017 'State Raw Materials Policy of the Czech Republic in the Field of Mineral Raw Materials and Their Resources' mandates to propose legislative measures that will enable nature-based reclamation/restoration to be used on a larger scale.*

2018 – *the Nature Conservation Agency of the Czech Republic (NCA CR) initiated negotiations with the Fuel Combined Company Ústí nad Labem, state enterprise. and the energy group Sev.en Energy on the delineation of larger areas left to natural spontaneous development in the Czechoslovak Army Large-scale Mine/CSA Quarry and the Vršany Large-scale Mine/Quarry.*

2019 – *Signing a memorandum of cooperation between the NCA CR, the Fuel Combined Company Ústí nad Labem, state enterprise., and the Czech University of Life Sciences Prague on the identification of suitable areas for ecological restoration (AOPK CR 2019).*

2020 – *Based on the Resolution of the Government of the Czech Republic No. 421 of June 17, 2019, an inter-ministerial working group (Ministry of Industry and Trade, Ministry of the Environment, Ministry of Agriculture, ministerial organisations and representatives of mining companies) is established with the aim of proposing the most effective way of using the structurally affected area of the Ústí nad Labem Region affected by brown coal/lignite mining.*

2021 – *The Government of the Czech Republic, by its Resolution No. 344 of April 6, 2021 took note of the results of the analyses and sets down the further procedure for the optimal use of the residual surface brown coal/lignite pits in the Ústí nad Labem Region, including increased use of ecological restoration.*

2021 – *Richard Brabec, Minister of the Environment of the Czech Republic, suspends technological reclamation at the Czechoslovak Army Large-scale Mine/CSA Quarry.*

2022 – *Anna Hubáčková, Minister of the Environment of the Czech Republic, extends the suspension of technlogical reclamation at the Czechoslovak Army Large-scale Mine/CSA Quarry.*

2023 – *Resolution No. 479 of June 28, 2023 of the Government of the Czech Republic instructs the Minister of the Environment, through the NCA CR, to prepare a proposal for the designation of a Specially Protected Area national category in the Czechoslovak Army Large-scale Mine/CSA Quarry.*

2024 – *Petr Hladík, Minister of the Environment of the Czech Republic, submitted a proposal for the Czechoslovak Army Large-scale Mine/CSA Quarry National Nature Monument to the Government of the Czech Republic, which took note of it without comments.*

2024 – *The Ministry of the Environment of the Czech Republic started the process of declaring the Czechoslovak Army Large-scale Mine/CSA Quarry National Nature Monument with the assumption that the declaration will take effect on July 1, 2025.*

The varied geological bedrock/subsoil and composition of the dumps are one of the drivers fundamentally affecting the natural succession and biodiversity within the area. © Pavel Pešout

Agricultural biotechnical reclamation, *i.e.* levelling out and humusing of the areas, has already been carried out on part of the Czechoslovak Army Large-scale Mine/CSA Quarry spoil heaps. The result is not very fertile soils with biodiversity at the level of a normal agricultural landscape. The areas are not part of the declared National Nature Monument. © Pavel Pešout

National Nature Monument Management Plan

In 2023, a management plan was developed for the future Czechoslovak Army Large-scale Mine/CSA Quarry NNM, which (due to the exceptional nature of the area) was discussed in an inter-ministerial working group and subsequently submitted for information to the Government of the Czech Republic. Its main objective is to ensure protection, conservation and management for the valuable communities in the former mining areas and to maintain the favourable state of the communities in various stages of succession. It is primarily concerned with maintaining the successional mosaic of habitat patches so that they form the most diverse coherent environment of treeless forests with a specific concentration of biodiversity. The primary objective is to maintain the character of this forest-free area, *i.e.* areas with different vegetation cover without invasive alien plant species across the majority of the area and thus to maintain suitable conditions for species of early successional stages, particularly the objects of protection of the NPP - the Tawny pipit and the Northern wheatear.

In most of the area, the management plan deals with spontaneous processes and the elimination of non-native plant species. In selected parts of the NNM, vegetation cover will be removed by heavy machinery in combination with diversified grazing and cutting of unsuitable woody plants/trees. The specific environment also requires specific interventions, and therefore controlled disturbance management will be possible in the area, which may be inappropriate in other environments (military exercises, off-road vehicles including motorcycles, *etc*.).

From the point of view of nature conservation in the Czech Republic, there is one more exceptional moment associated with the Czechoslovak Army Large-scale Mine/CSA Quarry. Following the government's decision to establish a Specially Protected Area there, the update of the rehabilitation and reclamation plan has led to increased involvement in ecological restoration. The Remediation and Reclamation Plan is a binding document that determines the procedure and levelling outthe mining area. It is drafted solely from a mining perspective and in accordance with the Mining Act. In the updated Czechoslovak Army Large-scale Mine/CSA Quarry plan, thanks to the cooperation between the mining company and the NCA CR, reclamation is planned for the 12.3 km^2 area of the NPP exclusively using ecological restoration methods there. Natural succession will be used in the area, suitable coal seam outcrops will be preserved, variously sized pools, water areas with shallow littoral, "field" wetlands will be created and previously unsuitably levelled parts of the terrain will be landscaped.

Czechoslovak Army Large-scale Mine/CSA Quarry as a model for other quarries

The solution for the Czechoslovak Army Large-scale Mine/CSA Quarry was sought in advance compared to other brown coal/lignite large-scale mines/quarries in the Most Basin. This was mainly due to the early date of the planned end of mining. Therefore, from the beginning, the approach for the Czechoslovak Army Large-scale

Thanks to the initiative of the Ústí nad Labem Region and the helpfulness of Severní Energetická (energy group Sev.En Energy), it seems that the largest machine in the country - the RK5000 excavator - will be preserved. The Nature Conservation Agency of the Czech Republic is counting on the possibility of keeping it in a suitable area within the National Nature Monument if the Ústí nad Labem Region decides to save the large machine and make it available to the public. © Pavel Pešout

Mine/CSA Quarry was prepared and discussed as a pilot for other post-mining areas. Another brown coal/lignite large-scale mine/quarry where the tried and tested solution has already been applied is the Vršany Large-scale Mine/Quarry. There, too, the NCA CR in cooperation with the Czech University of Life Sciences Prague has elaborated the necessary analyses. On the basis of them and the energy potential assessment (location of the solar power stations), the inter-ministerial working group agreed on a solution that delineates an area of 4.8 km^2 for ecological restoration. The Government, by its Resolution No. 298/2024, approved the proposed solution for the comprehensive and efficient use of the area of the Vršany Large-scale Mine/Quarry residual pit and ordered the NCA CR to prepare the designation of the National Nature Monument in the proposed scope also in this quarry.

The exact delimitation of the area is currently being discussed, which must respond to the definitive estimate of the termination of mining, which is permitted in the Vršany Large-scale Mine/Quarry until 2052, but for economic reasons may be terminated before 2030.

Other large-scale mines/quarries for which a higher involvement of ecological restoration is being discussed are the Bílina and Nástup Tušimice ones (Lake Libouš). However, suitable large areas, similar to the Czechoslovak Army Large-scale Mine/CSA Quarry and Vršany Large-scale Mine/Quarry are not available there, and so far, an area of hundreds of hectares has been identified for ecological restoration there. Large-scale ecological restoration projects, including the protection of the most important areas through National Nature Monuments in the Ústí nad Labem Region, are a major contribution to the Czech Republic's commitments under the EU Biodiversity Strategy 2030 (Pešout 2020). A similar approach should also be applied in the Sokolov Basin, especially in the Družba-Jiří Large-scale Mine/Quarry, and ecological restoration methods should also be more used in other post-mining areas - quarries, sand and gravel pits. ■

The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

Importance of Spatiotemporal Continuity of Forest Habitats for Forest Biodiversity

Jeňýk Hofmeister, Václav Pouska, Zdeněk Palice, Jaroslav Šoun & Jan Vondrák

Changes in the woody plant species composition and simplification of forest habitat structure are the accompanying features of forest management in the Czech Republic over the last two centuries. In addition to forest management itself, the reduction in the size of habitats that are little affected by human activity is also related to the overall human use of the landscape. It is generally considered that the small size of forest habitats, the development of which is primarily driven by natural forces, and the interconnectedness of such habitats in the landscape are among the significant drivers of the decline in the biodiversity of the organisms associated with them. However, relatively little has been known about which characteristics make less human-influenced forest habitats attractive to a particular group of forest organisms.

Scree forest with rich woody plant composition on a southern slope in the Oupořský potok/Oupoř Brook in the Týřov National Nature Reserve. © Jeňýk Hofmesiter

If we want to effectively protect and conserve the biodiversity of forest habitats, we need to identify which forest habitat features are key to biodiversity and focus on protecting and conserving them. There are a number of questions that can be asked about the characteristics of forest habitats in relation to biodiversity, and they relate to different spatial scales. To begin with the most commonly studied question: Is the main reason for the attractiveness of forest habitats less affected by humans for forest biodiversity due to their higher structural heterogeneity, which can be realistically measured and compared at the level of specific sites? In other words, is biodiversity a reflection of structural diversity? The question is based on the assumption that greater heterogeneity of natural conditions and individual (micro)habitats allows for the coexistence of more species-rich communities of organisms.

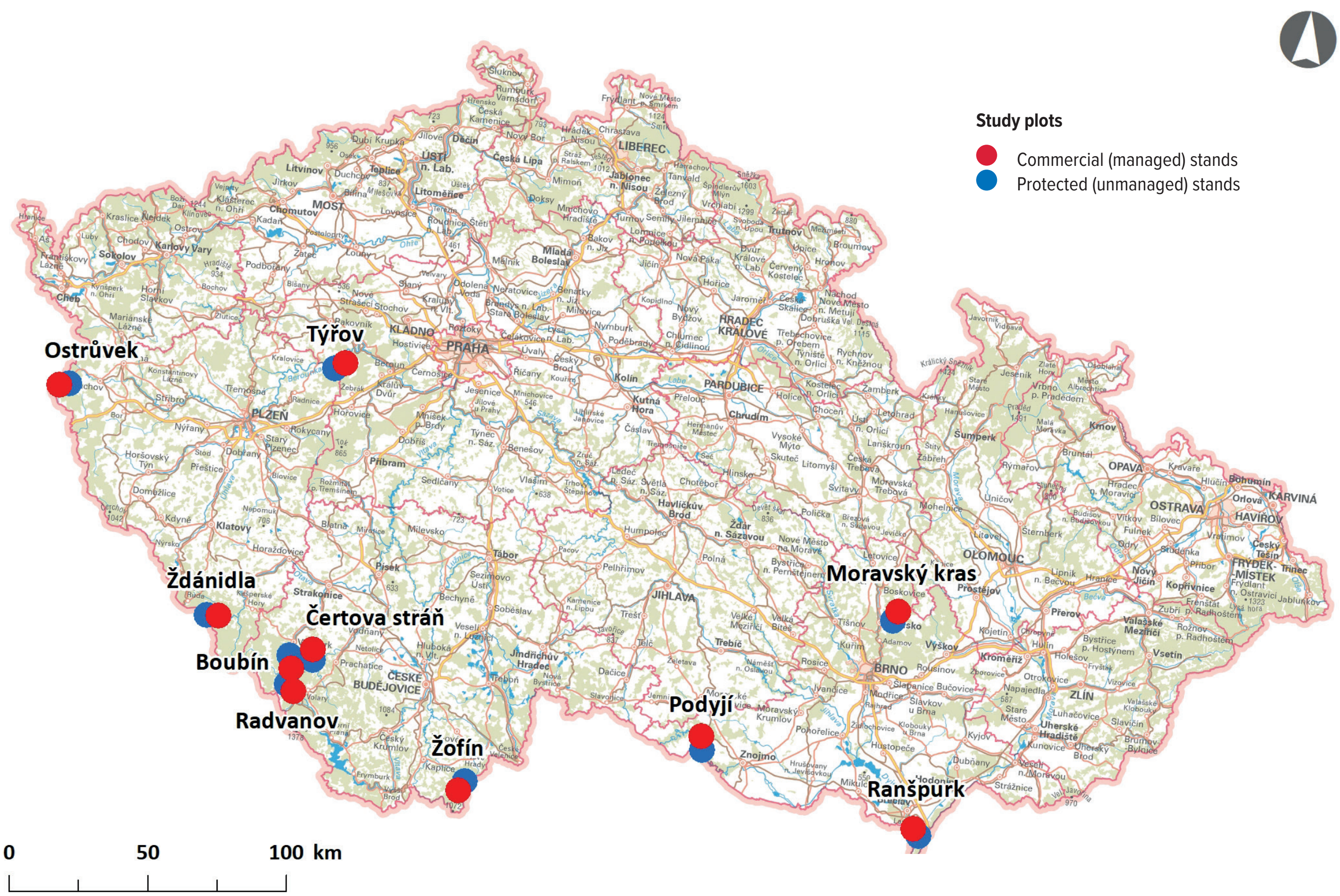
But is not it rather the total size of forest habitats at the landscape level that is crucial from the point of view of forest biodiversity? Habitat size can also be realistically measured and therefore its importance verified. Similarly, we can assume that as the duration of favourable conditions increases, the habitat is more likely to be colonised by new species that are suited to the conditions. That is, with increasing temporal continuity, the species diversity of the habitat is likely to increase as a result of successive colonisation by new species. In the extreme case, the characteristics of the structure and the degree of preservation of the forest stand at the local and landscape scales could represent ‘only’ the necessary conditions demonstrating the potential of the habitat for the existence of forest species-rich communities but their actual presence would be governed by the time (temporal continuity) over which these conditions persist. Is it not the temporal continuity of a given habitat that determines the presence and absence of species to the greatest extent?

Mountain reed-grass spruce forest in the Boubínský prales/Boubín Primeval Forest National Nature Reserve. © Jeňýk Hofmesiter

Flower-rich beech forest with a long-term continuing development undisturbed by forest management in the Žofínský prales/Žofín Primeval Forest. © Jeňýk Hofmesiter

Searching for answers to the questions

The authors tried to answer all the above questions by investigating the species composition of epiphytic and epixylic lichen communities in relation to the structure and spatiotemporal continuity of forest habitats at ten sites with remarkable lichen communities in the Czech Republic (Table 1). The survey was conducted in regions with lower levels of past air pollution,



Location of study plots within the Czech Republic. © Jeňýk Hofmeister

Data source: © State Administration of Land Surveying and Cadastre 2024, Nature Conservation Agency of the Czech Republic 2024

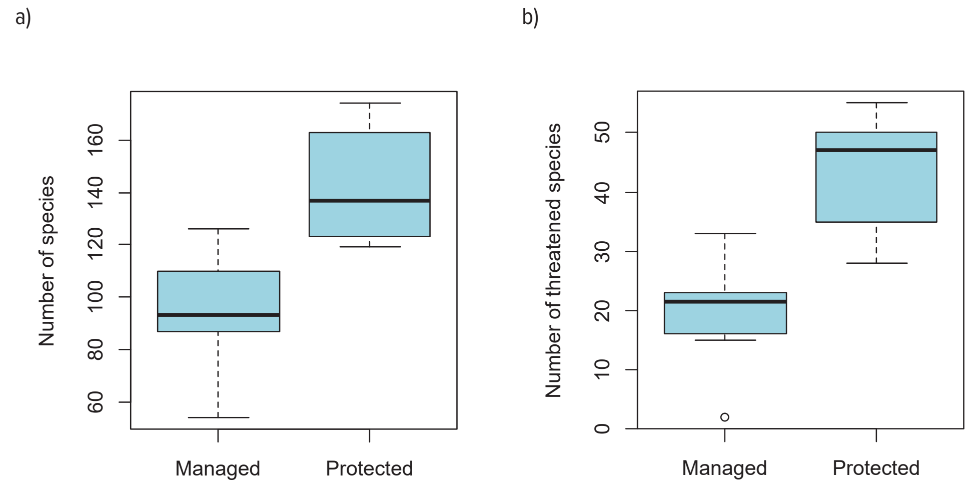
as this effect on lichen species diversity has been persisting. At each site selected, two 1 ha study plots were chosen to cover a comparable and as wide a gradient of natural conditions as possible, with one study plot located within a Specially Protected Area (and not managed for long term forestry) and the other located in a managed forest with a similar species composition and as old as possible. The sites within the Specially Protected Areas are the best-preserved fragments of forest habitats potentially important for epiphytic and epixylic lichens - and, in a broader sense, forest biodiversity in general (Table 1). An inventory of epiphytic and epicyclic lichen species on all substrates within 2 m of the ground surface was carried out at all sites. In addition, an inventory of microhabitats, species composition and structure of trees and dead wood was carried out there. Microhabitats were mapped using existing microhabitat catalogues, but these were modified and supplemented with some missing microhabitat types specific to epiphytic and epicyclic lichens.

Epiphytic and epixylic lichens display several favourable characteristics making them a suitable model group for this research. This is a relatively large group of species, with about 700 species occurring in the whole country. A significant part of the species diversity consists of taxa with the ability to indicate preserved forest habitats, *inter alia*, little affected by human activities. A significant part of the species is rare to very rare, and we have a fairly good knowledge of the distribution of these rare species in the Czech Republic. From the point of view of the mapping itself, it is an advantage that one visit is sufficient to determine the species diversity at a site, during which a group of experienced lichenologists will record most of the species. In addition, species can be easily recorded during the inventory, including the link to the specific microhabitat in which they occur, being specific to many species.

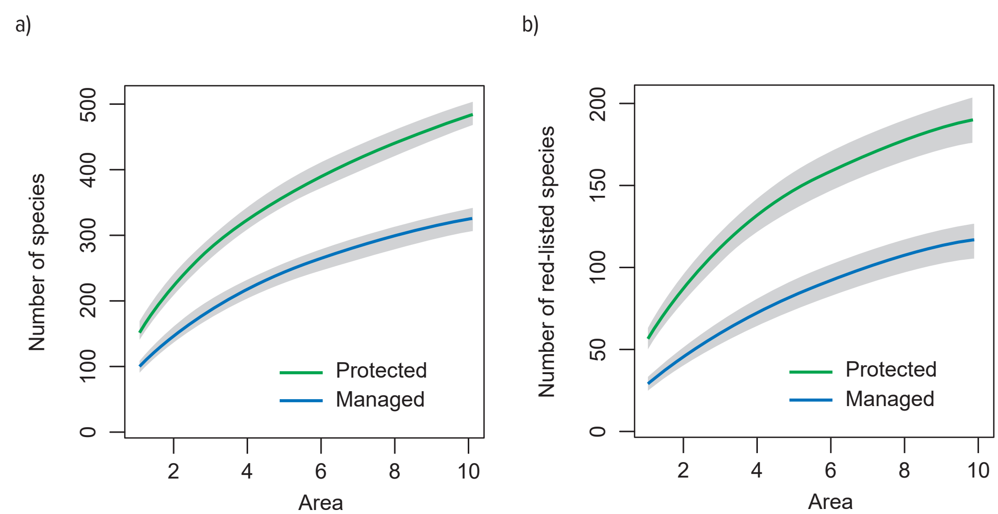
The aim of the research was to determine the importance of individual potentially important forest habitat features for the species diversity in epiphytic and epixylic lichens. A summary of these characteristics is presented in Table 2. The real significance of the influence of these characteristics on species diversity was evaluated using the data gathered using linear regression models (GLS - generalized least squares). In these models, elevation and the category separating habitats in managed and protected forest (without management) were included as additional explanatory variables.

What answers did the research provide?

A total of 513 species of epiphytic and epixylic lichens were found in 20 study plots (with a total area of 20 ha), representing a significant part of the total species diversity in the Czech Republic. As expected, both the total number of epiphytic and epixylic lichen species recorded and the presence of threatened species were significantly higher in protected forests compared to nearby habitats in commercial stands (see the figures right on this page). A total of 482 species were found in study plots in protected forests (see the figures right on this page), while 323 species were recorded in commercial forests. More than one third of the species (191) were found exclusively in study plots in protected forests (see the figures right on this page), while only 32 species were recorded exclusively in commercial growths. Similar differences between protected and managed forests were also found in the representation of endangered lichen species. While species recorded only in study plots in protected forests contributed significantly to the overall species richness of all sites, the contribution of study plots in commercial forests was generally much lower. It is worth noting that, despite the above differences between protected and commercially managed forests, the vast majority of sites surveyed in managed forests can be considered to be above average in terms of both total lichen abundance and the occurrence of threatened species, at least compared to 'normal' commercially managed forests in the Czech Republic.



Number of species of epiphytic and epixylic lichens (a) and number of species classified in one of the Red List categories EX, CR, EN or VU (b) recorded at the study plots in commercial (managed) stands and in protected (unmanaged) stands within the Specially Protected Areas. © Jeňýk Hofmeister



Accumulation curves of (a) the total number of lichen species recorded in managed and unmanaged stands and (b) the number of species listed in one of the Red List categories (EX, CR, EN or VU). © Jeňýk Hofmeister

Thus, we found relatively significant differences in lichen species diversity between study plots in (mostly) similar forest habitat types differing in the degree of protection/conservation. Do these differences in species diversity correspond to differences in forest habitat characteristics that we considered potentially important? Mostly yes, but we need to look at the results more closely. Variability in microhabitat types emerged as a very significant positive predictor of lichen species diversity. As the variability of microhabitats at a site increased, the number of lichen species and the number of threatened species found increased. Frequency of microhabitat occurrence was also a significant predictor of lichen species diversity, but in a negative sense. The explanation for the pattern is usually higher tree densities in commercial forests with common microhabitat types, but their abundance does not increase the lichen species diversity. However, the negative effect of microhabitat frequency on biodiversity needs to be interpreted within the limits of the study. Clearly, if we were to include not only the oldest stands but also younger growths and young growths where trees with microhabitats are rare, a conclusive negative relationship would most likely not be found.

Other characteristics related to forest habitat structure were not systematically applied in the models. Microhabitat heterogeneity seems to ideally capture the overall heterogeneity of habitat conditions related to tree species composition, age, size, *etc*., which in total determine lichen species diversity. Consequently, mapping microhabitat heterogeneity can be used as an indicator of the particular habitat potential for species diversity of epiphytic and epixylic lichens. However, it was not only forest structure characteristics expressed by microhabitat heterogeneity that influenced lichen species diversity there.

The species diversity in lichens increased with the extent of natural forest habitats in the vicinity of the study area. The model results were best when considering the area surrounding the study plot within 1 km, which

Table 1 Characteristics of study plots © Jeňýk Hofmeister

Study plot		Habitat	Elevation (m.a.s.l.)	Protected since (year)	Number of lichen species	Number of red-listed species
Boubín	BO	*Mountain reed-grass spruce forest*	1270	1958	119	35
		Mountain reed-grass spruce forest	1250		110	23
Čertova stěna/Devil's Wall	CS	*Acidiplilous beech forest*	725	1992	159	50
		Acidiplhilous beech forest	720		87	21
Moravský kras/Moravian Karst	MK	*Scree forest*	370	1956	123	40
		Scree forest	470		91	18
Ostrůvek/Islet	OS	*Acidiphilous beech forest*	750	1973	133	28
		Cultural spruce forest	780		54	2
Podyjí/ThayaRiver Basin	PO	*Scree forest*	390	1950	174	50
		Scree forest	395		126	33
Radvanov	RD	*Flower-rich beech forest*	895	1991	141	55
		Flower-rich beech forest	820		105	24
Ranšpurk	RN	*Hardwood floodplain forest*	180	1949	122	34
		Hardwood flodplain forest	170		73	15
Týřov	TY	*Scree forest*	320	1933	166	47
		Flower-rich beech forest	340		93	16
Ždánidla	ZD	*Acidiphilous beech forest*	1180	1950	163	54
		Acidiphilous beech forest	1130		118	22
Žofín	ZF	*Flower-rich beech forest*	770	1838	127	47
		Flower-rich beech forest	840		93	22

Table 2 The predicted and demonstrated importance of individual potentially significant forest habitat features for the species diversity of epiphytic and epixylic lichens; the magnitude of the predicted (positive) indicator potential is expressed by one or two '+' symbols: + indicates a positive effect, ++ indicates a strong positive effect. An unconfirmed or ambiguous effect is indicated by the symbol '(+)', the absence of a positive effect is indicated by the symbol 'x'. © Jeňýk Hofmeister

Habitat characteristics	Predicted effect	Demonstrated effect
Stand structural variability	+	(+)
Presence of big (old) trees	+	+
Presence of dead wood big pieces	+	(+)
Presence of big (old) trees with microhabitats	++	+
Presence of dead wood big pieces with microhabitats	++	+
Microhabitat variability	++	++
Microhabitat frequency	++	x
Close to nature forest habitat area	+	+

represents an area of approx. 300 hectares. However, larger distances could not be tested without inaccuracies, as some of the areas so defined already extended beyond the Czech Republic's borders and lacked relevant information. Alternative testing using the CORINE map layer also showed the best results for the area surroundings up to a distance of 1 km, but the natural habitat coverage is only approximate in this case. In any case, it can also be concluded based on these results that a larger extent of natural habitats in the vicinity of the study areas contributes positively to their species diversity. At the same time, however, it is important to note that the Specially Protected Areas cover at least 300 hectares of natural forest habitats only at two sites in national parks; in all other cases, the size of the Specially Protected Area itself is smaller - and often significantly so.

The last variable with a systematically significant effect on lichen species diversity was the category separating protected and commercial forests. The belonging of an area to protected forests was itself another characteristic predicting higher species richness of epiphytic and epixylic lichen communities and more frequent presence of endangered species. This means that part of the variation in species diversity between the study study plots cannot be explained by differences in stand structure (or at least not by those we studied) or differences in the extent of natural forest habitats in their surroundings. Even in real terms, the structure and species composition of old commercial stands at many sites did not differ markedly from those in Specially Protected Areas. How might protected and commercial forests differ, and have we not captured this by differences in the structure and quality of forest habitats at a local or landscape level? If we think about how protected and commercial forests differ further, it is the difference in the duration of their development since the last management intervention that is implied by their definition. Although the duration of undisturbed development varies considerably both in the individual protected forests (see Table 1) and to a lesser extent in the adjacent managed forests, it can nevertheless be stated that the forests within the Specially Protected Areas display a much longer continuity of spontaneous development without direct management intervention at each site. We conclude that this variable highlights the importance of temporal continuity in non-human-driven forest habitat development for lichen species diversity. This significance may not be observable (measurable) by forest habitat characteristics, although temporal continuity undoubtedly positively influences, among other measurable characteristics of forest structure, including microhabitat heterogeneity, the crucial importance of which our study also showed.

What does this imply for the protection of forest habitats?

In this study we have shown that the exceptional species diversity in epiphytic and epixylic lichen communities at the study sites and particularly the Specially Protected Areas is influenced by the heterogeneity and conservation of forest habitats at the local and landscape level, as well as by the time elapsed since the last management intervention. Thus, in addition to the variability of site-specific conditions, the spatial and temporal continuity of these habitats is of major importance for the lichen species diversity. This is threatened, even in many of the study sites, by the continued commercial forest management interventions in the immediate vicinity of the Specially Protected Areas, most of which are currently almost completely insufficient and should, according to the results of this study, reached at least 300 hectares in size. What opportunities do we have to strengthen and enhance the spatiotemporal continuity of forest habitats? Can we increase the area of strictly protected areas where forestry is excluded? At present, the area of strictly protected areas can be estimated at less than 1.5% of the Czech Republic's territory. This is very far from the target of strictly protecting at least 10% of the area set out in the EU Biodiversity Strategy for 2030 *Bringing nature back into our lives*. In the Strategy, the target is justified just by the very facts highlighted in the study. But do we even have suitable habitats whose protection can strengthen the spatial and temporal continuity of natural forest habitats?

Currently, the most widespread types of natural forest habitats in the Czech Republic are acidophilous and flower-rich beech forests covering almost 9% of the forest area. According to potential vegetation concept, beech forests should form the majority of the vegetation cover in the Czech Republic, which is far from being the case at present. Although a substantial part of the beech forest coverage is located within various Specially Protected Area categories, the predominant area of these habitats is subject to standard forestry management. Thus, there are probably only two beech forest sites in the whole Czech Republic, namely the Jizerskohorské bučiny/Jizeara Mountains Beech Forests and part of the Východní Krušné hory/Eastern Ore Mountains Site of European Importance (SEI, pursuant to Act No. 114/1992 on Nature Conservation and Landscape Protection, as amended later, the term for Site of Community Importance, SCI, later Special Areas of Conservation, SAC, under the European Union's Habitats Directive) EVL) where spontaneous development undisturbed by management interventions would be ensured on 300 hectares. However, beech stands make up a relatively large part of the commercial forests described as 'over-aged', as they are usually not worth harvesting due to their difficult accessibility. We therefore have a unique opportunity to take advantage of the situation and protect the stands. To a large extent, the same solution can be applied to the other types of natural forest habitats included in this study, provided that the protection of species diversity in other groups of organisms does not require active management of a particular habitat.

Acknowledgements

The research was supported by the Technology Agency of the Czech Republic through project SS01010270. Detailed results, including an inventory of species found and relevant literature, are presented in Hofmeister *et al.,* 2024. *Hot-spots of epiphytic and epixylic lichens in fragmented temperate forests are underpinned by microhabitat heterogeneity and spatiotemporal habitat continuity.* Biological Conservation 292, 110563. ■

The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

The Pitfalls in Protecting, Conserving and Managing the Highest Parts of the Czech Republic

Jindřich Chlapek, Radek Štencl, Stanislav Březina, David Krause & Jan Materna

In June 2024, a two-phase "consilium/review board" attended by leading experts was held in the Jeseníky and Krkonoše/Giant Mts. on the needs and possible ways of preserving and restoring biodiversity in the Alpine zone in both mountain ranges. The reason for convening this consultation was the ongoing changes in the vegetation of the Alpine treeless habitats over the last decades. Their probable drivers include the abandonment of long-term farming after the displacement of the German population after World War II and other societal changes in the 20th century, as well as in the increasingly rapid and pronounced global changes, particularly the increase in temperature and high atmospheric nitrogen deposition.

Removal of mowed matter from upper parts of the Velká kotlina/Great Basin Glacial Cirque where biomass could not be left due to risk associated with eutrophication. © Radek Štencl

The need to translate the external drivers into conservation practice has been demonstrated by the rate and the intensity of ongoing vegetation change, as identified through evaluating ongoing monitoring and scientific studies. Countering the overgrowth of the Alpine zone with active measures would mean, particularly in the Krkonoše/Giant Mts., a fundamental change in the current approach to its protection, conservation and management.

JESENÍKY MOUNTAINS (NORTHERN MORAVIA AND SOUTHERN SILESIA)

A short look into the history

A study of archival materials (Szabó *et al.* 2024) shows that the history of exploitation of the highest altitudes of the Jeseníky Mountains has at least been 700 years long. Over the centuries, the ridges have been burnt, grazed by oxen, harvested for hay or farmed in the so-called Alpine style. The intensity of farming in different parts in the treeless areas has varied considerably over this period, depending on property ownership, because the main driving force was not demand from the common people in the foothills, but rather the desire of the estate owners to make the most efficient economic use of their land. Farming on the Jeseníky Mts. ridges then ceased completely for many decades shortly after the World War II.

When Leo Bureš and Jan Jeník created a detailed map of the vegetation in the Velká kotlina/Great Basin Glacial Cirque in 1974 (Bureš 2022), they may not have known what a timeless work it was. In 2009, a new map was produced with the most accurate repetition of the methodology and the results of the comparison after 35 years definitely confirmed that the Alpine treeless area in the Jeseníky Mts. is indeed changing significantly. The comparison of the two mapping surveys not only showed an area-wide loss of species-rich vegetation types, but the repetition of the phytocenological images also showed that even where different types of Alpine grasslands were preserved, there was a decrease in the number of species (species richness). The change in vegetation structure was most evident in the onset and relatively rapid spreading of the European bilberry (*Vaccinium myrtillus*).

At the same time, in 2009, long-term data from experimental plots showed that active management (mowing) clearly promotes the survival of rarer and competitively weak species. The first 5 such plots, where the effect of mowing on the species composition of subalpine vegetation was monitored, had been established by Leo Bureš in Cimrmanova zahrádka/Cimrman's Garden on the edge of the Velká kotlina/Great Basin Glacial Cirque as early as 1990, and gradually more were added in various places without forests, *e.g.* at Vysoké Hole/High Meadow in 2004.

Sites with removed blueberry in the Malá kotelní jáma/Little Kettle Cirque Hole in the Krkonoše/Giant Mts. in 2022. © Stanislav Březina

Grassland and blueberry growths mowing above the timberline at the Cimrmanova zahrádka/Cimrman Garden site. © Radek Štencl

In 2024 free-ranging grazing by sheep was tested in the vicinity of the Petrovy kameny/Peter's Stones site. © Jindřich Chlapek

Since 2010, the mowed areas, which had been limited to experimental plots, have begun to expand to other areas with still surviving rare species, *e.g.* the Narcissus-flowered anemone (*Anemonastrum narcissiflorum*), Small white orchid (*Pseudorchis albida*), Bearded bellflower (*Campanula barbata*), Round-headed rampion (*Phyteuma orbiculare*), the Mountain pansy (*Viola lutea* subsp. *sudetica*), *etc*., aiming at stopping the overgrowth of these areas, especially with blueberries. By 2015, mowing was already being carried out on 3-4 hectares per year.

Return of area management interventions on the Jeseníky Mts. peaks

A breakthrough in the management setup occurred in 2015, when the first eradication of blueberry on an area of approx. 0.5 ha had taken place as part of the testing of management practices. Between 2017 and 2023, mowing was already underway at a rate of approximately 5-17 ha per year. In doing so, it has become apparent that complete suppression of bilberry is a long haul, and that repeated mowing of areas with bilberry is necessary to weaken it and stop its further spread.

In parallel with mowing, grazing is gradually being reintroduced in the Mt. Praděd/Great Grandfather National Nature Reserve. In 2012, cattle grazing began on the meadows near the Švýcárna site, since 2014 sheep have been grazing above the Ovčárna site and since 2019 a mixed herd of horses and cattle has been grazing on the slopes of Mt. Praděd/Great Grandfather. The impact of grazing activities on the natural environment has also been monitored and evaluated annually since the beginning.

A small but definitely interesting management measure was the complete removal of the turf at five sites with a total area of 0.4 ha in the upper part of Vysoké Hole/High Meadow in 2017 and subsequently on an area of 0.5 ha in 2024.

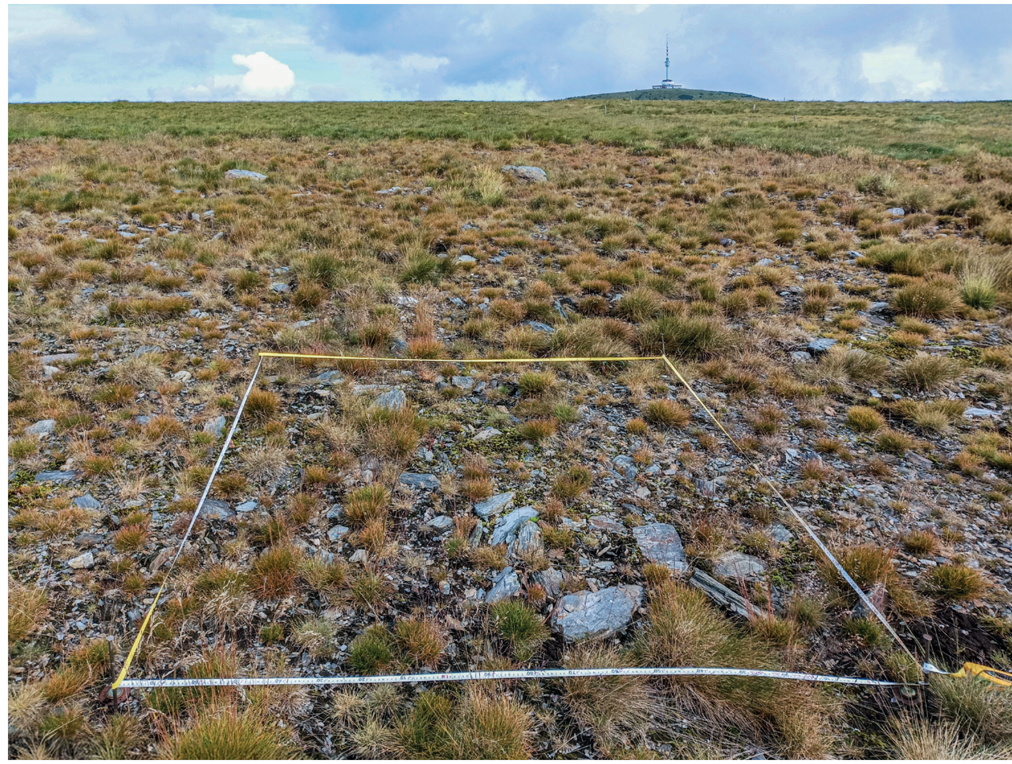
The results of the regular whole-area mowing are more than encouraging

After nine years of whole-area mowing, one of the expected assumptions has been confirmed, *i.e.* that not all Alpine grassland types need to be mowed annually and some vegetation types do not need mowing at all. The Alpine environment is conservative and processes are slower than at lower altitudes. To maintain stable vegetation types and prevent their degradation and species decline and loss, it will be sufficient to mow *e.g.* once every two or three years. The fact brings the advantage that, despite the financial demands of mowing in remote ridge locations, with an appropriate rotation, management can be optimised so that the biodiversity hotspots maintenance within the approx. 800 hectares of treeless areas in the Mt. Praděd/Great Grandfather region is sustainable in the long term.

However, almost all areas of Alpine treeless forest in the Jeseníky Mts. are registered as forest land. In order to allow grazing, which in this case is an intervention necessary to maintain and improve the condition of the objects of protection/conservation, it is therefore necessary to apply annually for a 'temporary restriction in providing forest functions' and to pay for this restriction (*e.g.* more than CZK 3,500 per hectare and month in 2024), which unfortunately makes grazing considerably more expensive.

An optimistic outlook

The next step towards the restoration of the species-rich subalpine grasslands is a five-year project funded by the Operational Programme Environment (OPE), starting in 2024, which aims to gradually expand and regularly carry out mowing on an area of 25 hectares and to the same extent carry out cattle and horse grazing on the south-western slopes of Mt. Praděd/Grand Grandfather and free grazing of sheep in the vicinity of the Petrovy kameny/Peter's Stones site. The OPE allows to finance projects for the protection and improvement of the environment from the European Union's Structural Funds.



State of vegetation at the Vysoká Hole/High Meadow: vegetation was fully removed thus denuding the mineral substrate 7 years ago. © Jindřich Chlapek

The idea for the period after 2029 is to resume year-on-year rotational free grazing on areas of dozens of hectares, perhaps with only additional mowing the plots where it has not been done yet and ideally with the production of local dairy products. This phase could mark a definitive shift from experimentation and conservation management to restoration of farming without the need for financial support beyond agricultural subsidies.

KRKONOŠE/GIANT MOUNTAINS (EASTERN BOHEMIA)

The key question of human influence on the current form of the Krkonoše/Giant Mts. Alpine treeless area

In the mid-1990s, when conservationists in the Velká kotlina/Great Basin Glacial Cirque in the Jeseníky Mts. started their first management experiments, an important summary text (Soukupová *et al.* 1995) was published from the perspective of the Krkonoše/Giant Mts., which is the result of comparative studies, long experience of the main authors and extensive confrontation with the literature. A team of experts around geologist and polar explorer Josef Sekyra and geobotanist Jan Jeník, it presents the Krkonoše/Giant Mts. parts above the timberline as, *i.e.* as a unique area with elements of both mountain and northern tundra (for more details see Březina *et al.* 2023 and Materna *et al.* 2023). The impact of humans on the sensitive tundra environment is assessed as clearly negative, especially in relation to ruderalization, eutrophication and trampling of vegetation around numerous paths or buildings. There is no mention in the text of at least 300 years of human influence on the Krkonoše/Giant Arcto-alpine tundra 's development or current shape.

Paradoxically, the unnoticeable role of humans managing the area above the Krkonoše/Giant Mts. timberline is recalled by Theodor Lokvenc, doyen in researching the past Krkonoše/Giant Mts. landscape (Lokvenc 1995). The mountains have been grazed and used for haymaking for centuries in the past. A rough idea of the extent of human activity at that time is given by the extent of the area with felled dwarf mountain pines *(Pinus mugo)* (either for the expansion of pastures and meadows or for fuel), which, according to Lokvenc covers up to 1,000 hectares, *i.e.* approx. a quarter of the entire Krkonoše/Giant Mts. area above the timberline. However, even he considers the human impact as rather negative, since the felling the Dwarf mountain pine has moved the vegetation in these parts away from its original state before the arrival of man. According to the state of knowledge at that time, the vegetation cannot return to this state on its own due to the lack of or very rare natural regeneration of the Dwarf mountain pine. One of the aims of the paper was therefore to justify the Dwarf mountain pine's artificial replanting, which was then carried out intermittently throughout the 20th century. In the background there is a conviction that the best we can do for Krkonoše/Giant Mts. nature is to undo the consequences of historical human influence and otherwise leave it to itself, or to the free action of natural processes that have shaped it over the previous millennia. This attitude is also evident both in the decree of the Government of the Czech Republic that legislated the establishment of the Krkonoše/Giant Mts. National Park in 1991 and in the contemporary planning documents elaborated by the Krkonoše/Giant Mts. National Park Administration.

A parallel in the approach to the secondary forestless area in the Krkonoše(Ginat Mts.

The strength of the "protection" spirit in nature conservation at that time is also evidenced by the cautious way in which the Krkonoše/Giant Mts. mountain meadows was started after the Velvet Revolution, where today we no longer doubt the necessity of active management. After World War II, the mountain meadows were abandoned by traditional farmers and since then many of them have been overgrown at different rates, first with expansive herbs and grasses, then with scrub and finally with forest. As late as the 1990s, only a fraction of the total area of about 11,000 hectares was managed by the Krkonoše/Giant Mts. National Park Administration. It was only with the LIFE CORCONTICA project (implemented 2012-2018) that meadows in the Krkonoše/Giant Mts. enclaves received comprehensive and conceptual management.

On the other hand, "up there" in the tundra, a firm belief in the optimality of the non-intervention regime persisted until recently. And rightly so. Evidence is mounting of how even well-intentioned human interventions in sensitive tundra habitats can be tricky in their effects. Dwarf mountain pine growths planted after World War II have gradually become closed and have begun to have a similarly deleterious effect on the unique tundra vegetation in their vicinity as the sprawling spruce trees "down below" in the meadow. After years of careful background data gathering and heated debate between naturalists and foresters, the risks from the Dwarf mountain pine's further expansion became too high, and a multi-phase project to reduce it over a total area of 160 hectares was initiated (Materna *et al.* 2023) ending with a third phase in 2022.

The results of comparative studies and monitoring speak unequivocally

Only the recent results of the Krkonoše/Giant Mts. Tundra - Past, Present and Future project have recently shown that there may not be an automatic equation between the Krkonoše/Giant Mts. tundra and the non-intervention regime under changing circumstances. Changes in its vegetation are not limited to areas with artificially planted dwarf mountain pines. Common woody plants, shrubs and grasses are spreading and unique tundra species, many of which being a direct target of the Krkonoše/Giant Mts. National Park activities, have been declining even at sites where no one has directly planted dwarf mountain pines - in Dwarf mountain pine's natural stands, in closed Alpine grasslands, on the highest Krkonoše/Giant Mts. peaks and in cirques, *i.e.* basically across the whole area (*cf.* Potůčková *et al.* 2021, Březina *et al.* 2023). It seems that while until recently, the changes have been relatively slow and gradual and there was hope that this was a return to a natural equilibrium state, in recent decades and years they have accelerated. As recently as the 1990s, the spread of blueberry or Norway spruce was not mentioned as a major problem (Wojtuń *et al.* 1995).

T answer the important question of whether we even have suitable management options to counteract the decline in rare Alpine plant species in the tundra, it is enough to go to the Jeseníky Mountains. Let us also reiterate that the current extent of mountain grasslands in the Krkonoše/Giant Mountains is, *inter alia*, the result of several hundred years of management. Part of the current changes in vegetation must be attributed to acid rain or nitrogen deposition and, of course, the increasingly intense global climate change. At the same time, however, they are all very reminiscent of the simple vegetation succession after the displacement of traditional farmers, *i.e.* what happened a few decades earlier in the Krkonoše/Giant Mts. meadows. Thus, the unique cold-adapted plant species are not likely to disappear as a direct result of climate change (warming), but rather due to overgrowth by common, competitively stronger species of shrubs, herbs and grasses, which we can cope with by similar management means as in the Alpine meadows below.

Conclusions of the tundra "consilium/review board"

The fundamental conclusion of the Krkonoše/Ginat Mts. part of the "consilium/review board" is that this is exactly what we should try to do in pilot management experiments as soon as possible. The ideal model species for such interventions are in the Czech Republic the specially protected species – the Sudetic lousewort (*Pedicularis sudetica* subsp. *sudetica)* and the Narcissus-flowered anemone. However, a comprehensive analysis of all tundra species should be made and consideration given to selecting additional species and their habitats (*e.g.* heathland in place of blown grassland) to cover the variability in possible approaches and outcomes. The size of areas for pilot interventions should be in from hundredths to tenths of hectare, interventions should primarily involve mowing and turf disturbance, grazing may also be considered. Interventions can be one-off, intermittent (approx. once every 3-5 years) or repeated*, e.g.* annually for approx. 3 years at the experiment's beginning and then leave the site unintervened for several years. The aim is to verify the actual impacts/effects on the selected specially protected species. The key point is that, according to the opinion of the Ministry of the Environment of the Czech Republic's staff present, none of the various proposed experiments to be carried out on the scale of hundredths of hectare is in conflict with the statutory nature zone regime, including the requirement for the implementation of such measures to be exceptional on the grounds of nature conservation interests.

Will the Jeseníky Mts. be a model for the Krkonoše/Giant Mts.?

The above information clearly shows a more progressive approach of the Jeseníky Mts. nature conservationists to the active management of the Alpine treeless habitast compared to the Krkonoše/Giant Mts., which was confirmed by the independent experts present at the 'consilium/review board'. In the Krkonoše/Giant Mts., all participants of the event unanimously recommended to go the way of small-scale pilot experiments in favour of specially protected species. These are intended to show whether simple interventions will bring the desired results even under the Krkonoše/Ginat Mts. conditions. While there was a consensus among the participants of the Krkonoše/Giant Mts. 'consilium/review board' on pilot interventions, there were divergent ideas on the longer-term vision and the introduction of active management interventions. The Krkonoše/Giant Mts. National Park Administration is thus facing a thorough discussion on the vision of the whole tundra area in the light of new circumstances. ■

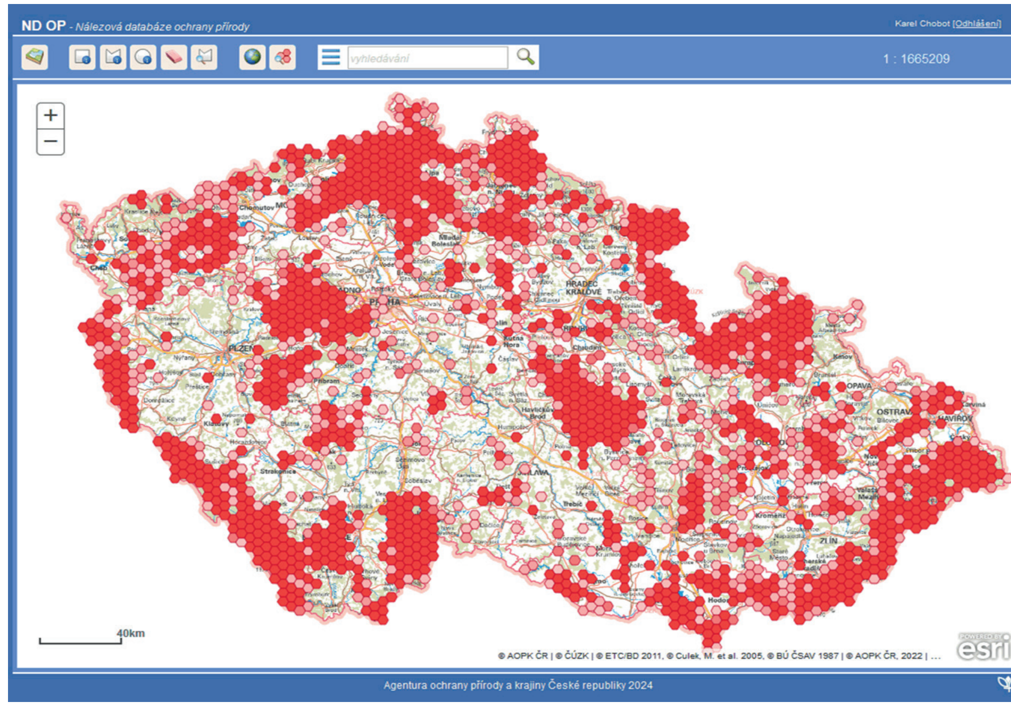
The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

Project Mapping and Species Inventories (Monitoring 2) Has Been Completed

Karel Chobot

The Nature Conservation Agency of the Czech Republic (NCA CR) is tasked with monitoring the condition of habitats and species, which can broadly be referred to as biodiversity monitoring. The monitoring and mapping of species and habitats significant for the European Union, which serve to fulfil the reporting obligations under EU directives, are funded by the state budget. However, the data collection needs are broader, and to meet them, the NCA CR proposes and manages a range of projects. The most extensive in terms of both objectives and funding are financed by the Operational Programme Environment.

One of the surveyed sites within the monitoring was Blanice River National Nature Monument. © Alois Pavlíčko



Overall view of occurrence data gathered during the project. © Nature Conservancy Species Occurrence Finding Data Database (NCSOFDD), Nature Conservation Agency of the Czech Republic

The Smooth snake (*Coronella austriaca*) is one of the more difficult species to be detected during reptile surveys. Even a shed skin can serve as evidence of its presence at a site. © Zdeněk Mačát

Between 2010 and 2015, the first such project was implemented, entitled as *Monitoring and nationwide mapping of species of European importance for the completion of the Natura 2000 network proposal in the Czech Republic*, abbreviated as *Monitoring and mapping of SEIs*. Its core content was the detailed and extensive mapping of selected wild animal species across the Czech Republic, which commenced in 2012. The project included the mapping and monitoring of species significant for the EU: crayfish; molluscs; beetles; butterflies and moths; dragonflies and damselflies; grasshoppers, locusts and crickets; mapping of selected fish species, amphibians, and reptiles, selected mammal species, and the mapping of bird species listed in Annex I to the EU Birds Directive. The mapping was carried out by 16 external contractors. At the same time, a similarly large-scale project called *Implementation of the Natura 2000 Network in the Czech Republic* was underway, the core content of which also involved data collection: inventory surveys in small-size Specially Protected Areas of national categories. These activities were also conducted out by a smaller number of competitively selected contractors; however, in the actual implementation of many surveys, it led to unwelcome compromises in quality. After the conclusion of both projects, it became evident that further fulfilment of the broad data collection and gathering needs regarding species would not be possible without a follow-up project; indeed, the then-current call under the Operational Programme Environment already anticipated more extensive funding for monitoring.

As early as 2015, the NCA CR's Department of Biodiversity Monitoring developed a proposal substantively combined both topics: the project *Mapping & inventory,* officially titled *Monitoring and mapping of selected plant and animal species and inventory of small-size Specially Protected Areas in nationally important areas in the Czech Republic*. By combining both major topics, the project once again surpassed the previous volume and financial records of the NCA CR (the total proposed project budget reached nearly CZK 360 million = EUR 14.5 million), while also bringing significant organisational and formal challenges.

Based on experience from previous projects, most fieldwork was carried out through part-time job agreements. In total, more than 2,100 such agreements were concluded within the project. While the agreements come with several limitations, they offer a key advantage: the ability to directly select and control the quality of contractors without intermediaries.

The project consisted of two main components, effectively the successors and continuations of the previous projects: (1) mapping and (2) inventory surveys. Mapping in this project also included plants, but it could only be conducted within protected areas: Protected Landscape Areas (PLAs), National Parks (NPs), Sites of European importance (SEIs, pursuant to Act

White Carpathians Mts. are the centre of occurrence for the rare Sage tortoise beetle (*Cassida canaliculata*). It has been confirmed in several species surveys conducted as part of the project. © Zdeněk Chalupa

No. 114/1992 on Nature Conservation and Landscape Protection, as amended later, the term for Site of Community Importance, SCIs, later Special Area of Conservation, SACs, under the European Union's Habitats Directive), and Bird Areas (Bas, pursuant to the above act, the term for Special Protection Area, SPAs under the EU Birds Directive). Inventory surveys, on the other hand, focused primarily on non-national small-size Specially Protected Areas (SSPAs) managed by the NCA CR – an extensive set of sites that had not yet been addressed. In addition, surveys were also carried out in National Nature Monuments and National Nature Reserves where they had previously been lacking and were required by the site management planning cycle. For the mapping and monitoring of fish, bats, and birds, the model of external contracts was retained, with these contracts being subject to public tenders. Due to the specialised nature of the activities, the contractors are entities with extensive experience and qualified experts: the Academy of Sciences of the Czech Republic, Czech Bat Conservation Society, and Czech Society for Ornithology. For the other groups, the activities were carried out by employees, both through part-time job agreements and by regional staff who were funded by the project. The project plan aimed to conduct monitoring at 14,790 sites and carry out 5,070 inventory surveys, including 50 surveys in the Prague territory (which had to be financed from other NCA CR sources). The combination of both activities led to greater survey efficiency. If an inventory survey for the relevant group was conducted within a given mapping unit, it was removed from the mapping plan. In essence, mapping complemented the inventory surveys in areas that were not covered by protected areas.

All the data gathered was stored and made accessible in the Nature Conservancy Species Occurrence Finding Data Database (NCSOFDD), where it is available to, among others, all State Nature Conservancy authorities. Due to the scale of the project, the volume of findings gathered has also been very high. In the NCSOFDD, two projects were established to consolidate the collected data – OP MapInv: Inventory of SSPAs, and OP MapInv: Monitoring and mapping of selected species. Both datasets are among the largest, with a total exceeding 925,000 records, nearly ten times the amount of data from the previous, more narrowly focused project Monitoring and Mapping (just under 93,000 records).

What was achieved in the project will be presented by individual species groups; many of the partial results will be published as articles in the *Příroda* journal issued by the NCA CR.

Mosses, lichens, and fungi

The "non-vascular" groups were always somewhat neglected in standard status monitoring, and the MapInv project provided a significant financial boost for surveys focused on them. The aim of mapping and monitoring was to focus on species from the Red List of Threatened Species of the Czech Republic, particularly those threatened by inappropriate management (*e.g.* rare forest epiphytes) or its absence (*e.g.* species of fen bogs and peatbog grasslands), relict species (*e.g.* Arctic-alpine species of glacial cirques/corries and snowfields), or rare, newly confirmed species. The distribution, condition, and population size of these species were assessed. For mosses and lichens, species significant for selected habitats were also mapped, including those found in: fields and stubble; mountain Norway spruce forests, sandstone rock cities, beech forests, steppe grasslands, limestone rocks, mires, glacial cirques/corries and snowfields, wind-swept alpine grasslands and alpine heathlands, fens, springs, watercourses, sandy areas, scree, relict pine forests, heathlands, oak forests, floodplain/alluvial forests, diabase and serpentinite outcrops, rocks rich in heavy metals, and the exposed bottoms of fishponds. Unfortunately, the financial boost encountered limitations due to unavailable capacity. Mycological surveys are very demanding, and the capacity of Czech mycologists was quickly exhausted. As a result, a significant portion of the planned surveys was not carried out, and the funds could not be utilised.

Vascular plants

The project set the goal of obtaining high-quality information about the most endangered group of vascular plants in order to propose optimal conservation measures for them. Once again, the project increased the resources dedicated to monitoring species, focusing on those significant for the EU. The critically endangered vascular plant species from the Red List of Vascular Plants of the Czech Republic were mapped, supplemented by Specially Protected Species (excluding those with an approved action plans/recovery programme). Quantitative population parameters were determined, along with data on the condition of the species and its habitat, including the recording of phytocoenological relevés.

Invertebrates

Large branchiopods, notable crustaceans, were mapped in grids of the network covering most of the large-size Specially Protected Areas (*i.e.* NPS and PLAs) and BAs. Aquatic molluscs were surveyed in 100 grid squares within selected PLAs, while terrestrial molluscs were surveyed in a different set of 100 grid squares. Targeted monitoring focused on potential and current sites of the Lesser ramshorn snail (*Anisus vorticulus*) and the whorl snails *Vertigo moulinsiana* and *V. angustior*, which are significant indicator species.

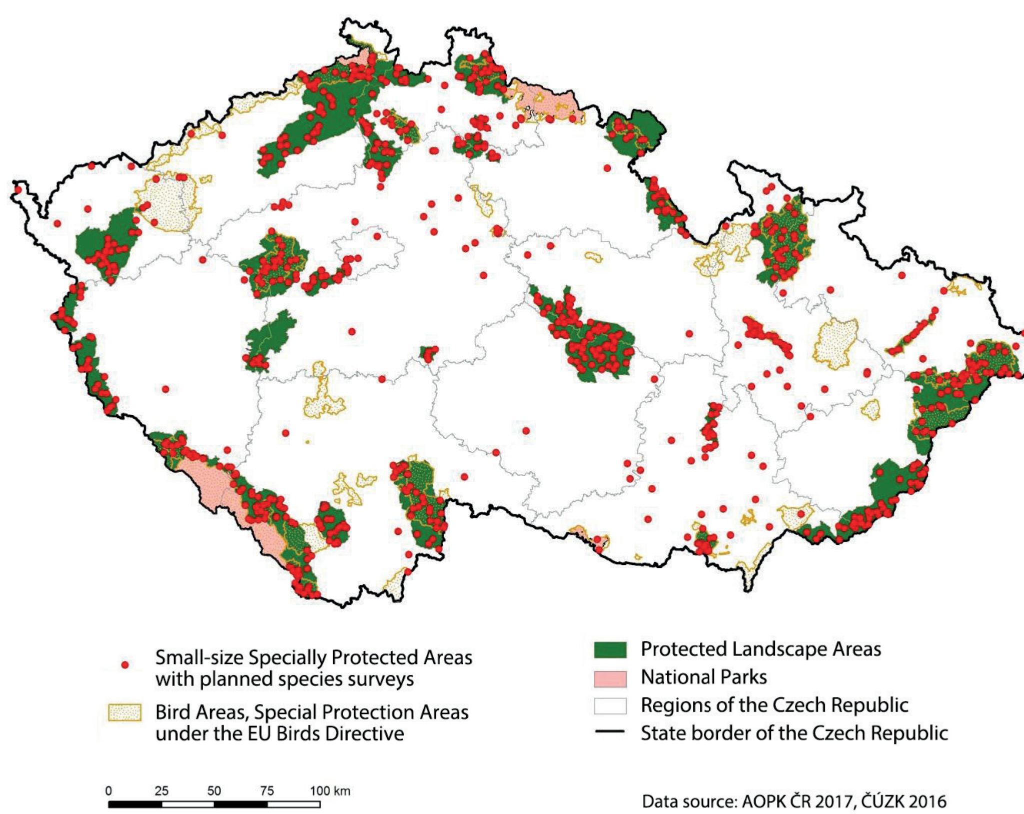
In the case of insects, the project mapped beetle communities in 592 second-order grid squares (provisionally referred to as quarter-quadrants). Depending on the habitat type, the focus was on saproxylic species groups (in forested areas) or phytophagous ones (in open habitats), while epigeic species were always surveyed. Due to limited expert capacity, results were submitted for only 400 grid squares by the end of the project. A total of 638 second-order grid squares within the PLAs were surveyed for orthopterans as well. Butterflies were also mapped in the same area, using both intensive (16 sites per grid square) and extensive (4 sites per grid square) survey methods. Based on the results of intensive mapping of butterflies in the PLAs, a thematic issue of the *Příroda* journal was compiled (published in the first quarter of 2024). This publication complements a series of regional butterfly distribution atlases that have been published in the Czech Republic in recent years. This series is probably unique on a global scale. Dragonflies and damselflies from the aquatic groups were surveyed across 600 grid squares; unfortunately, due to a lack of experts, only slightly over 400 grid squares were processed by the end of the project, as was the case with the beetles.

Vertebrates

The project included a repeat of the nationwide mapping of amphibians and reptiles, which has been conducted by the NCA CR since 2008, with the first phase completed in 2014 as part of the initial monitoring project. The established methodology was used to confirm the current occurrence of each species in every quarter-quadrant of the surveyed grid square, again within PLAs. The inventory of amphibians and reptiles further supplemented this mapping. In addition to mapping, the recent occurrence of amphibians and reptiles was confirmed in selected SEIs, using available resources.

In the case of fish, the availability of data is the result of the long-term efforts of the NCA CR to utilise various project resources to fill gaps in their knowledge. The need to update information on the population status of the fish species listed below is all the more crucial as these are mostly relatively short-lived species, and aquatic ecosystems are continuously subjected to significant anthropogenic pressure, which is expected to have a negative impact on these species. The project supplemented and updated data on the populations of Specially Protected fish species within PLAs and SEIs. While in the past, the study on the distribution and demographic parameters

Recorder camouflaged in the field – acoustic bird monitoring using automatic recorders. © Jan Havelka



Small-size Specially Protected Areas with planned species surveys.
© Nature Conservation Agency of the Czech Republic

of these species was the subject of scientific research, there are almost no such studies outside of conservation monitoring. At 50 sites, covering all SEIs (including Soutok/Confluence-Podluží SAC, the most significant SEI in terms of fish being a subject of conservation), endangered Ponto-Caspian species were monitored annually: the Streber (*Zingel streber*), Common zingel (*Zingel zingel*), Zinge (*Pelecus cultratus*), Danube ruffe (*Gymnocephalus baloni*), Striped ruffe (*Gymnocephalus schraetser*), Golden spined loach (*Sabanejewia aurata*), Ukrainian brook lamprey (*Eudontomyzon mariae*), Kessler's gudgeon (*Gobio kessleri*), nad the White-finned gudgeon (*Romanogobio albipinnatus*). The population status in the SEIs was assessed twice for other European significant fish species: the Weatherfish (*Misgurnus fossilis*), loach (*Cobitis* sp.), Bitterling (*Rhodeus sericeus*), Asp (*Leuciscus aspius*), Common bullhead (*Cottus gobio*) and the Brook lamprey (*Lampetra planeri*). In addition, fish communities were mapped in selected PLAs, which was analogous to the mapping activities carried out for other groups. The aim was to capture long-term changes in abundance and any changes in the distribution of fish species listed under the EU Habitats Directive and species of special conservation concern.

The project included three activities focused on birds. It enabled the mapping to be focused on Specially Protected Species that had not previously been targeted, as well as species with a negative population trend and species that are difficult to detect or are conflict species. Thus, the focus of the surveyors in the PLAs included species such as the Little owl (*Athene noctua*), Black-headed gull (*Chroicocephalus ridibundus*), Northern lapwing (*Vanellus vanellus*), Black-tailed godwit (*Limosa limosa*), Common snipe (*Gallinago gallinago*), and the Grey heron (*Ardea cinerea*), grouped into seven methodological categories. In each grid square, an average of four methodologies were used for mapping.

Night-time acoustic monitoring (which is a time-efficient method) was conducted for selected species that are difficult to detect: all owl species, the Eurasian woodcock (*Scolopax rusticola*), Hazel grouse (*Tetrastes bonasia*), European nightjar (*Caprimulgus europaeus*), Great bittern (*Botaurus stellaris*), Little bittern (*Ixobrychus minutus*), Spotted crake (*Porzana porzana*), Little crake (*Porzana parva*), and the Corncrake (*Crex crex*). Monitoring is carried out using audio recorders in grid squares selected based on the analysis of data gaps and available personnel capacity.

In BAs, the population size of all species listed in Annex I to the Birds Directive was assessed once. The project thus allowed for the restoration of this monitoring type, which had been carried out from 2005 to 2013 but was subsequently discontinued due to a lack of funding and replaced by other methodological approaches in previous projects. The data gathered during the course of the project were used for reporting under the same Directive in 2019 and will also be used in the next reporting period in 2025. As in other cases, the application of the data is broad and contributes to the development of further monitoring activities after the project's completion.

The range of activities for mammals was quite broad. Mammals, apart from those species that were subject to specific activities, were systematically mapped in the PLAs, many of which for the first time. Similar to the case with fish, systematic mammalogical studies were resumed after a long period, which would provide a complete overview of the mammal fauna in a specific area. Special attention was given to non-native carnivore species: the Raccoon dog (*Nyctereutes procyonoides*), Northern raccoon (*Procyon lotor*), and the American mink (*Neovison vison*) in the Krkonoše/Ginat Mts. National Park, where other mammal species were not mapped within the project.

For the Eurasian beaver (*Castor fiber*) monitoring was conducted every two years in all SEIs where the species is a subject of conservation (Kateřinský potok/Catherine's Brookand Nivní potok/Floodplain Brook, Labe/Elbe River Valley, Strážnická Morava, Dyje/Thaya River floodplain, Soutok/Confluence-Podluží, Litovelské Pomoraví/Litovel Morava River Basin, Morava/Moravia – Chropyňský luh/Chropyně Floodplain). Due to the complexity of the monitoring, funding outside the state budget was necessary. Monitoring the spreading and colonisation of new sites as part of the occurrence mapping is crucial, especially considering that the presence of Eurasian beaver in recent years has often conflicted with the land-use by agriculture, forestry, and water management. Occurrence mapping and population monitoring of Eurasian beaver in SEIs are part of the planned activities of the Eurasian Beaver Management Programme in the Czech Republic, which was approved in 2013 by the Ministry of the Environment of the Czech Republic, with the NCA CR charged to implement it.

Monitoring of 27 bat species within the project built upon long-term bat monitoring. Regular monitoring includes: 1) counting bats at hibernation sites/hibernacula (carried out in January and February – about 700 sites); 2) monitoring summer colonies (carried out in June and July – about 200 sites); 3) monitoring using detectors at selected sites; 4) trapping in nets at selected sites. It is essentially a continuation of a long-term project that was initiated as early as in the 1950s.

Monitoring of the Eurasian otter (*Lutra lutra*) was also carried out in SEIs where the species is a subject of conservation. It is one of the three methods for monitoring the otter defined in the approved "Management programme for the Eurasian otter (*Lutra lutra*) in the Czech Republic for 2009–2018." Nationwide mapping of distribution and estimation of abundance in selected areas, however, was outside the defined territorial scope of the project.

In the Czech Republic, the European wildcat (*Felis silvestris*) is the most mysterious carnivore, and reliable evidence of its occurrence in the country only emerged after 2011. It was monitored and mapped in selected sites with suitable habitats for the species, and new findings were often made by camera traps.

Conclusion

Similarly to the previous project, the project *Monitoring and mapping of selected plant and animal species and inventory of small-size Specially Protected Areas in nationally important areas in the Czech Republic* was another valuable experience for the NCA CR. Project funding for specifically focused activities on gathering species data is, in times of tight budgets, probably the only chance to supplement such data, and in many cases, the only opportunity to obtain them. This also applies to the data necessary for assessing the condition of protected areas, which are used to set management measures and to fulfil the obligations of the NCA CR as their manager.

Thanks to the project, the Czech Republic's survey of the status and distribution of species has been significantly improved, and our knowledge, essential for the effective management of protected areas, has undeniably increased. ■

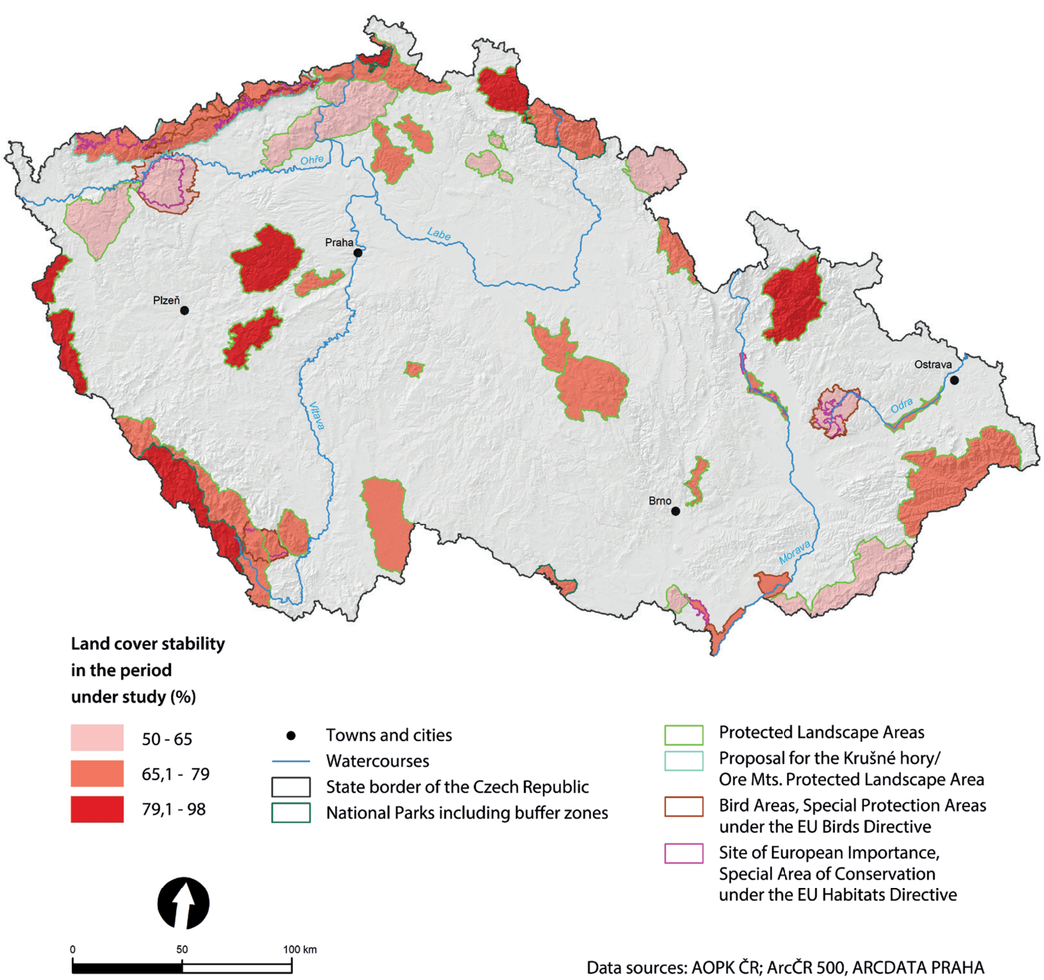
How has the landscape of our protected areas changed over the past 70 years?

Tomáš Janík & Dušan Romportl

The Czech landscape has gone through significant changes over the past decades. These changes have also affected protected areas such as National Parks (NPs), Protected Landscape Areas (PLAs) and Natura 2000 sites. An analysis of landscape changes, their assessment, and understanding may lead to better management and future governance of these areas.

The Berounka River in the Křivoklátsko Protected Landscape Area (Central Bohemia). © Jaroslav Vojta

The Pálava/Pavlov Hills Protected Landscape Area and Nové Mlýny waterworks/water reservoirs (South Moravia). © David Outrata



Analysed areas and land cover stability rate in the period under study. Source Nature Conservation Agency of the Czech Republic and outputs of the project.

In addition, the responsible manager must balance multiple conflicting interests in these areas. Landscape change assessments may help answer the question how to manage and use the landscape for production, recreation, and nature conservation. Based on four time horizons at which we assessed changes in landscape cover and anthropogenic pressure, we present findings of the changes that have occurred in our protected areas.

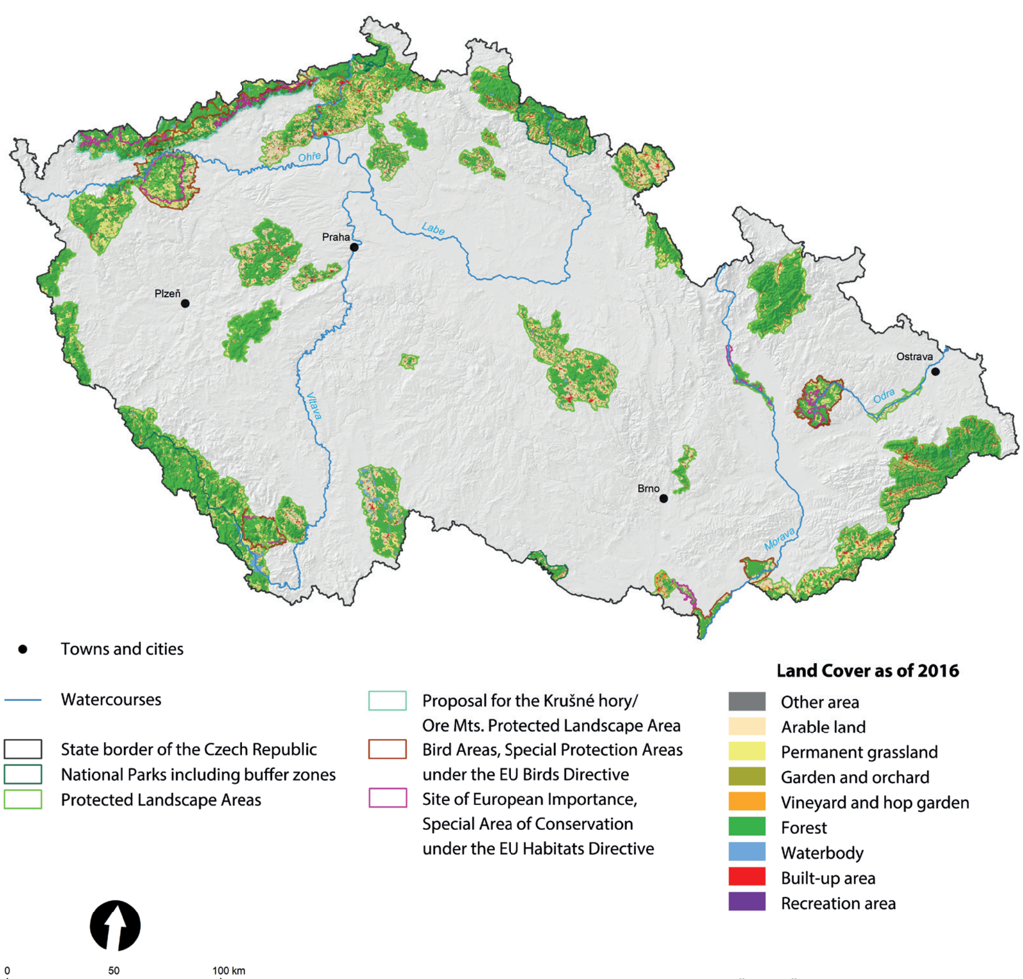
Why track landscape changes?

A five-year project titled Landscape Monitoring was carried out at the Silva Taroucy Research Institute for Landscape and Ornamental Horticulture between 2018 and 2022, under a contract with the Ministry of the Environment. Its aim was to provide NP and PLA Administrations and the entire Ministry with information on the development of the landscape in all 30 large-scale protected areas (LSPAs). The same analyses were carried out for selected Natura 2000 sites and for areas where designation of an NP or PLA is considered. Based on comparable data across LSPAs throughout the Czech Republic, this information can then be used for further management and decision-making in the areas.

Methods

Data on landscape use were acquired by means of manual vectorisation, i.e. digitisation of information from map data in ArcGIS. Thanks to diverse data sources used, nine categories of landscape cover could be distinguished (Arable land, Permanent grassland, Gardens and orchards, Vineyards and hop gardens, Forests, Waterbodies, Built-up areas, Recreation areas, and Other areas). These were processed on the basis of the 1:25,000 Military Topographic Maps of Czechoslovakia created between 1952 and 1956. We further used the Military Topographic Map from 1988–1995, the Basic Topographic Map made between 2002 and 2006, and finally aerial photographs from the years 2016 to 2020 were used. These four time horizons, simply indicated as 1950, 1990, 2004, and 2016, depict the landscape at key milestones which influenced its further development. In the 1950s, collectivisation of agriculture took place, the German population had been displaced, and the first protected areas were being established. The year 1990 marked a change in the political

The Broumovsko Protected Landscape Area (eastern Bohemia) – sandstone areas with rock towns surrounded by the rural landscape. © David Outrata



Current land cover of the areas studied. Source Nature Conservation Agency of the Czech Republic and outputs of the project.

and economic regime with major consequences for the landscape, e.g. changes in agriculture, but also in nature and landscape protection, including the Nature and Landscape Protection Act. In 2004, the Czech Republic entered the European Union, which introduced many changes to the Czech landscape, such as new measures under the Common Agricultural Policy and in the field of nature conservation. The current state of the territory was then elaborated with the data from 2016 to 2020. The minimum size of mapped polygons was 0.8 ha with a minimum width of 40 m. Linear elements were not taken into account in these analyses.

Data on anthropogenic pressure on the landscape were processed in a similar way and at analogous time intervals. These included built-up areas, recreation areas, and linear infrastructure (ski lifts, cable cars, power lines) and further roads, paved paths, and streets. Built-up and recreation areas were defined above a size of 0.2 ha. Separately, data on buildable areas showing possible their development potential was obtained from the Regional Offices. To process this detailed data, more accurate 1:10,000 maps were used – the oldest time horizon was processed based on Military Topographic Maps from 1957 to 1971 and then from Basic Topographic Maps from 1988 to 1993. The 2004 and 2016 time horizons were completed using available orthophotographs and based on the ZABAGED database.

Changes in landscape cover and structure

Looking at changes in the landscape cover of NPs and PLAs, an increasing dominance of forest is particularly noticeable. Its proportion in all NPs and PLAs together increased from 55% to 63% over the 70-year observation period. The forest area grew most strongly until 1990. On the contrary, more intensive forms of farming declined, with a decreasing proportion of arable land (from 23% to 9%), while the total permanent grassland area increased from 17% to 21% after a slight decline before 1990. At the same time, the change from arable land to permanent grassland area was the strongest, and its intensity has increased to the present day. An increase in area was recorded for waterbodies, mainly due to the construction of waterworks until 1990.

The development varies however strongly across protected areas. National Parks are

Mountain range in the Jeseníky Protected Landscape Area (northern Moravia). © David Outrata

generally more forested (an increase from 70% to 79%) and both arable land area and permanent grassland area have seen a significant decline. The overall stability is also higher, with 83% of the landscape cover in National Parks remaining unchanged over the four time horizons, while changes were observed in 30% of the area in Protected Landscape Areas. Logically, we also found a lower proportion of built-up areas in the National Parks and a lower increase in built-up areas over the observation period.

From the perspective of landscape change, the 30 LSPAs can be divided into two basic groups. One includes mostly ‘forest’ areas, i.e. PLAs and all National Parks, having a higher landscape cover stability and also predominantly forested areas. Typical representatives are mountainous PLAs like the Beskydy, Jeseníky, and Jizera Mountains PLAs. The other group also comprises extensive areas of cultural landscapes significantly altered by humans, represented by e.g. the Central Bohemian Highlands, Bohemian Karst, and Blaník PLAs. This division relates to their main values and possible threats. Forest areas are valuable for their stability and forest ecosystem integrity, but are threatened by activities and structures leading to undesirable fragmentation of the area. The benefits of areas with more open agricultural landscapes are the diversity and harmonious development of human activities and nature. Threats are mainly found in an increase in human activities and strong homogenisation of the landscape structure, which manifests itself by e.g. an increase in average land parcel size when assessing all LSPAs together.

We also studied whether proportion of stable landscape parts varied with date of PLA designation. When making a division into groups of areas designated in 1955–1970, 1971–1988, and 1989–2016, no major differences between the areas were found. Looking at the last designated PLAs, i.e. Brdy and Bohemian Forest, largely forest landscapes without settlements are protected here, and this trend, which probably means a simpler negotiating process when creating new PLAs, is also found with prepared NPs and PLAs.

Anthropogenic pressure

The assessment of built-up and recreation areas showed a steady increase. Interestingly, while built-up areas are more represented in PLAs and showed an increase, National Parks have a stronger representation of recreation areas due to their considerable extent in Krkonoše National Park. Built-up and recreation areas are unevenly distributed across the protected areas. Built-up areas increased more in the vicinity of larger towns in PLAs, especially after 1990 as part of the suburbanisation effect. These are e.g. the Bohemian Karst and Moravian Karst PLAs, the Central Bohemian Highlands PLA, and the Jizera Mountains PLA. Moreover, the current proportion of built-up areas correlates with the area of developable land, so it can be assumed that the differences between protected areas will rather increase, and pressure for development will especially take place at sites where more built-up areas are already present. Recreation areas are more represented in the mountains, where they include ski resorts, which (especially after 1990) have significantly increased in area and include linear infrastructure such as cableways and ski lifts. Elsewhere, the proximity to clients from large towns or other specifics such as spa centres manifests itself: an abundance of golf courses in the Bohemian Karst near Prague and in Slavkov Forest near Carlsbad and Marienbad.

Also the development of the observed roads has its own patterns. The length of the roads did not change much in total. Locally, roads were closed, often for reasons of nature conservation, while elsewhere new road sections were built. The increase in streets correlates with the increase in development. This does not count for paved paths. In predominantly forested areas, including National Parks, a stagnation or expansion of the path network took place, apparently hand in hand with forestry and recreational activities. By contrast, in more open areas with meadows, pastures and fields, the total road length declined, mostly until 1990, as a result of agriculture collectivisation of land consolidation.

Selected Natura 2000 sites

Outside of the LSPAs, analyses were also carried out for selected Natura 2000 sites, including areas in the Ore Mountains (Klínovecké Krušnohoří SCI, Krušnohorské plató SCI, Novodomské rašeliniště – Kovářská Bird Area, Východní Krušné hory Bird Area) and areas largely overlapping with the military training areas Boletice Bird Area and SAC, Hradiště SAC, Doupovské hory Bird Area, and Libavá Bird Area and SAC. In southern Moravia, sites at the confluence of the Morava and Dyje rivers (Niva Dyje SCI, Soutok-Podluží SCI, and Soutok Tvrdonicko Bird Area) were selected, as well as the Bzenecká Doubrava – Strážnické Pomoraví Bird Area. The Litovelské Pomoraví SAC largely overlaps with the PLA of the same name.

The Krkonoše/Giant Mts. National Park (eastern Bohemia). © David Outrata

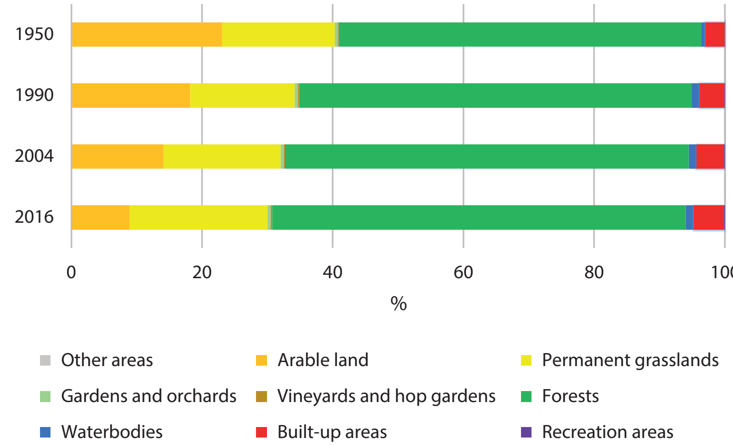
In these groups, some similarities but also different underlying trends can be traced. The areas in the Ore Mountains are situated in a mostly stable forested landscape with a minimum of development and recreation, and the forest expanded moreover over time. In Natura 2000 areas overlapping with military training grounds, a relatively large change in landscape cover was observed. Thanks to the military use we did not observe intensive human activities here. These areas were mainly overgrown with forest and a relatively large part remained permanent grassland. A higher proportion of forest and less development (compared to PLA average) are characteristic of the area along the Morava river. What differs is that the proportion of arable land in the marginal parts increased or stagnated (Litovelské Pomoraví), so that the overall intensity of agriculture increased.

Parts of the investigated Natura 2000 sites which do not overlap with the current NPs and PLAs are important from the conservation perspective also for their securing landscape connectivity in the LSPAs. Boletice acts as an important stepping stone between the Šumava and Blanský Forest PLAs, the Doupov and Ore Mountains between the Slavkov Forest and Elbe Sandstones PLAs, the Soutok and Bzenecká doubrava sites are situated between the Pálava and White Carpathians PLAs, and finally Libavá lies between the Litovelské Pomoraví and Poodří PLAs.

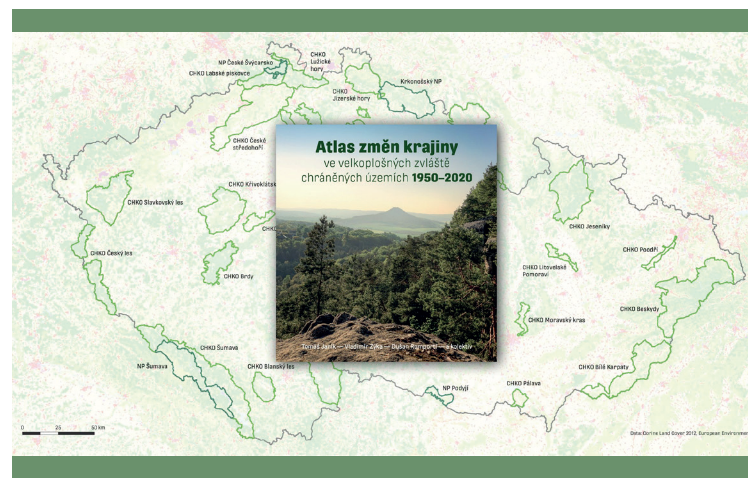
How do the newly prepared NPs and PLA stand in terms of landscape development?

The government‘s programme declaration explicitly lists three new areas to become NPs or PLAs: Křivoklátsko NP, Soutok (as an NP in the declaration, now being discussed as a PLA) and the Ore Mountains PLA. Křivoklátsko NP should be established in the central part of the Křivoklátsko PLA and is similar to the other already established National Parks in the observed features: it is a stable highly forested area (97% of the area was forest during the observation period) with a minimum of anthropogenic structures. Woodland also prevails at Soutok and in the Ore Mountains, where anthropogenic structures are at the same time represented only minimally. The Ore Mountains belong to a group of PLAs characterised by a high stability and forest cover. The core areas consist of current Natura

Lowland area with floodplain forests in the Litovelské Pomoraví/Litovel Morava River Protected Area (Central Moravia). © Jaroslav Vojta



Representation of land cover categories in the large-size Specially Protected Areas at the monitored time horizons. © Tomáš Janík



Several publications were produced under the project. Results for all large-size Specially Protected Areas are summarised in the Atlas of Landscape Changes in Large-size Specially Protected Areas 1950-2020. ©Tomáš Janík

2000 sites. There did not use to be many built-up areas, but their size increased again after 1990, and recreation areas increased even stronger. Also Soutok is predominantly forested and stable in terms of landscape cover with a minimum of built-up and recreation areas, but at the same time, an intensification of agricultural activity was observed in the marginal parts of the current Natura 2000 sites over the years.

Future trends

Our National Parks and Protected Landscape Areas represent a diverse range of landscapes, but share some trends in landscape change. These include an increase in forest and permanent grassland area, most notably through a change from arable land. Built-up and recreation areas have also increased, albeit unevenly across the territories. Our research also points to potential values of and problems in the areas. On the one hand, they are mostly stable forested areas with an expanding road network and (in the case of attractive mountainous areas) also recreation areas, particularly ski resorts and related infrastructure. On the other hand, there are areas with a higher proportion of meadows, pastures and fields with a decline in roads and a simplified landscape structure, where it is important to maintain landscape diversity and a harmonious relationship between man and nature. Moreover, if we take a similar perspective on the areas considered for establishing an NP or PLA, such as the part of Křivoklátsko, the Ore Mountains, and Soutok, we can conclude that they do not significantly differ in the observed features, and are suitable candidates to be designated an NP or PLA from the landscape perspective.

We are currently, for the next five years, comparing the NPs and PLAs and their immediate surroundings and the potential for designating new PLAs and NPs. The outputs from both projects, including an atlas and a geoportal, can be found at www.monitoringkrajiny.cz. ■

The European Larch More Native than Previously Thought. How to manage it in Specially Protected Areas?

Jindřich Prach, Petr Pokorný, Martin Prach, Kristýna Hošková, Tomáš Fér & Pavel Bednář

The idea that the European larch (*Larix decidua*) is native only to the Nízký Jeseník/Low Jeseník Mts. (northern Moravia and southern Silesia) between the Alps and the Carpathians is being changed by new research documenting larch surviving for thousands of years at some sites in the North Bohemian sandstones. We do not have such detailed research elsewhere, so we do not know if larch grew there for a long time. Nevertheless, shifts and uncertainties in knowledge need to be taken into account in conservation planning. It does not make sense to eliminate larch across the board from common regularly managed commercial forests and within protected areas. On the other hand, in rocky habitats and areas less affected by forestry, it should be protected as a potentially interesting and valuable relic for nature conservation. The case of the European larch shows how scientific knowledge is progressing and how the interests of nature conservation and production forestry can be reconciled.

Under some rock edges of the North Bohemian sandstones, it has been newly discovered that the European larch survived there, at least in small quantities, together with pine trees for thousands of years. © Jindřich Prach

Native and non-native species are not like black and white

The nature conservation approach to species considered non-native is not uncomplicated. Some species are native to other continents. Some cause obvious damage. The need to eradicate such species in nature conservation areas can hardly be disputed. Other species are native to nearby parts of Europe and have only previously been limited by dispersal possibilities, climate, competition from other species, *etc.* Such species may not have occurred in the Czech Republic in the recent past, but their distribution may be changing in the same way as the drivers determining their distribution*, e.g.* the climate mentioned above. The conservation approach to such non-native species is different - nobody is trying to eradicate the False Oat-grass (*Arrhenatherum elatius)* from common meadows, or the Meadow brome (*Bromus erectus*) from steppe grasslands. Neither is the Eurasian collared dove (*Streptopelia decaocto*) from the Czech Republic's avifauna.

The view on the issue of (in)originality in the light of the constant passage of time and long-term changes in nature is essential, although difficult to grasp for everyday nature conservation practice. Words such as 'native', 'natural' or 'natural' (state, habitat, species occurrence, forest composition, *etc.*) are commonly included in many protected area management plans and various conservation documents without explicitly considering what state we are referring to. To a past one? (But how old?) Or to a hypothetical state without humans? (But in today's climate, or perhaps in another climate of a time before significant human influence?) Moreover, scientific knowledge is deepening and interpretations are becoming more precise. Larch is a good example of shifts in knowledge and the resulting necessary changes in nature conservation practice. As we will show below, the lack of tangible evidence of the larch's long-term survival used to be overestimated and gradually resulted in "textbook truths" about the non-nativity of the European larch in the Czech Republic everywhere outside the Nízký Jeseník/Low Jeseník Mts. area.

Larch trees can maintain gaps and clearings in otherwise shady deciduous broad-leaved forests after traditional management is abandoned. A site with the critically endangered Ladybells *(Adenophora liliifolia*) in former oak-hickory coppice forest in the Karlštejn National Nature Reserve. © Jindřich Prach

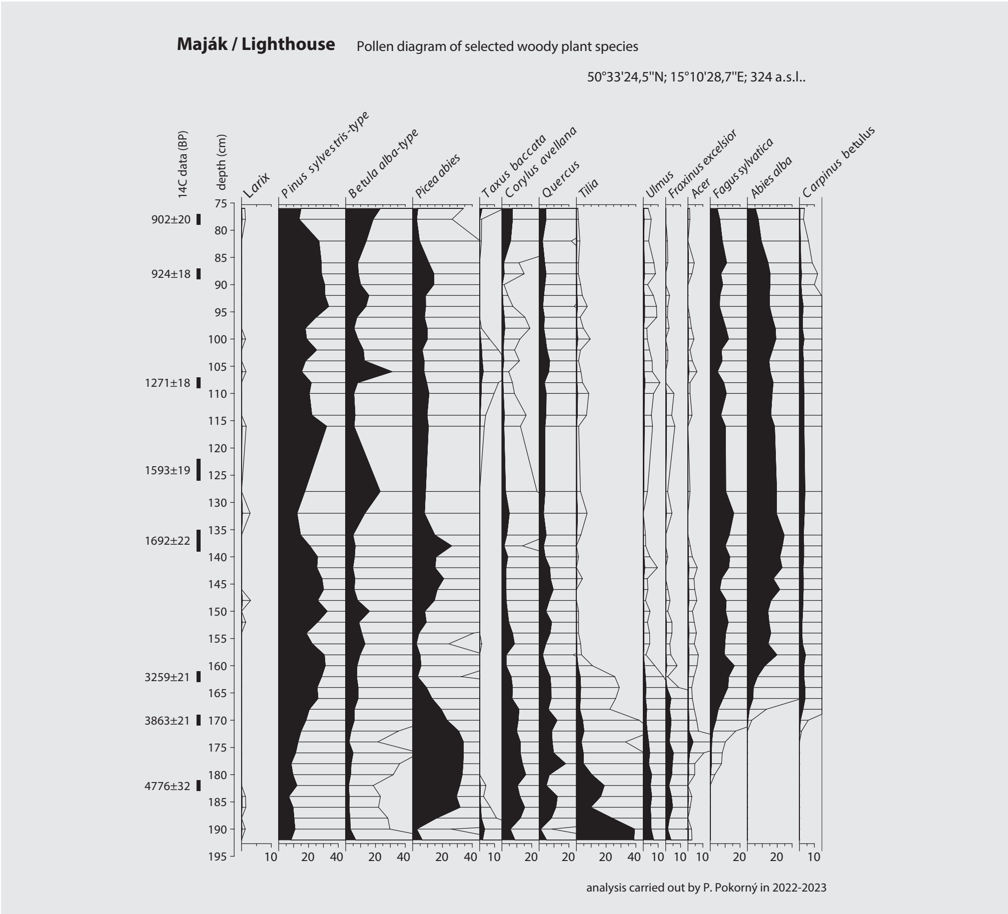
Windows into the past - paleoecology and molecular phylogeography

We do not have a time machine to look at what ecosystems looked like in the past. We can only make indirect estimations through various scientific methods and with varying degrees of imprecision. Paleoecology examines the remains of organisms in old strata. In the Czech Republic's conditions, these are most often peat, sediments in pools, lakes or fishponds, or sediments of rocks under overhangs of rocks and in caves. In the layers, plant remains - pollen, seeds, charcoal, *etc.* - and animal remains - vertebrate bones, mollusc shells, insect fragments - can be identified in various ways. The problem with larch is that it produces less pollen than other common woody plant species. Its pollen is harder to disseminate, poorly preserved and difficult to identify and determine. The microstructure of larch wood very resembles that of the Norway spruce (*Picea abies*); when identifying *e.g.* carbon from archaeological surveys or timber from building structures, the mixed item spruce/larch is usually reported. Therefore, larch difficult to detect by routine methods.

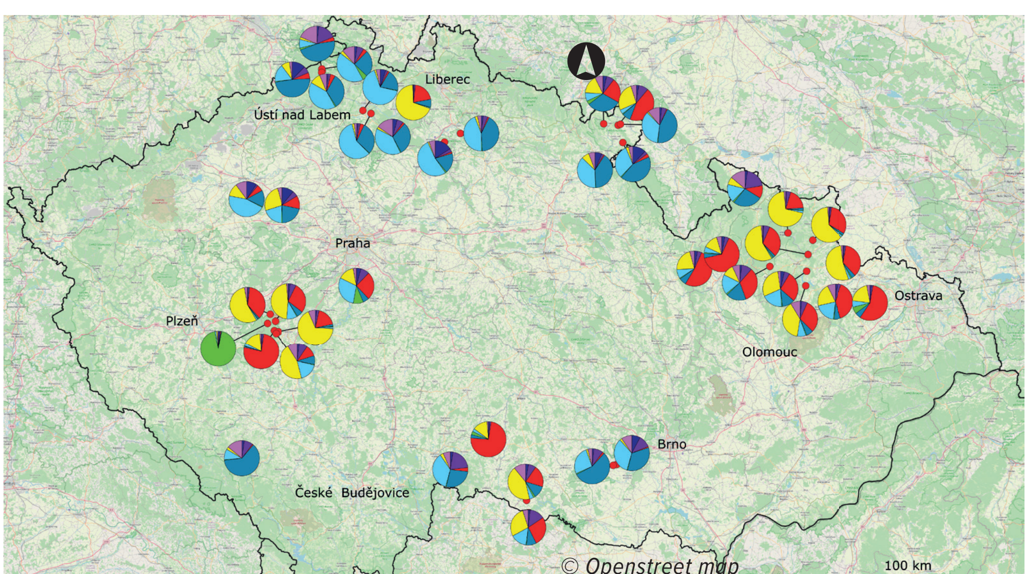
Research into the relatedness and diversity of current populations provides a different perspective on the past. From analysing DNA fragments from multiple individuals and multiple sites, we can compare how individuals differ in their heritable traits and which sites resemble more the other (for a discussion of the method, *cf.* Fér *et al.* 2021). From this we can estimate with some probability how species have spread across Europe in the past. In the case of the European larch *e.g.* which populations are closer to the Carpathian ones, which to the Alpine ones, which are probably pure plantings from a single distant source, and which, on the other hand, are a heterogenous mixture. At some sites, the genetically admixed Japanese larch or karamatsu (*Larix kaempferi*) has been found without this being obvious at first glance.

Changes during the Ice Age and post-ice age

When considering the formation of today's habitats, it is useful to start with the last ice age, tens of thousands of years ago. Let us not imagine the Last Glacial Period (LGP) as in popular movies. Central Europe was quite warm



Simplified pollen diagram from a peat borehole at the Maják/Lighthouse site in the Český ráj/Bohemian Paradise. © Petr Pokorný



Jeseníky Mts. & Carpathians Mts. 1 | western Alps | eastern Alps 2 | Tyrol 2
Jeseníky Mts. & Carpathians Mts. 2 | eastern Alps 1 | Tyrol 1 | *Larix kaempferi*

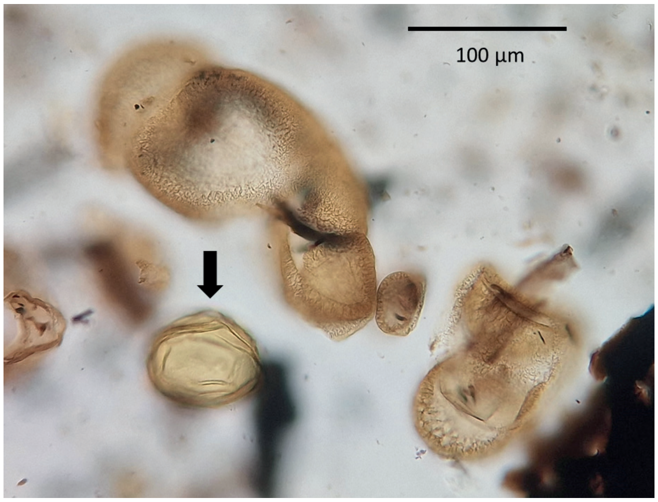
Geographical overview of part of the results of structure analysis of genetic relationships among selected populations of the European larch (*Larix decidua*) for Czech Republic. © Martin Prach

in summer, with glaciers as far away as somewhere beyond present-day Berlin. But there were droughts and cold winters there. This suited the deciduous larch and the tree species was probably widespread in the present-day Czech Republic's territory (*cf. i.a.* Jankovská & Pokorný 2015, Pokorný & Abraham 2021). To what extent these were single trees in more favourable conditions *e.g.* near rivers, or more continuous larch boreal forest/taiga is unclear - both are possible (Prach *et al.* 2023). In any case, the presence of larch in the last Ice Age is evidenced from multiple sites from pollen finds and also from cone and wood finds (*e.g.* from the present-day Prague-Podbaba site from analyses of 30,000 – 40,000-year-old deposits of a former river branch/arm discovered during foundation excavation; Jankovská & Pokorný 2008). Larch coal has also been found in mammoth hunters' fire rings *e.g.* from the resent-day Brno area. The situation can be summarized as saying that where the respective old layers were well preserved and studied in detail, larch was usually found.

However, knowledge about the occurrence of larch under ice age conditions will not help us much in today's practice. There was a substantial change after the Ice Age, when other woody plant species gradually became dominant as the climate had become wetter. First pine (*Pinus* spp.) and birch (*Betula* spp.), then oak (*Quercus* spp.) and more demanding species (hazel *Corylus* spp., lime *Tillia* spp., maples *Acer* spp.) and spruce. Later, beech (*Fagus* spp.) and fir (Abies spp.), which was already under the strong influence of prehistoric farmers. Later still, and at lower altitudes, hornbeam (*Carpinus* spp.) came to dominate. Larch gradually retreated. As a heliophilous, shade-intolerant species, it clearly was not able to successfully compete with shady forests (Dudová & Szabó 2022). However, it apparently did not disappear everywhere, as we will show below.

Larch in the last centuries

There are no reliable reports on larch from the Middle Ages and the early modern period (more Nožička 1962). The situation is even more obscured by the unclear nomenclature of the woody plants. Larch was often called 'cornel or dogwod', in some regions even 'yew' (*cf.* Meduna & Prach 2021). The fact that larch was not commonly found in Bohemia, at least not as structurally useful timber, is suggested by a reference in Mattioli's herbarium (16th century),



Pollen grain of larch (marked with an arrow) together with pollen of fir and pine identified in layers dating back to the Bronze Age in the České Švýcarsko/Bohemian Switzerland. © Petr Pokorný

Dwarf, probably browsed or bitten by game forms of larch in the Český ráj/Bohemian Paradise. © Jindřich Prach

which reminds us that larch wood for gutters in Prague was bought and imported from the Bruntál region located in the Nízký Jeseník/Low Jeseník Mts. on the Moravian-Silesian border. Since at least the end of the 17th century, larch has been commonly cultivated for forestry.

New findings - larch documented in North Bohemian sandstones

Paleoecological research requires suitable sediments. Peat-bogs and other wetlands are very rarely located in dry rock pine habitats where heliophilous larch is more expected to be found. Therefore, the species has almost escaped from palynological research for a hundred years. Individual pollen grains used to be considered as accidental long-distance transfer by wind, misidentification or contamination by current pollen. It is only in recent years that sediments have been found in the immediate vicinity of rock edges. The sites and findings from these have been described elsewhere (*cf.* Pokorny *et al.* 2023 - in the freely available Forest Research Reports). In this article, we will present only a brief summary. In the Český ráj/Bohemian Paradise, in the Hruboskalsko Nature Reserve, a peat deposit was discovered at the Maják site, accumulated over the last 5,500 years or so. Larch pollen is present in small quantities, but has been repeatedly documented in about ten differently aged layers. In another part of the Český ráj/Bohemian Paradise, in the Příhrazské skály Nature Reserve, layers of domestic animal dung stabled in the rock overhang during the Iron Age have been studied (Ptáková *et al.* 2021). These contain plant opals, so-called phytoliths, very probably originating from larch needles. Other findings come from similar conditions in the rocks of the Labské pískovce/Elbe Sandstone and České Švýcarsko/Bohemian Switzerland. In a fissure cave on the edge of the Labe/Elbe River canyon, right in the present-day relict rock pine stands, the sediment formed on its difficult-to-access bottom was studied by D. Vondrák *et al.* Larch pollen occurs in layers dating back 6,700 years and older, *i.e.* from a period dominated by deciduous broadleaved forests, when it was assumed that larch had already been displaced from forests in the Czech Republic by these competitively stronger tree species. Another nearby site, the Okrový převis/Ochre Overhang at Pravčický důl, where detailed research has still been in progress, has shown larch pollen grains in Bronze Age layers.

Molecular phylogeographic analyses carried out so far on 559 individuals within 44 sites in the Czech Republic have not yet revealed any possible "Czech lineage" significantly different from the Alpine or Carpathian ones. It appears, however, that at most Czech sites, including rock edges in the vicinity of paleoecologically studied sites, alpine-related larches predominantly grow. The fact that these are plantations rather than the natural alpine range extending into Bohemia is suggested by the finding that larches are mostly close to Tyrolean populations, from where seed was historically traded, rather than to populations in the eastern Alps, where it would be closer in the case of natural dispersal. This somewhat corrects the conventional wisdom in forestry community that the Alpine larch was not initially successful in cultivation because it suffered from 'canker', and thus, it was subsequently replaced by the predominantly Jeseník larch. On the contrary, the larch populations from the Brdy Highlands (Central Bohemia) are closer to the Jeseníky and Carpathian larches. However, it has still been too early to assess whether the Brdy larch is a relatively pure plantation originating from the Jeseníky Mountains for historical reasons, or whether some "Czech" larch, genetically close to the Jeseníky and Carpathian larches, has hypothetically survived there. Several other sites seem to be equally "suspicious". Molecular phylogeography has also revealed alpine plantations in some small-size Specially Protected Areas in the Nízký Jeseník/Low Jeseník Mts., where the native Jeseník larch is directly under protection (Prach *et al.* 2023). How to approach larch in conservation practice?

Larch has apparently not spread widely across Central European ecosystems in recent millennia, even though it grew nearby and would have had somewhere to come from. So we need not fear its massive spread at the expense of natural habitats. Its occurrences in economic forests, even if they are in protected areas (e.g. in the third or even second zones of protected areas, in MZCHÚ with a different object of protection than the forest ecosystem), do not have to be considered a risk either. There is no reason to eliminate larch. In forests where larch has been cultivated for centuries, there is no reason why this should not continue to be the case. We are not considering larch-dominated stands in which larch does not thrive and which are only occasionally left over from earlier times. In practice,

Borehole sediment sampling at the Maják/Lighthouse site in the Český ráj/Bohemian Paradise. © Jindřich Prach

it is a mixture of larch, which can be a structural enrichment in spruce, for example, but also in beech and oak woodland. From a conservation point of view, the presence of larch is often indifferent, yet from a forestry point of view larch can be an important carrier of production and economic value.

How to approach larch in conservation practice?

Larch has apparently not spread widely across Central European ecosystems in recent millennia, even though it grew nearby and would have had somewhere to come from. Therefore, there is no fear on its massive spread at the expense of natural habitats. Its occurrences in commercial forests, even if they are in Specially Protected Areas (*e.g.* in the third or even second zones of Protected Landscape Areas, in small-size Specially Protected Areas with a different object of protection/conservation/management than the forest ecosystem), do not have to be considered a risk either. There is no reason to eradicate larch there. In forests where larch has been cultivated for centuries, there is no reason why this should not continue to be the case. We are not considering larch-dominated stands in which larch does not thrive and which are only occasionally left over from earlier times. In practice, it is a mixture of larch, which can be a structural enrichment in spruce, for example, but also in beech and oak/hornbeam woodland. From a conservation point of view, the presence of larch is often indifferent, yet from a forestry point of view larch can be an important for production and economic value.

More important from the point of view of nature conservation, however, may be the potential surviving relict larch populations that may be hiding in many Specially Protected Areas without our knowledge. Such populations could be everywhere in the Czech Republic outside the Nízký Jesník/Low Jeseník Mts. region, where this was not in doubt. Moroever, clearly relict populations have not yet been confirmed elsewhere in the Czech Republic. It will always be methodologically difficult. Genetic analyses always provide results only with some degree of probability or uncertainty. Paleoecological methods, even if they reveal the presence of larch in prehistoric and medieval times, cannot tell us whether the larches there are their direct descendants or recent plantings from elsewhere. If there are relict occurrences of larch anywhere, they will probably already have been genetically diluted by plantings from the surrounding area. Nevertheless, the possibility of potential survival of larch in the Czech Republic should be kept in mind in nature conservation planning and local interventions.

Potentially interesting populations can be identified by various indications. Historical records are scarce, and there is no choice but to estimate from natural conditions. These are places where long-term reduced competition from other woody species can be expected, *e.g.* on cliff edges, in scree or generally in rock pine forest habitats. In general, sites where there are other heliophilous relict species, *e.g.* plants or some poorly dispersing insects, may be promising for larch. The forester and nature conservationist should also be alert when they find larch in areas that are difficult to access by logging and in old stands where planting has probably not taken place for as far back memory goes.

In the light of the new findings from the North Bohemian sandstones, it is necessary to reconsider the previous conservation approach to the European larch and pay attention to such potentially relict surviving populations throughout the Czech Republic. At the very least, the eradication of larch from Specially Protected Areas should not be proposed across the board. Equally important is not to replant larch or promote its spreading from earlier plantings. Planting of genetically different individuals would dilute a potentially valuable local population.

In summary, larch and its reasonable economic cultivation as an admixture in forests across the Czech Republic does not seem to be a threat to nature conservation. Further research would even discover populations displaying high nature conservation values. The admixture of larch in commercial forests can be a good trade-off between commercial-economic and nature conservation interests, in conservation planning and negotiations both on the local and national level. Thus, in nature conservation planning and negotiation, whether local or national, let us not waste for the sake of larch the energy and capacity so necessary to suppress tree species from other continents, such as the Northern red oak (Quercus rubra) or the Douglas fir (*Pseudotsuga menziesii*).

The text was written with the support of the National Agency for Agricultural Research project NAZV QK21010335 *Possibilities of using larch in Czech forests under the impact of global climate change* (LARIXUTOR) and with the support of the Technology Agency of the Czech Republic project within the programme Environment for Life No. SS07010074 *Paleoecological reconstruction of ecosystems as a basis for planning the conservation of Specially Protected Areas.* ■

The list of references is attached to the online version of the article at www.casopis.ochranaprirody.cz

Larch can grow to a considerable size under favourable conditions. The biggest larch in the Czech Republic grows near the municipality of Benešov nad Cernou in the Novohradské hory Mts. (South Bohemia). © Jindřich Prach

The Hodonínská Dúbrava/Hodonín Oak Grove House of Nature

Libor Ambrozek, Roman Strnad & Jana Kalábková

‘Pannonian oak forest on sand’. This is a title of a unique habitat of open-canopy/coppice oak groves that have been preserved north of the town of Hodonín (South Moravia) covering some hundreds of hectares. Extraordinary geological conditions and centuries of using them by humans resulted in remarkable species diversity. Rather paradoxically, species that elsewhere occur in steppes and meadows are the main target of nature protection, conservation and management there.

Original wooden structure reminding a forest, hidden behind the blinds on the second floor of the Hodonínská Dúbrava/Hodonín Oak Grove House of Nature. © Petra Kotásková

Today, the stands are a Site of European Importance (SEI, pursuant to Act No. 114/1992 on Nature Conservation and Landscape Protection, as amended later, the term for Site of Community Importance, SCI, later Special Area of Conservation, SAC, under the European Union's Habitats Directive) within the European Union's Natura 2000 network, and the most valuable parts have been protected as a National Nature Monument since 2014. If you want to know more about this remarkable natural gem, you have the opportunity as of June 1, 2024: on that day, the Hodonínská Dúbrava/Hodonín Oak Grove House of Nature was launched in the town of Hodonín, being the only visitor centre in the Czech Republic dedicated to a small-size Specially Protected Area.

Its initiator was the Municipality of Hodonín in collaboration with the Nature Conservation Agency of the Czech Republic (NCA) and Moravské naftové doly//Moravian Oil Mines company, which is also significantly involved in other regional, *i.e.* South Moravian projects related to landscape and environmental protection.

The exposition also presents the nature of two different and very significant habitats in the surrounding of the Hodonínská Dúbrava/Hodonín Oak Grove, namely an aeolian/wind-blown sand community in the Pánov Nature Monument at the eastern margin of the forest complex and a fishpond system on the Kyjovka stream, bordering Dúbrava on the west.

A forest as many others,

a visitor to Hodonínská Dúbrava/Hodonín Oak Grove may say at a glance. But a first impression can easily deceive. The central theme of the exposition, designed by architects Roman Strnad, Jan Vrbka, and Jiří Jurenka of TheBüro studio, is therefore looking into depth. The principle is a play with an escalation of scales – the actual forest almost starts behind the premises of the building, while the upstairs extension itself, in which the exhibition is located, is a model of a forest. The construction is made of wood, and the load-bearing elements are conceived as trees with branches. The very imaginative solution was designed by the Létající inženýři studio headed by architect Tomáš Havlíček.

Walking through this miniature forest, one encounters another miniature, a model of a forest named *Modeles*, the heart of the exposition as a whole. Visitors can look into the model by means

Pannonian oak forest on sand is a unique habitat occurring in the Czech Republic only north of the town of Hodonín. © Libor Ambrozek

One of the twenty infoboxes introduces us to a Eurasian hoopoe feeding its young. © Petra Kotásková

Visitors find dozens of colourful photos of wild plants and animals on the doors in the cloakroom. © Aleš Ležatka

In front of the building, you are welcomed by two fighting males of the stag beetle, mascot of the House of Nature, as a seesaw for small children. © Petra Kotásková

of a *camera obscura*, where the model is moved by projected thematic animation. All key features and activities one can encounter in the area are presented within six square metres. The core of the model includes open coppice oak forests and former human activities to which the forest owes its species diversity, *i.e.* mowing and grazing. We further see oak forests encroached by a shrub layer and pine monocultures, the result of intensive forest management in the 20th century, which has displayed a significant negative impact on the current state of the Dúbrava. Also captured is the interesting history of the Pánov: pasture in the Middle Ages, later becoming a military training area where after World War II, dragoons were replaced by tanks and armoured personnel carriers. Still today, military vehicles have been an important means of maintaining sand steppes with their unique flora and fauna there. In front of us, human activities come to life by three cameras pointed at key *Modeles* locations. On the infopanel lining the entire display, visitors can learn more about the history, present and extraordinary natural richness of the Hodonínská Dúbrava/Hodonín Oak Grove.

What else can be found upstairs?

When a visitor explores *Modeles*, (s)he will not know what to do first. The whole space is filled with a range of original exhibits with even more original titles. These definitely win on the count of *Infokrab* items, twenty in number! They are based on the principle of surprise: the content is hidden (although the rhyme on the outside gives a little hint), so if interested, you have to open them. In 15 cases, you will find the most important plants and animals, portrayed by artists Vendula Chalánková and Hana Svobodová. You can also look forward to photographs and short video sequences, and on the inside of the lid you will learn many interesting facts about the species in question. The remaining five infoboxes deal with significant features, presented by one-minute videos. Opening them not only reveals the content, but also triggers a variety of nature sounds.

Equally important as the iconic species is the explanation of the wider context, the links between them, and a presentation of the whole ecosystem. The individual exhibits are therefore thematically linked and complement each other.

Mr Oak in the main role

As indicated by the term House of Nature, the cornerstone of the community is the oak. In our case it is the Pedunculate oak (*Quercus robur*), symbol of power, longevity, and resistance, a sacred tree for many peoples since ancient times. Several exhibits are dedicated to it, trying to capture its role in all aspects. *Stromostroj*, portrayed by Jiří Vítek, is a foldable model of a tree which visitors can take apart or put together. It is accompanied by a text about tree anatomy as well as its nutrient cycle and production. *Dřevořez* is found somewhat hidden behind *Obrazobot*, a large projection screen. Although the name is singular, visitors see four cuts through oak trunks. The oldest one of them was determined by dendrochronologist Jiří Kyncl to be 284 years old! Its long life was only ended by the 2021tornado. Interesting dates

In addition to local herbs, shrubs and trees, the garden also features a sand dune and a waterbody, resembling sand steppes and fishponds. © Petra Kotásková

from regional and world history, and from the history of natural sciences are marked on it. The other cuts show changes in natural conditions during tree growth and other facts which can be read from the annual rings.

The *Slido* exhibit consists of three sliding shiftable panels presenting the rich community of mostly animals which find shelter or food in the tree or live there permanently, and their relationships. The fourth representation of the oak tree, this time as three parts of a trunk in different stages of decay is named *Kmenokuk* and reveals the colourful world of insects. Over twenty species are shown there, not only in photographs with captions on the infopanel, but also as products of nature located on the trunks.

Sands and fishponds

As mentioned in the introduction, the House of Nature is not only dedicated to coppice oak forests, but also to rather opposite habitats, *i.e.* aeolian/wind-blown sands and fishponds. Whereas the rolling plains of Pánov refer in summer to the Moravian Sahara, as the nearby Bzenec area was called until the 19th century, the thirty fishponds on both banks of the Kyjovka stream provide a refuge to dozens of waterfowl species. Over the staircase, a graphic design of flying birds named *Ptakolet*, also created by Jiří Vítek, reminds us of flocks of black-headed gulls (*Chroicocephalus ridibundus*) and greylag geese (*Anser anser*). The landscape of sands and fishponds including their plants and animals is captured in a black-and-white image on twee large glass panels connected to the staircase wall. All species are provided with captions as well as colour photos on the infopanel beneath the panels. Boxes with screens inside directed at the glass offer a view of the landscape, play footage from both worlds, and entice to visit them in person.

For playful and competitive visitors

If you feel that you already know much about the nature of Hodonínská Dúbrava/Hodonín Oak Grove and its surroundings, you can test your knowledge in a quiz which runs on a large screen poetically named *Obrazobot*. The quiz has three levels, so if you are not certain, you can start with the easiest one. *Obrazobot* also allows visitors to virtually travel to a variety of locations within the area and become part of a photo of some of them. Children and playful adults may prefer the *Pexebox*, a memory game on two game boards with various numbers of squares. And thirdly, there is a *Biotéka* for particularly curious visitors. This offers nearly 200(!) wooden cards, which are a really rich mix of information, interesting facts, and photographs of species and phenomena. On the upper side you will find a fact, a question, or the name of a feature or species, while the backside provides answers, photographs, or explanations.

And then the roof

It would be a pity to show plants in photos or videos only. The forest species of the Dúbrava, which we will see in a moment, naturally need shade. However, the inhabitants of the Pánov former military training area ground, which are accustomed to hot sand and lack of water, could get used to growing on the roof. Therefore, strips along the railing have been planted with thirty species which one can encounter on warm slopes or grow on the aeolian/wind-blown sands of southern Moravia – the Hairy feather-grass (*Stipa capillata*), the Sandy everlasting (*Helichrysum arenarium*), the Purple mullein (*Verbascum phoeniceum*), just one beauty after another. The remaining part of the roof is covered with colourful mats of several stonecrops (*Sedum* spp.) species.

Return to the ground floor

Due to the exhibits, we have started our virtual tour of the House of Nature upstairs. It is now the right moment to return to the ground floor. Situated at the entrance you will find the reception desk, where you can buy, besides tickets, a small souvenir or regional delicacy. Any waiting is made pleasant by two screens where one can view photos of not only Dúbrava, but also other Houses of Nature in the Czech Republic, activities of the NCA CR, or do the quiz that you know from the upstairs. The lobby will delight all map lovers. Inherent to the Houses of Nature are films about the territory of their name. The 20-minute film of the beauty of and threats to the Hodonínská Dúbrava/Hodonín Oak Grove was made by GNOMON Production and is screened in the large hall, also downstairs. In other rooms, children can find a suitable space for environmental education and join various group activities. They will certainly enjoy the time spent there, because such colourful cabinets with dozens of photos of flowers and animals are perhaps nowhere else to be seen.

What awaits us outside outdoor

What would a House of Nature be without a piece of real nature? The road to that was however not easy. Originally, this place was the premises of the Centre for Environmental Education Dúbrava, around which children could use the extensive garden with many valuable full-grown trees, flowerbeds and uncommon secluded places. All this changed at the end of June in 2021, when a devastating tornado swept right through it. Almost nothing remained there. On the contrary, besides fallen trees and debris of the facilities, the wind also brought a lot of other waste. At the same time, however, space for a new garden in the spirit of the presented area was created there.

The exterior exposition was designed by experienced garden architect Lukáš Lattenberg of Atelier Per Partes, while the realisation was undertaken by Florstyl. Again. Visitors find there a small Hodonínská Dúbrava/Hodonín Oak Grove. The House of Nature is lined by beds of common and rare herbs, and new forest and fruit trees as well as a number of shrub species were planted. A stone-lined pond simulates the Kyjovka fishponds, while the Pánov plain is imitated by a quite large sand dune, which certainly be appreciated by children. At both the pond and the dune, infoboxes are located, and there also is an insect hotel in the garden.

Further an outdoor classroom for approx. 40 people, a fireplace with seating, and an open area for games and other events are available there.

Not to forget

Finally, two important issues should be mentioned. Firstly, we are indebted to all those who participated in implementing this large and demanding avtivity. Unfortunately, they cannot all be listed, but some have been mentioned in the text, others can be found in the infobox. Concerning finances, which always come first, the total expense exceeded CZK 100 million (EUR 4 million). While a half of the amount was acquired from some projects, the other half is the Municipality's contribution. Key donors were the Ministry of the Environment of the Czech Republic (through the Operation Programme Environment funded from the EU funds and other subvention programmes/subsidy schemes), the Karel Komárek Family Foundation, and the South Moravian Region.

Project preparation was completed in 2020, and the actual construction built by the OHLA ŽS company started in February 2022. The exhibition was installed by the Nowatron Elektronik company.

Secondly, we should mention the possibilities, which open up around the new House of Nature. Practically from its entrance, visitors can make a walk to the groves at the National Nature Monument following the red markers. Moreover, adjacent to the nearby Hodonín Zoo, the southern part of the Dúbrava forest complex is available as a suburban forest park – an extraordinary space where inhabitants of and visitors to the town of Hodonín can explore and recreate. It combines natural values, sports and leisure elements. After the tornado raged through part of it, nature is searching its own way of recovery and restoration there, and the town has also been preparing an interesting nature educational trail.

Let us wish the House of Nature and its staff success in bringing the people closer to the beauty of the local nature and in gaining their support for its protection. ■

INVESTOR: Municipality of Hodonín
House of Nature architectural design: Létající inženýři studio – Tomáš Havlíček
Exposition project: TheBüro studio – Roman Strnad, Jan Vrbka & Jiří Jurenka
Garden project: Létající inženýři studio – Tomáš Havlíček in collaboration with Per Partes studio – Lukáš Lattenberg
Building contractor: OHLA ŽS, plc.
Exposition contractor: Nowatron Elektronik, spol.Ltd.
Garden contractor: FLORSTYL Ltd.

TOTAL EXPENSES (incl. VAT): CZK 109.2 million (EUR 4.4 million)
Construction costs: CZK 67.4 million (EUR 2.7 million)
Costs of interior: CZK 2.1 million (EUR 84,000)
Costs of exposition: CZK 17.3 million (EUR 696,000)
Costs of garden: CZK 12.2 million (EUR 490,000)
Other costs: CZK 10.2 million (EUR 410,000)

TOTAL SUBSIDY: CZK 50,369,301 (EUR 2,027,000)
Grant providers:
Operational Programme Environment: CZK 23.1 million (EUR 930,000)
Karel Komárek Family Foundation: CZK 15 million (EUR 604,000)
South Moravian Region: CZK 10 million (EUR 402,000)
National Programme Environment (energy savings): CZK 2.1 million (EUR 85,000)
National Programme Environment (garden): CZK 7 million (EUR 282,000)
CONSTRUCTION PERIOD: February 2022 – October 2023
REALISATION OF GARDEN: December 2023 – May 2023

Nairobi National Park – Nature versus Transport Infrastructure

Jan Plesník & František Pelc

I think having land and not ruining it is the most beautiful art that anybody could ever want.

Andy Warhol: The Philosophy of Andy Warhol (From A to B and Back Again) (1975)

Canberra, Seoul, Saint Louis, Chicago, Warsaw or Nairobi. What do these famous cities have in common? Unlikely as it may seem, national parks have been declared in their immediate vicinity or even within them. Yet only one of them can boast the unofficial title of the World's only Wildlife Capital. Kenya's capital city is the holder of this title, thanks to the national park of the same name.

The Newly built railway significantly disturbed landscape scenery/character in Nairobi National Park. © Jan Plesník

Nairobi National Park is located just seven kilometres from Kenyan capital city's centre with a typical skyline.
© František Pelc

How it all started

And indeed. For many visitors to sub-Saharan Africa, Nairobi National Park provides the first ever encounter with the still breathtaking nature there. And it has been doing so for 84 years.

British colonists arrived in the area where the national park is, at that time inhabited by nomadic Maasai and settled Kikuyu, in the late 19th century. But the real turning point came in 1895, when Britain's Queen Victoria fought an imaginary duel with her grandson, Kaiser Wilhelm II of Germany, over who would be the first to reach the largest lake on the African continent, which had borne her name for almost four decades, by rail. Kenya was then part of British East Africa, while neighbouring Tanzania was called German East Africa. Incidentally, evil tongues claim that it was because of the German and Russian rulers of her kinship that the woman over whose realm the sun did not really set had herself named Empress of India, so as not to remain "merely" queen.

Her Majesty's subjects secured Albion's victory by bringing from British India some 36,000 coolies and artisans, drawn mainly from the poor villages in the Punjab in then British India. Each coolie signed a contract for three years, which were by no means a relaxing holiday. The reason for the railway's construction was clear: steam locomotives were able to transport not only goods, especially ivory, but also soldiers quickly and in large numbers on the Mombasa-Lake Victoria line: they thus helped to ensure dominance of the entire strategic region of the African Great Lakes. The cost of building the line eventually amounted to almost 5% of the then astronomical annual budget of the United Kingdom. Therefore, the sarcastic politician Henry Labiouchere nicknamed it the Lunatic Line.

In 1899, a large working army arrived with sleepers and rails to the area which the Maasai, who were no match for the warrior Indians of the Great Plains, called Enkare Nairobi, the Place of Cool Waters, referring to the cold stream which flowed through the area. Thus, the builders found an ideal location to establish an important rail depot there: it was at an elevation of almost 1,700 m above sea level, so there was no risk of malaria, it had a mild temperate climate and, last but not least, it offered abundant water resources as a permanent supply.

With the rapid expansion of the city into the surrounding countryside and the development of agriculture, the abundance of not only the iconic fauna species in its surroundings had rapidly decreased. Although part of the area was included into the Southern Game Reserve, where hunting, a traditional pastime of British men, was banned, the restrictions did not apply to other activities. Therefore, hunting was not permitted in the reserve, but nearly every other activity, including cattle grazing, dumping, and even bombing by the Royal Air Force (RAF) during pilot's training was allowed there. As in so many other cases, it was one man's stubbornness that finally decided everything.

Mervyn Cowie had already been born in Nairobi and when he returned to Kenya in 1932 after

The railway running through Nairobi National Park was built by a Chinese company with money granted as a loan from a Chinese bank. © František Pelc

The Southern white rhino (*Ceratotherium s. simum*) was introduced into Nairobi National Park. © Jan Plesník

nine years of studies in the United Kingdom, where he graduated from the prestigious Oxford University, he was literally horrified recognizing how the number of the large mammals had depleted around his birthplace during his nine-year absence. But the local British colonial authorities opposed the establishment of a national parks right next to Nairobi. The tenacious Scotsman therefore decided to use a trick that today we would call at best fake news, at worst pure disinformation. Playing devil's advocate to push public opinion against hunting, he wrote a letter to a much-read local newspaper signed „Old Settler“ and proposing the slaughter of all of Kenya's wild animals. There was public outcry against this suggestion, and the government was forced to act, and formed a committee to examine the matter. This was indeed the first in Kenya to be proclaimed on 16 December 1946, and Cowie became its first executive director. In it he introduced a model, still widely applied, whereby the bulk of the funding for the protected area management came from tourism: moreover, following the American national park model, Maasai pastoralists were removed from their landst.

NOAH'S ARK FOR RHINOS

Nairobi National Park is one of a limited number of places offering safari participants the opportunity to see both species of African rhino in the wild.

As recently as the early 19th century, more than one million black rhinos (Diceros *bicornis*) roamed the African savannah. Its population reached an imaginary bottom in 1993 as a result of massive hunting: no more than 2,300 specimens left across a huge area of its original distribution range. Today, this remarkable odd-toed ungulate species numbers 6,500 individuals: however, the International Union for Conservation of Nature (IUCN) continues to classify it as Critically Endangered worldwide at a global level. Nairobi National Park harboured 101 of these animals in May 2024: the population reach the highest density in Kenya there. At the beginning of 2024, 21 black rhinos were transferred from the park to the private Loisaba Reserve in the north of the country.

As black rhinos are browsers, eating high-growing vegetation out of trees and shrubs, they tend to seek habitats with shrub or tree cover. Therefore, visitors to Nairobi National Park are more likely to see southern white rhinos (*Ceratotherium s. simum*) seeking open spaces where they graze peacefully on grass in small family groups. But these animals are not autochthonous there: they are native to South Africa and 11 animals released into Nairobi National Park have founded a population of 31 individuals today. In 1895, there were only a few dozen white rhinos left in the world, concentrated at a single site in South Africa. A careful search of the archives has confirmed that there are, after all, a few more rhinos left than previously thought. The efforts of the South African State Nature Conservancy and, in particular, of local farmers who have begun to keep rhinos on their fenced properties have resulted in a gradual increase in their number. Currently, 16,800 specimens live in the wild and in semi-preserves on the black continent, despite a recent huge wave of poaching.

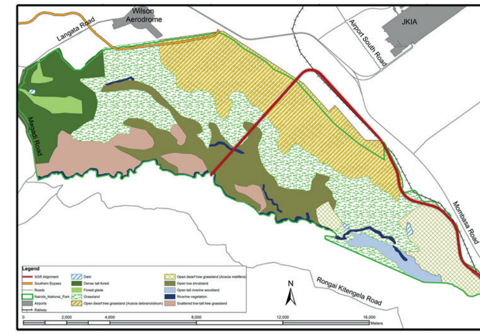
Common ostrich (*Struthio camelus*) prefers open land including East African savanna. © Jan Plesník

What Nairobi National Park has to offer today

The development of Kenya's capital, one of the fastest growing cities in the world and currently home to 4.4 million people, has led to Nairobi National Park confirming its reputation as a protected area literally on its doorstep: it is just seven kilometres from the city's centre. It covers 117 km^2, only slightly smaller than the Český kras/Bohemian Karst Protected Landscape Area (Central Bohemia), and is mostly covered by typical East African savannah, *i.e.* open wide grassland plains with scattered *Acacia* spp. bushes. The uplands in the western part of the park are covered by dry forest, while in the south, along the permanent watercourse, the Mbagathi River, a floodplain forest growth has developed. Apart from the occasional deep rocky valleys and gorges, visitors to the park cannot fail to notice the rocky slopes hosting several notable species of vascular plants such as the monocotyledonous *Murdannia clarkeana*.

The proximity to the highly populated capital city has forced the fencing of the national park: electric fencing lines its northern, eastern and western boundaries. In contrast, the southern boundary, formed by the Mbagathi River, connects to the open landscape of Athi - Kapito, where large ungulates migrate in and out of the park. While the regular movement between the Serengeti in Tanzania and Kenya's Masai Mara, aptly referred to as the Great Trek, is well known to nature lovers, it is less well known that more than a million of these mammals used to make the journey between Kilimanjaro and Mount Kenya. The founding of Nairobi has interrupted that migration: rather, the northernmost point of the now much smaller migration is the national park itself.

Despite its small size by African standards, Nairobi National Park hosts more than 100 mammal species, at least 60 amphibian and reptile species, 516 bird species and half a thousand vascular plant species. However, it is the charismatic larger mammals that attract tourists to the national park the most. They can observe, *inter alia*, lions (*Panthera leo)*, leopards (*P. pardus*), Cape buffalo (*Syncerus c. caffer*), cheetahs (*Acinonyx jubatus*), spotted hyenas (*Crocuta crocuta*), African buffaloes *(Syncerus caffer*), Masai giraffes (*Giraffa tippelskirchi*) and hippos (*Hippopotamus amphibius*). Of the famous Big Five, only African bush elephants (*Loxodonta africana*) are missing from the park. Fearing continued conflicts with humans, the local elephants have been moved to the Masai Mara National Reserve. On the other hand, Nairobi National Park is one of the most important sanctuaries protecting both Africa rhino species (see box on previous page).



The Standard-Gauge Railway passes through the core of Nairobi National Park (red line). © Jan Vrba

Close to the Nairobi National Park Main Gate there is a site where seized ivory or rhino horns have been several times publicly burnt. © Jan Plesník

Chinese capital was supposed to solve the problems with the Lunatic Line

The ravages of time have also taken their toll on the Mombasa-Lake Victoria railway line. Due to poor maintenance of the rails and trains, the journey from Nairobi to Mombasa took 24 hours at the beginning of the millennium, twice as long

Most of Nairobi National Park is covered by East African savannah. © Jan Plesník

as in the previous decade. At that time, only half of all lines in the country were operational. But in 2011, the Kenyan government decided not to upgrade the Lunatic Line but to build an entirely new line from Mombasa to Uganda's capital Kampala. This is the largest and most expensive infrastructure project since Kenya's independence in December 1963: it will cost the state at least USD 3.6 billion (CZK 81.5 billion).

The financing of the costly construction was by a loan from the solved Export–Import Bank of the Republic of China (Chexim) covering 90% of the cost, while the Kenyan cabinet will pay a tenth. The line will not be electrified, with diesel locomotives running at an average speed of 120 km/h, reducing the journey from Mombasa to Nairobi to four hours. Companies from what was until recently the world's most populous country have pledged to employ up to 30,000 Kenyans in the construction.

In December 2015, disturbing news leaked that the new line would run right through the heart of Nairobi National Park. The Ministry of Transport there subsequently commissioned an Environmental and Social Impact Assessment (ESIA) in accordance with the domestic law. Its results were described by experts as dubious and manipulated, as they visibly favoured the government's preferred route. Moreover, of the seven options considered, five passed through the national park and the remaining two also encroached on it, although within its boundaries. Any options that bypassed the park completely were not considered at all: - the government would have had to buy up private land.

And the result? Since 2019, the landscape scenery/character in the legendary national park has been disturbed by a six-kilometre single bridge built on columns 18 metres above the ground. To limit vibrations, the 4 x 4 m columns had to be buried deep into the ground. It has been well known that the environmental impacts of linear structures extend far beyond them. Not only noise, but also pollutants from the construction, operation and maintenance of the the

The best time to watch Grant's zebras (*Equus quagga boehmi*) is the dry season, when they concentrate close to water sources in the national park. © Jan Plesník

Standard Gauge Railway connecting Mombasa and Kampala affect the wider environment, despite the installation of numerous noise barriers. Experience shows that railways or roads through previously little affected protected areas encourage the introduction of invasive alien species, increase poaching and lead to changes in wild animal behaviour. Meanwhile, a tunnel has been built under the A2 motorway near Mount Kenya, which is also used by elephants.

To be objective, not all environmentalists criticize the construction of the bridge. Some point out that running the line on the ground would fragment the national park's landscape much more, and the rails would be a difficult barrier for many animals to overcome. According to the late Kenyan scientist and conservationist Richard Leakey, it is most important that Nairobi National Park is not diminished.

According to the local press, the original plan was to repair only the damaged parts of the over 100-year-old railway in the existing corridor, which the World Bank was prepared to support. In the end, the chosen solution brought an entirely new construction there, including the above cutting through the national park. During the implementation, the investment increased considerably compared to the plan, which was criticised by some opposition political bodies. It is an open secret that the construction was also linked to corruption. Eighteen actors were eventually convicted. The beginnings were also difficult for the actual operation. Due to the lack of modern locomotives, coaches and carriages as well as the charges for using the new railway, much of the goods, including mined minerals, have been are transported by heavy trucks from the coastal areas to Nairobi and the surrounding areas. The state of the road between Mombasa and Nairobi is consistent with this.

It's not just about the actual construction

Kenya is often considered a model country on the black continent when it comes to nature conservation and landscape protection. The country has introduced some surprisingly strict measures: *e.g.* it is forbidden to own ivory, use plastic bags or hunt wild animals for trophies. In the opinion of numerous scientists and professional or voluntary conservationists, its long-established reputation has suffered considerable damage with the construction of a busy railway in the core of the national park. The project sets a bad precedent that will not affect only all of Kenya's protected areas but also other African countries who look up to Kenya as a positive role model for wildlife preservation and environmental protection. Thus, there are legitimate concerns that other sub-Saharan countries will simply say: If Kenya can do it, why can't we.

Kenya, like many other African states, is in debt to rich China, and is currently the fourth most indebted African country, which may bring many socio-economic and political problems in the future. However, among all the question marks and reservations, the routing across the area of a small national park on the outskirts of a large city stands out. We are convinced that a more economical solution could have been found, at least at the park's boundaries. The length of the drive would have been increased by fifteen minutes, but the integrity of the park would have been better preserved there. Regrettable. ■

The list of references is attached to the online version of the article at www.casopis.ochranaprirody cz.

Summary of 2024 Issues

On Nature in the Czech Republic

Zajíček P.: The Most Recent Knowledge about Findings in the Kateřinská jeskyně/Catherine's Cave

At present, in total 13 prehistoric carbon drawing traces are registered at various sites within the Old Kateřinská jeskyně/Catherine's Cave (the Moravský kras/Moravian Karst, South Moravia). In 2016, detail research on rock walls had begun there. In 2019 a series of samples was taken and it was found that three of them are about 6,500 years old: they became the oldest cave charcoal drawing traces on the Czech Republic' territory. In 2023, other drawings from the Ledová chodba/Ice Corridor were successfully dated back. One of them is located between previously dated prehistoric drawings. The other two are situated in a more remote part of the corridor where there have been hundreds of inscriptions, signatures and years of modern times since the late 18th century. All the drawings are 5,200 to 6,500 years old. According to the past findings, a massive and spacious portal of the Kateřinská jeskyně/Catherine's Cave and at the same time also space in the near Suchý žleb/Dry Canyon were for a long time inhabited by prehistoric humans in the Late Neolithic Period as well as in younger periods. Inner space of the Kateřinská jeskyně/Catherine's Cave behind a narrow corridor 60 meters long was definitely not permanently inhabited because there was no permanent fire. The most probable explanation why the inner part of the cave was repeatedly visited by humans is that the space was considered to be a shrine. Finding of the oldest prehistoric charcoal graffiti in the Czech Republic had opened other possibilities of a comprehensive research at the unique site carried out in 2021 and 2023. The most important findings are from sediments in the non-named corridor. Prehistory was represented by shards from ceramic containers 3,000 to 4,000 years old, i.e. from the Bronze Age. Discovering a secret money counterfeiting workshop from the Middle Ages, the very first in the whole Moravský kras/Moravian Karst, was the most surprising discovery there. Finding a prehistoric stone arrow from light Scandinavian chert and particularly of two slate fragments where a procession of figures is depicted is also unique. It resembles a procession of Hittite gods of the Underworld known from a rock relief in the Yazilikaya Shrine in Hattusa in Turkey. Age and origin of the former discovery has been still examined as well as the fact how the fragments arrived into the Moravský kras/Moravian Karst.

Tájek P.: Natural Values of the Slavkovský les/Slavkov Forest Mts. Protected Landscape Area (West Bohemia)

The Slavkovský les/Slavkov Forest Protected Landscape Area (PLA) was declared in 1974, being the 17th PLA in the former Czechoslovakia. Since its very beginning, it has been aiming at mineral springs and their infiltration areas. In addition to hundreds of mineral springs used by humans or freely rising at distant sites of the sparsely populated region, the Slavkovský les/Slavkov Forest Mts. also harbours a lot of very important natural phenomena – extensive forest peat-bogs, the largest serpentinite area in the Czech Republic, many well-preserved wet meadows or sunny dry slopes with rare orchid species. The PLA also includes the spa towns, namely Karlovy Vary/Carlsbad, Mariánské Lázně /Marienbad and Lázně Kynžvart. The romantic landscape of broad-leaved deciduous forests in the vicinity of Karlovy Vary/Carslbad and Mariánské Lázně /Marienbad, interwoven with trails for walks of spa guests, was also inscribed in the UNESCO World Heritage List in 2021. At the same time, in the Slavkovský les/Slavkov Forest Mts. there are many historic heritage monuments: among the most famous, the Loket Castle, Bečov nad Teplou Castle, Kynžvart Castle and a hunting lodge at the settlement of Kladská should be mentioned. They symbolize the harmonious landscape where historic heritage values meet natural ones and by combing both of them, unique landscape units are formed. More information can be found in Arnika/Volf's Bane Journal having been published since 1975. It originally aimed at the Slavkovský les/Slavkov Forest Mts. region, but since 2004 it has also been dealing with interesting issues, fun facts on and new knowledge about the whole Karlovy Vary/Carlsbad Region provided by natural and historical sciences.

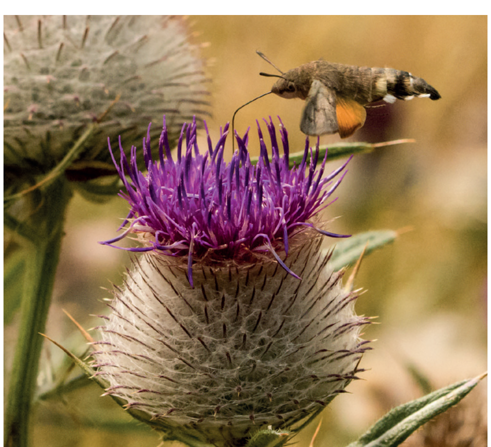
Vylita T.: The Slavkovský les/ Slavkov Forest Mts. as the Spa Therapeutic Landscape

The Slavkovský les/Slavkov Forest Mts. is a part of the world-famous West Bohemian mineral spring area spatially related to the Oher rift structure and wretch or transverse deep fits. The area is from a point of view of hydrogeology absolutely extraordinary by mineral water outflows of various types, spring gas effluxes and peloid reservoir development. Contrary to other identically protected areas, the Slavkovský les/Slavkov Forest Mts. Protected Landscape Area (PLA) was established to preventively protect the natural supportive environment of the most important spas in the Czech Republic – Karlovy Vary/Carlsbad, Mariánské Lázně/ Marienbad, Lázně Kyžvart as well as the former spas at Prameny/Springs, Podlesí, *etc.* In addition to natural therapeutic sources, namely spring waters or natural mineral water sources, there also are peloid reservoirs, declared and protected as natural therapeutic source (from the former village of Čistá to the town of Krásno) or protected from other reasons (Kladská Peat-bogs) and spring gas effluxes, of them carbon dioxide prevails. Within the PLA, specific climate conditions in spas of Lázně Kynžvart and Mariánské Lázně/Marienbad are also used for therapeutic purposes. Effect of the so-called spa therapeutic landscape located in the vicinity of natural therapeutic spas in the Slavkovský les/Slavkov Forest Mts. has been recently officially recognized in this respect.

Krása A.: The Aesculapian Snake in the Vltava River Basin

The Aesculapian snake (*Zamenis longissimus*), the biggest snake in the Czech Republic attracts everybody's attention at first glance by just its size or climbing skills. For biologists and nature conservationists, history of its findings in the Czech Republic, namely in the Ohře/Eger River Basin, Dyje/Thaya River Basin and in the Bílé Karpaty/White Carpathians Mts. is interesting. Almost every year an individual is found outside the above areas. To identify a new population, repeated findings and survey in suitable habitats are crucial. Specific factors for the snake include a typical river phenomenon, intensive gardening with often mowed grass that produces a lot of composts, livestock breeding with stables and dunghills and various small buildings falling in ruins.

The above patterns were confirmed in the Vltava/Moldau River Basin south of Prague, in area delineated by the Vltava/Moldau River and the village of Krňany and of Třebsín (Central Bohemia). In 2016-2020, more than 100 reports on the occurrence of Aesculapian snakes of all age classes were gathered. Only 26 individuals were directly observed and 18 of them were captured. The findings are from both dumps, landfills, composts or small gardens and directly from buildings. In meadows and forests the snakes were almost missing. From some shaded skins and dead individuals found, samples were taken for further DNA analysis.



Fuglíková J.: Availability of Food and Sites for Sleeping and Providing Offspring with Food – These are Troubles for Czech Insect Pollinators!

Insect pollinators have been rapidly declining in the Czech Republic as well as in other European Union's Member States, some of them being on the verge of extinction. Their importance is not only in food production but pollination is an essential precondition to maintain healthy and diverse ecosystems. There has been no single driver of wild insect pollinators decline and loss. The drivers include land-use changes, intensive production, pesticide use, environmental and light pollution, invasive alien species, pathogens and climate change. Pollinators are a huge and diversified insect group, in the Czech Republic including mainly bumblebees (*Bombus* spp.), hoverflies (Syrphidae), house flies (*Muscidae)*, beetles (*Coleptera*), butterflies and moths (*Lepidoptera*) or wild bees as well as the Western honey bee (*Apis mellifera*).

And possible consequences of the insect pollinator decline and loss? Almost 90 % of world's wild flowering plants depend at least partially on animal pollination to reproduce, 50 % of them depend fully. Plants cannot learn to live in the world without pollinators, breaking a long-term co-evolution of plants and insects is irreversible and has principal impacts not only on both the groups of organisms. Pollinators offer an excellent possibility to be model organisms for explaining importance and necessity of wild living organism biological diversity. They also provide indisputable benefits when pollinating orchards, vegetable fields or gardens, wild pollinators enhance or directly provide food production, particularly crops of high nutritional value. The latter is the principal reason why we should protect and conserve the above insect group, too.

Zatloukal V., Mašková R. & Beranová J.: Using Non-Native Woody Plants for Climate Change Adaptation Measures

As a response to current climate change, the Government of the Czech Republic approved the comprehensive National Action Plan on Adaptation to Climate Change in 2017, requiring, *inter alia*, "to methodically unify use of geographically non-native woody plant species being non-invasive and not hybridising with native ones, reaching maximally 20% of growth composition: these are particularly the European larch (*Larix decidua*) and Douglas firs (*Pseudotsuga* spp.)". Climate change is among the drivers of massive abatement of the Norway spruce (*Picea abies*), the most common and from a point of view of timber production the most important woody plant species in the Czech Republic resulting in a long-term decline in timber production and changes in range of products. High proportion of forest soils has been disturbed by acidification and nutrition degradation mainly due to large amount of nutrients through huge biomass extraction, particularly if also brushwood and biomass, which is not a part underground timber mass and has not the diameter larger than 7 mm including the bark, are removed. Moreover, the timber production, which is a pillar of forestry depends on long-term sustainability of forest ecosystem functioning. Therefore, excessive direction towards the production should not threat the functioning. Enhancing water regime in forest soils is supported particularly by preventing new drainages and remediation of old ones despite partial losses in production, restoration of canalized watercourses and by remediation of unsuitable and unused roads, grooves and tracks. Setting the limits for use of non-native woody plant species was based on analysing forest health and threats of forests possessed by climate change, assessing possibilities of native woody plant use in adaptation of forest to climate change, selection of suitable non-native woody plant species and setting limits for their use. If climate change scenarios will accomplish themselves, large changes in woody plant species composition with signification increase in oak (*Quercus* spp.) proportion should be expected in the Czech Republic in 20 – 40 years.

Nature & Landscape Management

Hošek M., Bartaloš T., Kadlubiec R., Kešner M., Pavka P., Pavková K. & Trojáček P.: Delineation and Conservation of the Floodplain Significant Landscape Element

Among Significant Landscape Elements (SLEs), sometimes called also Significant Landscape Features (SLFs), floodplains display the greatest difficulty both in delineation and conservation. In addition to long-term needs, the importance of floodplains has been newly highlighted in the currently debated European Union's Nature Conservation Law. One of its key targets is in fact principal restoration of watercourses which only hardly can be implemented without whole areas of their floodplains. In 2020 – 2023, the authors tried to solve the problem of missing methodically unified approach by project entitled *Practical tools for floodplain significant landscape feature protection and planning* and funded by the Technology Agency of the Czech Republic. The process was divided into two steps. Framework delineation of floodplains along significant watercourses in the Czech Republic is based on automated source data processing and is characterized by lower precision and accuracy (scale 1 : 25,000). The above outputs of the project dealt with more than 16,000 kilometres of significant watercourses, totally covering approx. 6,550 km^2. Detailed floodplain delineation uses mostly manual delineation in maximally feasible precision and accuracy, *i.e.* on minimal scale 1 : 10,000, on significant as well as small watercourses in the extent of municipality with extended powers (MEP) administrative district, applying also the framework delineation. The detailed floodplain delineation procedure was tested on territories of three MEPs. In addition to the delineation procedure, some other products were generated, namely Floodplain categorization, Catalogue of floodplain functions and Manual for using the data of delineated and categorised floodplains in planning documentation. The methodology for floodplain delineation has an ambition to become the principal expert/technical background for delineating floodplains of watercourses in the Czech Republic, potentially unifying floodplain delineation and categorisation by State/Public Administration authorities, including land-use/territorial planning.

Lysák F., Chytrá H. & Kotasová Adámková M.: Slovácké lúky/Moravian Slovakia Meadows: A Way to Restoration

Slovácké lúky/Moravian Slovakia Meadows situated in the Dyje/Thaya River floodplain on the eastern edge of the municipality of Lednice (South Morava) and closely following on from famous Lednice Castle Park harbour extensive and comprehensive floodplain meadows covering approx. 200 hectares. The site preserves the unique biodiversity-rich environment providing a huge range of wild plant and animal species with suitable habitats for their occurrence. Despite their size and diversity, the meadows have partially lost their natural values. Some parts are included in the Niva Dyje/Thaya River Floodplain Site of European Importance (pursuant to Act No. 114/1992 Gazette on Nature Conservation and Landscape Protection, as amended later, the term for Site of Community Importance, SCI, later Special Areas of Conservation, SAC, under the European Union's Habitats Directive) and the whole area would become a part of the proposed Soutok/Morava and Dyje/Thaya Rivers Confluence Protected Landscape Area. In 2023, within the Jedna příroda/The One Nature project a framework restoration study was conducted aiming at assessing the current state and restoration capacity of the area. The study examines natural conditions, history, drivers of degradation, current state including negative factors as well as possibility to restore the site, taking into account local specificities and restrictions caused by water management and other interests at the site. The study's main topics include water regime and vegetation of grassland and wetland habitats in the above area.

Tájek P., Kožíšková H., Tájková P. & Jaška P: Nature Protection, Conservation and Management in the Slavkovský les/Slavkov Mts.

As similarly to other Protected Landscape Areas (PLAs) in the Czech Republic, nature conservationists also in the Slavkovský les/Slavkov Forest Mts. (West Bohemia) deal with grassland management, enhancing forest tree composition or creating pools to support threatened water animal populations. First targeted interventions had begun about in 1990: they included self-seeding woody species removal at the most valuable sites outside forests. In the beginning the measures had been carried out by volunteers, in the 1990s possibility to fund them from the Ministry of the Environment of the Czech Republic appeared in the 1990s. Therefore, their number has been step by step increasing. The Slavkovský les/Slavkov Forest Mts. PLA was one of the first areas in the Czech Republic where peat-bogs and mires restoration started. First wood small dikes appeared on drainage canals as early as in the middle 1990s. Although a lot of partial restoration measures have been implemented, the total landscape wate retention capacity has unfortunately not been in good conditions. Many legislation and ownership restriction do not allow to change it. Nevertheless, the landscape water retention capacity has been partially increasing at least by creating new small water bodies. In 2013 – 2023, thanks to subventions/subsidies more than 174 pools covering totally 2.98 hectares and reaching the total volume of 20,800 m^3 were created or restored there: the average size of the pools is 171 m^2.

Hubený P.: Natural and Artificial Forest Restoration Effectivity

For assessing natural and artificial forest restoration effectivity four clearings after logging (Laka, Lenora, Říjiště and Perník) and a site after wind and European spruce bark beetle (*Ips typographus*) disturbances (Poledník) in the Šumava/Bohemian Forest Mts. Two sites, namely Poledník and Řájiště, were not artificially reforested. At Říjiště site, two 20 x 20 meters game-proof fences were established where European silver firs (*Abies alba*) were planted, within a clearing artificial restoration were not applied. At the other sites artificial planting was carried out aiming at improving species composition in the future growths. From these plots, restoration density and its species composition were derived. The final density was compared with records on numbers of tree species used in artificial restoration. One of the main goals of the study was to find in which extent artificial planting can influence future forest stands. Assessing the number of individuals contributing to rejuvenation on the clearings and artificial planting effectivity aiming at changing species composition in favour of other trees than the Norway spruce (*Picea abies*) suggest that the whole process has been dominated by natural regeneration and by coming-back prevalence of Norway spruce forest where undoubtedly also other woody plant species shall survive: the latter shall not definitely prevail in the future forest generation. On clearings forests similar to those being there before logging shall grow, in many aspects they shall be more structured, possibly with more gaps; nevertheless, they will be similar to the previous ones. Surprisingly enough, they will be also similar to those growing there in the 19th century, *i.e.* to descendants of primary forests.

Vondřejc T.E.: Alpine Longhorn Beetle Management in the Vlára River Pass Special Area of Conservation

The Alpine longhorn beetle, also known as the Rosalia longicorn (*Rosalia alpina*) is among the most beautiful beetles occurring in the Czech Republic. Its bright blue coloration with black spots on elytra makes it an unmistakable species. Its life cycle lasts three years. Alpine longhorn beetle's main food woody plant unambiguously is the European beech (*Fagus sylvatica*); moreover, it can also inhabit other deciduous broad-leaved trees, *e.g*. the Wytch elm (*Ulmus glabra*) or the Sycamore (*Acer pseudoplatanus*). The beetle requires sufficient amount of dead wood because females oviposit the fertilized eggs into it: they use both fresh breaks, standing remnants of trees or fallen trunks and dying wood on trees having been still living.

In Bohemia, the last population lives in the Ralská pahorkatina/Ralsko Uplands, on Malý Bezděz and Velký Bezděz hills. In Moravia it occurs in floodplain forests along lower reaches of the Morava/Moravia and Dyje/Thaya rivers. The Bílé Karpaty/White Carpathians Mt. Protected Landscape Area (PLA, Southern Moravia) is inhabited by beetle's Carpathian population that can be found particularly in the Vlára River Pass. The Nature Conservation Agency of the Czech Republic, namely its Bílé Karpaty/White Carpathians Mts. PLA Regional Branch, has been for several years implementing a lot of measures aiming at targeted support to and conservation of the Alpine longhorn beetle. Regular monitoring of Specially Protected Species and of their habitats is an important part of their management. In the Vlára River Pass area, targeted mapping including a concurrent assessment of management measure impacts has been for several years carried out. From this point of view, particularly an inventory aiming at saproxylic and mycophagous beetles performed in 2018 was principal: 222 species were determined in the course of it.

Knižátková E., Šikola M., Machoňová D., Volf V. & Jetenská E.: Results of the Finished Project Aiming at Providing Specially Protected Areas with Planning Documentation

The project "Providing Planning Documentation for Sites of National Importance in the Czech Republic" that includes Outlines of Recommended Measures II (ORM II) contributed to further systematic development of the EU Natura 2000 network management in the Czech Republic. Not only there are high-quality planning documents available both for Sites of European Importance (SEI, pursuant to Act No. 114/1992 Gazette on Nature Conservation and Landscape Protection, as amended later, the term for Site of Community Importance, SCI, later Special Areas of Conservation, SAC, under the European Union's Habitats Directive) and Bird Areas (pursuant to the above act, the term for Special Protection Area, SPA under the EU Birds Directive) as well as Management Plans for Small-size Specially Protected Areas overlapping with Natura 2000 sites fully taking into account requirement of species and natural habitats of the EU importance, but it also was for the first time more holistically examined in the sample of more than 200 sites whether the measures are successfully implemented just in the field. The results have been directly applied in immediate management of the individual sites under study. Moreover, they have also pointed out some more systemic issues requiring more comprehensive solutions. For example, more attention should be paid to sites under the so called basic conservation in the near future so that the status of the subjects of conservation will not be threatened there in the long term. The project should not be considered to be the end of such activities. The activities of the ORM II project have been directly followed and more elaborated by the One Nature IP LIFE project.

Bedan R., Svobodová O. & Krása A.: The Peregrine (Falco peregrinus) in the Moravský Kras/Moravian Karst

From a point of view of nature's values and species richness, the Moravský kras/Moravian Karst (South Moravia) is of great importance. In addition to many other wild animal jewels the Peregrine (*Falco peregrinus*) has been again occurring there. In the past often 3 to 4 pairs had nested there. Moreover, they have disappeared from 1957, particularly due to applying DDT pesticide. In 2016, the positive change appeared. The first pair was found in the Vývěry Punkvy/Punkva River Springs National Nature Reserve (NNR): breeding was successful, because peregrines reared three young. The Peregrine's comeback brought about necessity to deal with new issues related to attendance of the Moravský kras/Moravian Karst Protected Landscape Area (PLA) by tourists and risk of undesirable disturbance. During nesting of the first pair it was not necessary to implement any measures in the field and the breeding was kept secret because due to distantness of the nest. From the very beginning, Nature Guards were significantly involved in the above activities. They delineated the area with restricted entrance and checked and reinforced the restrictions applied. During the last nine years when peregrines have been again present in the Moravský kras/Moravian Karst, there were 19 breeding attempts. Of them 15 were successful: totally, 40 young fledged. The year 2018 was the most successful, because from both nests four young fledged. The first failed nesting was found only a year later, *i.e.* in 2019. Three nestlings from a nest in the Vývěry Punkvy/Punkva River Springs NNR were shortly before fledging preyed by the Eagle owl (*Bubo bubo*) breeding approx. 700 meters from the Peregrine's nest. Thus, peregrines resettled the Moravský kras/Moravian Karst spontaneously and successfully. The authors believe that despite some difficulties peregrines will nest successfully there also in the future.

Soukupová F. R., Sedláček L. & Vacek D.: Supporting the Green Infrastructure in Settlements

The Green Infrastructure is a crucial step towards more sustainable towns and cities resilient to climate change while providing a healthier environment for their inhabitants. In the Czech Republic, there is a large number of high quality public spaces and they are being created at the same time. Nevertheless, there are many challenges to overcome, particularly in ensuring the long-term and quality management of existing elements. Another challenge is to provide individual urban greenery segments, sites/areas and elements with the connectivity, as the urban development density and some linear barriers often limit the possibilities of their really functional connectivity. However, after two years of consultations on projects under IROP SC 2.2 Green Infrastructure of

Towns and Municipalities, the authors see a ray of hope. In many towns and cities in the Czech Republic, there has been an increasing interest in public green spaces. Successful implementation of new projects, proper management of existing green infrastructure elements and their comprehensive development will require appropriate education, communication and raising public awareness and, above all, the common goal of climate-resilient and liveable towns and cities.

Prudík B., Daněk T. & Musil J.: How Broad is A River for Fish?

In the Czech Republic, the previously overlooked lateral migration is gaining attention from the State Nature Conservancy authorities, scientists, as well as River Basin Management Authorities and other watercourse managers. It is the movement of fish into the lateral watercourse ecosystems - shallows, pools, gravel beds/bars and of river dead arms/ backwater or oxbow lakes and ideally also beyond the river bed edge into flooded floodplain forests and meadows. Its restoration provides the ability to reduce invasive alien species numbers and to improve water quality and overall ecological conditions there. Promoting it with appropriate measures is therefore highly desirable also for implementing the European Union's Water Framework Directive. For fish, migration is the movement of an individual for a specific purpose. This may be for reproduction, but it may also be for feeding, escape or shelter. Lateral migration is a type of migration defined by a direction perpendicular to the longitudinal axis of the stream. It is a relatively general term to describe a complex group of movements controlled by drivers either attracting or repelling fish to move to the bank or middle of the river. The most important factor in relation to lateral migration is the water column height, as increased flows create one of the most threatened ecosystems to which fish migrate exclusively laterally. There are not many sites/places where these ecosystems can be found in the Czech Republic's landscape in the Czech Republic. Moreover, unmanaged streams are generally small watercourses, which are characterised by lower fish species diversity than large lowland streams.

Just T.: Favourable Flow Conditions

One of the tasks of watercourse management is the maintenance of favourable flow conditions (FFC). Unfortunately, in the Czech Republic even today many water managers still have had a simplistic, schematic and consequently incorrect view of FFC in the field. Wherever, irrespective of the fact that there are various conditions in different watercourse stretches and different objectives are to be applied there, they associate the idea of FFC with maximising the flow capacity of the watercourse bed. They are also supported by the idea generally held by self-government authorities in the country that a stream or river bed is generally better the more water it can hold, despite whether it is surrounded by houses or meadows, fields or forests. The greatest possible flow capacity is usually desirable in watercourse stretches in and near built-up areas and within reach of important structures. The protection of built-up areas, roads, utilities and similar buildings is a socially recognised priority. To protect these interests, flow capacities shall be maintained at high flood flows. In the built-up areas in municipalities, a perimeter flow capacity of Q100 - "100-year water" - is commonly considered desirable, often even being greater. However, what applies in built-up areas is not at the same time the general standard in the open, undeveloped landscape. On the contrary, spills outside the watercourse bed must be supported because of the flood wave decreasing and flattening there.

Frei I., Jílková V., Kotyzová M., Laštůvka Z., Malenovský I., Musíl Z., Pižl V., Řehová V., Starý J., Straková M., Šefrová H., Tajovský K., Tůma J., Vašíček M. & Vymyslický T.: Study on Grassed Sites in the Moravský kras/Moravian Karst Protected Landscape Area

The Moravský kras/Moravian Karst Protected Landscape Area (PLA, South Moravia) was newly declared in 2019. In addition to the change in boundaries and new more detailed protection/conservation conditions, the delineation of nature conservation zones has also changed. The main reason for the zonation change on karst plateaus was to limit erosion into sinkholes and leaching of fertilizers and pesticides into the karst underground. A total of 114 hectares of arable land was grassed in 2019-2020. Most of them were sown with a subnational/regional or species-enriched grass mixture, which the Nature Conservation Agency of the Czech Republic (NCA CR) contributed financially to. In 2019, the grassing was followed first by a one-year study carried out by the NCA CR and funded by the Landscape Management Programme and then in 2020-2023 by a four-year study within the Landscape Natural Function Restoration Programme (LNFRP) entitled as "Monitoring of above-ground and soil biota of grasslands of karst plateaus in the selected areas within Zones I and II of the Moravský kras/Moravian Karst Protected Landscape Area". Grassing over caves and around sinkholes contributed not only to the protection of karst ground and water from pollution, but also to the dividing of the farmland into smaller parts. Thus, the islands of greenery on arable land have been hosting a variety of wild animals and plant species, including rare weed species, which are indicators of nature-friendly agriculture and contribute to increasing local biodiversity. Surveys have shown the importance of proper selection of seed mixtures at various sites for preserving plant gene pool there. Comparison of outputs basic inventory results gathered from different groups of organisms and changes in soil features provided the basis for more detailed comparisons between grassland and arable land types.

Research, Surveys and Data Management

Ouhrabka V.: Using Georadar in Karst Areas and for Cave Surveys

Caves defined as underground holes of natural character are the main subject of speleological surveys. The first systematic speleological surveys had been conducted on what is now the Czech Republic as early as 300 years ago aiming mainly at passing through freely accessible, mostly known caves, their description and at basic documentation (maps and drawings). Only later, during the 19th century speleological survey intentionally began to deal with finding and discovering new caves. Modern technology allowed to penetrate to new caves by digging through massive cavings, corridors filled by sediments, rock narrows and water siphons/sumps or to climb up through high colouirs. Georadar, a device allowing to determine interfaces between the individual materials in the bedrock provides a new method to looking under the Earth's surface. According to technology applied and character of the bedrock it is able to look hundreds of meters under the ground because it operates on the *principle* of transmitting and reflecting short duration electromagnetic pulses from a transmitter. A reflected wave is composed of received impulses. A special software can display the wave at any point of measuring and to assemble a whole radargram from the individual waves. The first remarkable success related to testing the georadar in seeking for yet unknown cave corridors was made by Slovenian speleologists in early 2019. Based on measuring in the vicinity of the Škocjan Caves possible directions and depths of further continuation of known cave spaces had been identified. Consequently, by digging to the depth of about 90 meters under the surface the speleologists really entered in new caves. Thus, georadar survey helped to made the first great discovery in the Škocjan Caves after almost one hundred years.

Fránková M., Soukupová M. G., Bobek P. & Kulichová J.: Phycological and Paleoecological Research of the Selected Mineral Springs in the Slavkovský les/ Slavkov Forest Mts. Protected Landscape Area (West Bohemia)

The Slavkovský les/Slavkov Forest Mts. Protected Landscape Area was established in 1974 for its exceptionally well-preserved water regime including numerous mineral springs. Since 2012, the mires and springs have been classified as Wetlands of International Importance by the Ramsar Convention. In 2021 the authors conducted phycological and paleoecological research of several springs. They studied the recent biota with a focus on microscopic unicellular algae - diatoms. The authors found species rich assemblages (altogether 103 taxa) with a significant percentage of national Red List taxa. The flagship species of the local iron springs was *Pinnularia ferrophila*. In order to determine whether the endemic species inhabits the mineral springs in the long term, sedimentary cores collected near the springs were examined. Through the oldest sediments (Novoveská kyselka and Číhaná), the authors were able to look into the wetlands' history dating back to the end of the Last Ice Age (13,000 years). The scientists found *Pinnularia ferrophila* in fossil as well as in modern samples at two sites: in the deepest sediments of Číhaná and also Kramolínská kyselka. The fossil diatom assemblages displayed species richness (111 species) similar to the contemporary ones and national Red List taxa were also found among them. As part of the palaeoecological research, the authors also studied other proxies (pollen grains and macrofossils) that helped to reconstruct past changes in the local landscape.

Plesník J.: Conservation Genetics Has Been Helping Nature Conservation and Landscape Protection more than a Half of Century

Genetic diversity describes variability in succession of bases within the nucleotides forming alleles within a DNA or RNA molecule, and traits within a species. Therefore, it always is intraspecific. Thus, it refers to the heritable variations between individuals and populations coded within DNA. *The combined differences in the DNA of all individuals in a species make up the genetic* diversity: in other words, it is the unique genetic makeup of each individual, which is determined by DNA. Genetic diversity allows species, communities and ecosystems to adapt to the environment, resist negative disturbances and to develop themselves: thus, it is the necessary precondition for evolutionary changes. At the same time it significantly supports maintaining ecosystem processes, functions and services and provides human society with a lot of possibilities how to increase productivity in agriculture, forestry and fishery. The main drivers of genetic diversity decline/loss include natural habitat fragmentation, degradation, destruction and loss, overexploitation of populations by humans and climate change. All the factors can decrease abundance in populations and reduce space inhabited by them (demotope). The article briefly summarises the current knowledge of the topic including rapid advances in genomics.

Šindelář J.: Koněpruské jeskyně/ Koněprusy Caves Scanning

In underground space 3D scanning a joint project called characteristically the Koněpruské jeskyně/Koněprusy Caves 3D scanning was carried out jointly by Geo-cz and the Cave Administration of the Czech Republic in 2023. A substantive part of upper and middle floor of the Koněpruské jeskyně/Koněprusy Caves (Central Bohemia) was scanned by terrestrial laser scanners made by Faro and Trimble companies. At the same time, data provided by spheric videogrammetry were also gathered there. After completing an accuracy test it can be stated that spheric videogrammetry at fixed values of the elements is an accurate enough, detailed, very quick and low-cost method. Therefore, it was consequently applied in documenting all hardly accessible sites in the Koněpruské jeskyně/Koněprusy Caves. A lower floor of the Koněpruské jeskyně/Koněprusy Caves consists of 360 meters of abysses and corridors of very small size, which should be crawled. Checking accuracy of the low floor scanning is through points locked on the surface close to an entry into underground space and location of the chimney in the southernmost part that was locked from the surface in the second half of the 20th century. During only five days, parts of the Koněpruské jeskyně/Koněprusy Caves having been known yet were scanned. In total, 200 meters of the upper floor, 1,700 meters of the middle floor and 350 meters of the lower floor were documented.

Havelka J.: Owls in the Brdy Highlands Protected Landscape Area

Extensive Norway spruce stands with dispersed hollow trees in the Brdy Highlands Protected Landscape Area (Central Bohemia) offer suitable conditions for occurrence of rare boreal owl species – the Boreal owl, also known as the Tengmalm's owl (*Aegolius funereus*) and the Eurasian pygmy owl (*Glaucidium passerinum*). Moreover, the conditions have significantly changed by extensive salvage cutting there. The study presented aimed at response of both owl species to the changes. The owls' occurrence was examined by acoustic monitoring using automatic recorders in the period of their highest acoustic activity. In total 402 records made across 235 km^2 of the area were analysed.

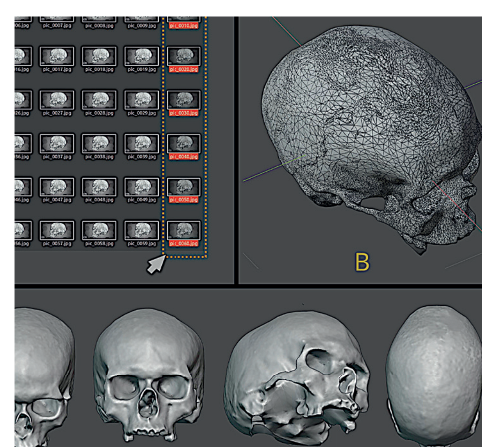
Boreal owl territory density was estimated at 2-4/10 km^2 (53-83 territories) while for the Eurasian pygmy owl it was 1.3-2/10 km^2 (32-57). From a point of view occurrence of the above species, the Brdy Highlands are a significant area. Based on the findings, future of the Boreal owl that prefers open clearings for foraging for prey is not significantly threatened by salvage cutting there. On the other hand, the Eurasian pygmy owl avoids the clearings. Therefore, it is important to monitor the owls also in other areas with similar environmental conditions.

Hauck D., Konvička O., Venkrbec T., Marek J., Šácha D., Barcíková S., Čížek L. & Veselý M.: Monitoring of the Alpine Longhorn Beetle (*Rosalia alpina*) in the Vlára River Pass Special Area of Conservation

In the northern part of the Bílé Karpaty/White Carpathians Mts. Protected Landscape Area, the Vlára River Pass Site of European Importance (SEI, pursuant to Act No. 114/1992 Gazette on Nature Conservation and Landscape Protection, as amended later, the term for Site of Community Importance, SCI, later Special Areas of Conservation, SAC, under the European Union's Habitats Directive) is located. The Alpine longhorn beetle, also known as the Rosalia longicorn (*Rosalia alpina*) is one of the nature conservation targets there. In 2021 the Nature Conservation Agency of the Czech Republic commissioned the beetle's monitoring to be carried out there aiming at gathering detailed information on the species. Due to mark-recapture method applied it was found that the population size is more than 3,000 individuals, of them about one quarter being females. Species' mobility was also studied. In total there were 12 movements by flights longer than one kilometre, the longest reaching 3,300 meters. Research also showed that there is an important subpopulation west of the SEI/SAC, consisting of approx. one fifth of the individuals and that there are movements by flying between the Czech and Slovak Alpine longhorn beetle populations. Among non-target species found during the study, critically endangered longhorn beetles *Necydalis ulmi* a *Stictoleptura erythroptera* should be mentioned. Comparing aerial photographs from 2006 and 2018 demonstrated that 34.5% of old European beech (*Fagus sylvatica*) growths were logged within the SEI/SAC in 12 years only. Based on outputs of the research management was proposed consisting of non-intervention approach, selected management, increase in dead wood amount, increase in numbers of reserved solitary trees intentionally left on clearings and particularly of trimming trees.

Klečková I., Kozel P., Kolář V., Tájková P., Ribeiro P., Linke D., Matos-Maraví P. & Sucháčková Bartoňová A.: Genomics in Insect Conservation: Challenges and Possible Use

Maintaining the highest genetic diversity of the species reflected by large and stable population sizes is a principal and traditional approach in conservation genetics. Genomic research can be applied in studying population structures, even at the very detailed scale. Such analyses allow to gather information on structure of the studied populations, their sizes and on barriers limiting exchange of individuals among them. Past changes in the population sizes can be estimated and researchers can also find which populations have been declining and whether the decline is a long-term trend or a fluctuation even when the fact is not at first sight clear from field observations. Thus, genomic techniques help to examine causes of decline in some insect species surviving only in isolated populations. They also allow to reveal dynamics of and connectivity among populations in the landscape that makes establishing a network of suitable habitats easier there. Last but not least, we can support declining populations or those on the brink of extinction by restocking them by individuals from suitable viable populations. At present, climate and habitats have been changing so quickly that wildlife translocation become more and more important in nature conservation. In some threatened butterfly species, assisted colonisation has been suggested. Genomics allows to estimate the number of individuals of the target species necessary for successful re-introduction. Finally, identification of unique populations supports to justify their protection, conservation and management also among land owners and land managers. Therefore, genomics shows a clear prospect in relation to proposed amendments to Act No.114/1992 Gazette on Nature Conservation and Landscape Protection because pursuant them not the individual but just populations shall be protected, conserved and managed.



Drbal K.: Forensic Facial Reconstruction of the Mladeč I Skull

Current research techniques not only give precision to opinions on some questions related to human evolution in Europe, but in many cases, they result in whole and principal rethinking of the questions. It was also the case of a finding from the Mladečské jeskyně/Mladeč Caves (Central Moravia). Facial reconstruction of the Mladeč I skull was selected to improve currently used techniques. In data gathering also the Naturhistorisches Muzeum/Museum of Natural History Vienna was involved: the skull was deposited there. Nevertheless, the skull itself is not complete which complicated the facial reconstruction. Fortunately, the Naturhistorisches Museum Vienna had made the online version of the Mladeč I crania available under the Creative Commons license (CC BY-NC 4.01). The model became the principal input for the facial reconstruction. Consequently, 2,753 images were generated, of tem 83 were separated for views and as a basis for the photogrammetry. A further step was reconstruction of skull's missing parts, namely mandible (lower jaw) and teeth. In order the facial approximation to be carried out, the skull must be complete and, in view of this situation, it was necessary to conduct a reconstruction of the missing parts of the structure. Before beginning the work to recover the missing regions, some measurements were taken on the skull to be approximated, in order to locate virtual donors that would serve not only for recovery, but also for the subsequent process of facial approximation. Measurements were made of the spaces between the orbital frontomalars, between the glabella and the nasion, and between the rhinium and the most extreme lateral edge of the orbit. These data are plotted on a graph of population clusters, indicating affinities with tomographies that may be in the authors' virtual donor collection. In the case of the Mladeč 1 skull, there was greater affinity with clusters of Asians, general Brazilians, and Brazilians of markedly African ancestry. This positioning is not definitive evidence that it is an individual from those ancestral groups, but that there is a compatibility of the eye and nose region with individuals from the clusters.

Václavík T., Čejka T., Bednář M. & Šarapatka B.: Agri-environment Approaches in Farmland

Intensive agriculture significantly contributes to biodiversity decline and loss and the degradation of ecosystem services in Europe's landscapes. Agri-environment approaches have been introduced as a tool to mitigate the negative impacts, but their effectiveness and the extent to which they are used by farmers varies widely. The European research project entitled as BESTMAP (Behavioural, Ecological and Socio-Economic Tools for Modelling Agricultural Policy) aimed to develop a methodological framework for modelling the impact of Agri-environment Schemes (AES) on farmland. The project's methods take into account the complexity of farmers' decision-making and the various preferences of different farm types. At the same time, the project assesses the impact of different AES implementation scenarios on biological diversity and ecosystem services in five case study areas across the European Union, including the Czech Republic, namely in the South Moravia and Zlín regions. Thus, the results of the BESTMAP project show that AES can contribute to the conservation of biodiversity and environmental components, but their current implementation has been insufficient to achieve significant positive impacts. To increase their effectiveness, the diversity of farms, farmers' motivations and the comprehensive relationships between farming practices and the environment need to be taken into account. However, it is essential to emphasise that effective biodiversity conservation requires a comprehensive approach that goes beyond AES alone and involves wider changes in farming practices and landscape planning.

Prach J., Hájková P., Vondrák D., Dudová L., Marešová P., Bobek P., Chattová B. & Pokorný P.: Research on Ecosystems' Past – What Can Paleoecology Offer to Current Nature Conservation?

Research on peat-bogs, lakes, fishponds, cave interiors, *etc.* step-by-step builds up an idea of the past in the Czech Republic's territory. Botanist, zoologist, geologist, archaeologist, data analyst and many others meet at one excavation site or at the evaluation of the results. The picture that emerges is the one that textbooks and various maps present to practical conservationists, foresters, landscape planners and similar applied professions. Moreover, the situation is not as clear and simple as it appears *e.g.* in the tables within the Specially Protected Area management plans. There is no single 'natural' or 'natural' state that contrasts with the human-altered state of the area and could be an unquestionable target for protection, conservation or restoration. Nature has always been changing, species have been migrating or dispersing across the landscape and have been becoming extinct in some areas. For millennia, moreover, this has happened in inseparable interaction with humans. Not one such change can be seen and studied live, but many similar changes have taken place in the past. In Central Europe, the influence of man in shaping even what we have nowadays used to call natural habitats has increasingly been becoming evident. Understanding such a development is a good basis for accepting the need for active management of protected areas and protected species. It is then more a political decision as to which areas we want to maintain *e.g.* in the state of the 19th century cultural landscape (meadows), which in the era before introducing modern forestry measures (*e.g.* grazing and coppice forests) and which should be experimentally without man (primary/virgin forest reserves) or where we want to highlight some ecosystem services provided also by a habitat with a species composition having no analogy in the past.

Borovec J. & Pixa J.: The Water Quality in the Nové Mlýny Waterworks and in the Dyje/Thaya River Downstream (South Moravia)

In the Czech Republic, the water quality in the rivers is not good. Neither is the quality of aquatic ecosystems good, as shown by the regular assessment of their ecological status under the European Union's Water Framework Directive. Certainly, compared to the state of the rivers at the end of socialism in the late 1980s, the current situation is "orders of magnitude better". However, the most noticeable improvements occurred as early as in the early 1990s and looking at nutrient concentrations in streams over the last 20 years, for example, any significant decline could not be found. Experimental results show that all sediments are significantly removing oxygen from the water, and the sediments in the Nové Mlýny Waterworks Middle/Věstonice Reservoir (South

Moravia) are also absorbing nitrate and releasing ammoniacal nitrogen massively. In terms of phosphorus, the release from sediments in the Upper and Middle Reservoirs is significant. It seems as if the Lower Reservoir does not change the water much anymore and releases what it has "inherited" from the reservoirs above it into the Dyje/Thaya River down the river. The Nové Mlýny Waterworks and the Dyje/Thaya River is a huge system that cannot be solved by one partial action only. Therefore, many partial actions, careful planning and compliance towards the desired improvement are required there. There also are opportunities once in the century, such as the crossing of the D52 road in front of the Upper Reservoir or compensatory measures on the water level fluctuations at the Middle Reservoir. Both actions provide critical opportunities for improving the Nové Mlýny Waterworks ecosystem and must not be implemented in a purely "engineering-technological" manner. Within both actions, measures can be carried out to reduce the Nové Mlýny waterworks' trophic level and the consequent decrease in phytoplankton biomass and to slow down the processes associated with its decomposition.

Nature Conservation Legislation

Jelínková J.: Reducing Competence and Powers of the Czech Environmental Inspectorate

By the 15th subsection of Act No. 465/2023 Gazette changing Act No. 416/2009 Gazette on Accelerating Building of Transport, Water and Energy Production and Consumption Infrastructure and Infrastructure of Electronic Communication (Linear Infrastructure Act), as amended later, and other related laws, Act No. 114/1992 Gazette on Nature Conservation and Landscape Protection (ANCLP) was amended. The changes mainly deal with competences and powers of the Czech Environmental Inspectorate (CEI) that shall not deal with natural persons not doing business anymore. The reduction of CEI's powers was done through a Members of Parliament amendment not related to the Linear Infrastructure Act topic. Thus, comments of other State Nature Conservancy authorities including those of municipalities and Regions or environmental citizens' associations were excluded. The reduction is caused by changes in the first sentence of Article 80 of the ANCLP pursuant to it the CEI lost competence for checking and consequently pursuant to Article 80 paragraph 4 of the ANCLP for dealing with natural persons' offences. There is no transitional regulation/temporary provision within the amendment, *i.e.* the CEI has to hand over proceedings on an offence, which had begun before the amendment entered into force, to other State Nature Conservancy authority having been continuing to be authorised to deal with them, most often to municipality with extended powers (MEP), alternatively to the Nature Conservation Agency of the Czech Republic. Therefore, workload will increase in Municipal Offices of MEP and other State Nature Conservancy authorities, although they have been dealing with supervising agenda rather optionally. Due to their heavy overloading with permission activities under pressure of the very strict deadlines which shall even increase by issuing the Unified Environmental Opinion pursuant to the New Building Act it is not realistic that they will be able to provide more capacities for checking, preventive and sanctioning activities than they have to date done. Thus, rights for nature conservation and landscape protection shall probably be reduced by revocation of natural persons not doing business from the competence of the CEI, a specialized checking and enforcement authority with more than thirty-year experience and tradition in the Czech Republic.

Pešout P. & Kinská dal Borgo J.: Changes in Payments of Compensation for Losses Caused by Nature Conservation Provisions in Agriculture, Forestry and Fishpond Management

In the Czech Republic, there have been payments of compensation to owners for loss caused by nature conservation provisions in agriculture, forestry and fishpond management for twenty years. The legal framework for the compensation payments is set by two implementation decrees which have recently been significantly amended. The methodology for assessing legitimacy and amount of compensation has been developed and specified. Except of areas managed by the respective National Park Administrations, financial compensation payments is managed by the Nature Conservation Agency of the Czech Republic across the whole country's territory. By introducing the scheme in 2004, the Czech Republic joined many European countries where losses to owners caused by nature conservation are in various extent compensated. Step by step, payments of compensation for complications in agriculture, forestry and fishpond management have become one of the most important financial tools of the State Nature Conservancy in the Czech Republic. Although the amount of finances demanded has been year after year increasing it has not reached the estimation made during introducing the scheme into amendment to Act No. 114/1992 Gazette on Nature Conservation and Landscape Protection twenty years ago.

Havel P.: Czech National Nature Restoration Plan

Since the European Commission presented proposal for a European Union's regulation on nature restoration (Nature Restoration Law, NRL) almost two years have passed. During that time, a compromise on the NRL's content was finally reached. In the case of natural habitats, it includes exception allowing to reduce nature restoration targets in common types of natural habitats or in recreated natural habitats. The provision on pollinator population recovery was also changed, namely in relation to the extent of obligatory monitoring. Consensus on restoration of agricultural ecosystems offers a possibility to select two of three indicators, in the case of forest ecosystems six from seven indicators given by the NRL. There is no duty for the EU Member States to change financing from the Common Agricultural Policy and the Common Fishery Policy for 2021 – 2027 when implementing the NRL through National Nature Restoration Plans (NNRP).

The last necessary step is approving the proposal on the NRL by the Council of the European Union. Consequently, a key tool is NNRPs allowing the Member States when applying the NRL to take into account specific natural and socio-economic conditions, to set priorities and activities in nature restoration and to quantify them.

Kosejk J.: Impact of Changes in the Building Act on State/Public Administration Performance in Specially Protected Areas

In 2024, Building Act recodification introducing an issuing the Unified Environmental Permission (UEP) does not include Specially Protected Areas and Natura 2000 sites in the Czech Republic. In these areas, the respective State Nature Conservancy authorities (SNCA) integrated under the UEP issue the so-called SNCA joint decision in which they assess the intention requiring the UEP from a point of view of all interests. Moreover, since July 2024 the legislative changes shall cause an extreme increase in workload in Specially Protected Area Administration staff that should be urgently reduced by a set of various measures.

Therefore, the Nature Conservation Agency of the Czech Republic (NCA CR) has initiated a set of legislative, methodological and administrative measures to reduce a bureaucratic load within the Building Act implementation in National Parks and Protected Landscape Areas. From a long-term point of view, it aims at actively influencing planning documentation developers in National Parks and Protected Landscape Areas to elaborate land-use/territorial plans with the given regulatory elements or regulatory plans. For planning documentation developers, the NCA CR has been preparing financial incentives from subvention programmes/subsidy schemes for the activities.

Mach P. & Škorpíková V.: Some Thoughts on Necessity to Change Setting Species Protection Exemptions

Legislative protection of specially protected wild plant and animal species is restrictive in the Czech Republic. It is based on protection of individuals by restricting activities negatively impacting their natural development. Formal requirements follow from provisions of Act No. 114/1992 Gazette on Nature Conservation and Landscape Protection. As amended, if an exemption is not issued in the interest of nature conservation, another public interest of the intent prevailing over the interest of nature conservation has to be clearly proved. When reviewing the decision on exemptions, meeting the above formal requirements is strongly emphasized. According to the judicature, the burden of proof of meeting them lies with the applicant. Consequently, the decision-making State Nature Conservancy authority should assess whether the arguments provided by the applicant are in this respect sufficient. Following judgements, the decision-making bodies have to look into whether public interest on the intent representing all-of-society value worth of special protection is met. By its very nature, exception from species protection is not a tool serving to solve systemic issues related to measures applied in a blanket manner and their negative consequences for nature caused by industry, transport, agriculture or forestry. Provisions to control such activities should be accepted conceptually when main executive, management and legislative bodies and of course experts participate in.

Focusing on the Public

Plesník J.: On IUCN Lists. This Time on Green Ones

The International Union for Conservation of Nature (IUCN) is sometime accused that through well-known Red Lists it excessively highlights unfavourable status of global nature. Therefore, an idea to award from a point of view of nature conservation important and well protected, conserved and managed protected areas has resulted in the idea of the IUCN Green List of Protected and Conserved Areas. A protected or conserved area or Other effective area-based conservation measures (OECM) that reaches the IUCN Green List Standard is certified and recognised as achieving ongoing results for people and nature in a fair and effective way. Any site can join, and work its way towards achieving verified success, and then maintain the Standard or further improve. More than 600 individual protected areas or OECMs have been involved in the IUCN Green List of Protected and Conserved Areas campaign. Moreover, not all have been obtained the certificate of inscription on the Green List. As of 1 January 2024, there were 61 protected areas or OEMs on the list: in total, they cover 735,551 km^2, *i.e.* 0.4% of the Earth's surface. An intention to present to the professional and general public species or other taxa, due to effective conservation measures saved from extinction, has not been quite new. For elaborating Red Lists and Red Data Books IUCN used also the category Saved in 1987 to 1994. After the 5th World Conservation Congress IUCN begun to develop the IUCN Greem List of Species. After a series of consultations conducted in 2012 – 2018 the conceptual framework of the IUCN Green List of Species was proposed and it was decided to call the new measuring species recovery the IUCN Green Status of Species to avoid confusion with the above IUCN Green List of Protected and Conserved Areas. Species is fully recovered if it is present in all parts of its range, even those that are no longer occupied but were occupied prior to major human impacts/disruption, it is viable (*i.e.* not threatened with extinction) in all parts of the range and it is performing its ecological functions in all parts of the range. The IUCN Green Status of Species, a set of metrics designed to characterize the past and potential future recovery of each species on the Red List, was festively launched at the opening of the 7th World Conservation Congress held in Marseille, France in September 2021.

Jongepierová I. & Říhová J.: The White Carpathian House of Nature

In the end of 2023, the Bílé Karpaty/White Carpathians Mts. Protected Landscape Area Visitor Centre – The White Carpathian House of Nature (BK-WCHN) was approved in Bartolomějské náměstí/Bartholomew Square in the historic quarter of the town of Veselí nad Moravou (South Moravia). An investor and an operator of the BK-WCHN is the Czech Union for Nature Conservation Bílé Karpaty/White Carpathians Mts. The site was selected also due to good connection by public transport to the PLA's southern part as well as the fact that lively tourism on the Baťa Canal and on adjacent bike trails provide plenty of visitors there. Design of the facility begun as early as in 2016. In 2020 – 2021 there were some tenders for BK-WCHN's building, equipment and furnishing: some of them had to be repeated. Finances were provided by the South Moravian Regional Office and the Town of Veselí nad Moravou and small contributions were donated by some municipalities. The original building in Bartolomějské náměstí/Bartholomew Square was completely restored. On the ground floor, there is a reception and exposition, while on the 1st and 2nd floor a lecture theatre, a library and offices for operating the BK-WCHN can be found. The other building is a passive new construction where a part of the exhibition is located on two floors. An atelier is available there not only for activities with children but also for various workshops and training courses. The whole BK-WCHN's exhibition puts on playfulness and creativity. Zoya Volkova's drawings on blueprint background are complemented by photos and movies as well as by a series of animations. All texts were translated into English and German. Adjacent winter outdoor space can also be used for various purposes, too. A water element – the Morava/Moravia River with meanders shows illustratively how water can be retained within the landscape and aims at children. The BK-WCHN will be festively launched in March 2024.

Hofmeisterová H., Hromas J. & Pojer F.: The Český kras/Bohemian Karst House of Nature Launched

Priorities of the Nature Conservation Agency of the Czech Republic (NCA CR) also include communication with, education of and awareness among the general public and the target groups. Without it, it is not possible to effectively and over a long period protect, conserve and manage nature and the landscape in the country. Protected Landscape Areas (PLAs) harbour natural and cultural heritage of national and international importance. Some of them are a part of the UNESCO World Network of Biosphere Reserves, Wetlands of International Importance (Ramsar Sites) or UNESCO Global Network of National Geoparks/Global Geoparks. Traditionally, they are among the most important and the most attractive tourist destinations in the Czech Republic. The Český kras/Bohemian Karst House of Nature has been the twelfth established by the NCA CR. The Cave Administration of the Czech Republic in close collaboration with the NCA CR, namely the Český kras/Bohemian Karst PLA Administration built a multifunctional facility within the Koněpruské jeskyně/Koněprusy Caves in the Zlatý kůň/Golden Horse National Nature Monument (NNM) located in Central Bohemia. It will serve to visitors to the Koněprusy jeskyně/Koněprusy Caves and the Český kras/Bohemian Karst aiming at helping them to perceive importance, beauty as well as vulnerability of the landscape there and to offer to them a possibility to contribute to its protection and preservation. The House of Nature building contains an exhibition, a multifunctional hall, a playroom, usual utility rooms for visitors (sanitary facilities, a sandwich bar and a shop) as well as modern working space for the Koněpruské jeskyně/Koněprusy Caves Administration. There is an adjacent outdoor exhibition and an educational path through the Zlatý kůň/Golden Horse NNM and its vicinity. In three parts, the exhibition in the House of Nature presents to visitors geological patterns of the Český kras/Bohemian Karst, origin, development and importance of karst phenomena and, of course, Český kras/Bohemian Karst PLA's biota: technical parts of the exhibition are complemented by playground equipment, quizzes and riddles dedicated not only for children.

Loučková B., Tichopádová E., Stella D., Drlíková J., Martinovská A., Zvěřinová S. & Vačkářová D.: Participatory Ecosystem Service Assessment

One of the ways how to present to the society importance of benefits provided by nature not only for human life, but also for society well-being and economy is their assessment – identification and quantification. Within the EU LIFE project One Nature the authors organized a series of participatory workshops in three Protected Landscape Areas (PLAs) in the Czech Republic, namely Třeboňsko/Třeboň Basin, Křivoklátsko and Slavkovský les/Slavkov Forest Mts. in 2022-2024.

In each PLA four workshops were held aiming at assessing significant nature's contributions to people and their mutual relationships by socio-cultural assessment. During a group discussion, the participants selected relevant nature's contributions for the given area and consequently they placed the contributions on four-grade scale according to importance of its occurrence. In a further step, in the most important nature's contributions the extent of their providing by the individual ecosystem types at the sites was assessed. Data from matrixes describing the relationship among the most significant ecosystem services were then analysed and cartographically visualized through ecosystem service hot spot and cold spot maps in all the three PLAs.

Miklín J. & Kmet J.: On the Pavlov Hills, Their Beauty and Diversity

Since 2024, the Pavlov Hills Protected Landscape Area (PLA) has had its visitor centre – the Pavlov Hills House of Nature that was built by rebuilding and completion of the former archaeological museum at the village of Dolní Věstonice (South Moravia). An exposition having the Eurasian hoopoe (*Upupa epos*) as a mascot presents the Pavlov Hills colloquially called *Pálava as an area displaying extraordinarily high species richness as well as a long-term coexistence between humans and nature. An idea to use the museum's historical building at Dolní Věstonice had for the first time emerged in 2016 and in 2017 it was elaborated into a conceptual intent. The background for the establishing the exposition was the document entitled as Strategy for Visitors in the Pavlov Hills PLA, which also includes the Pavlov Hills House of Nature Outline. The latter defined the main aim of the exposition as follows: Through the exposition and services in the Pavlov Hills House of Nature to help visitors to perceive importance, beauty, but also vulnerability of the Pavlov hills landscape, to appreciate its uniqueness and* *efforts paid to protection, conservation and management of the area by the State Nature Conservancy authorities, managers, municipalities, museums and other bodies as well as local people and to inspire visitors to support conservation of natural and cultural values by their behaviour there. Based on the above, experts developed the up-to-date, interactive and varied exposition. Its motto welcoming visitors is On the Pavlov Hills, their Beauty and Diversity and Responsibility of Humans for Their Fate. Preparatory work started in 2017 and an application for subvention was submitted within the Operational Programme Environment (OPE) in November 2018. Just in 2019 developing movies, exhibits, texts and design began. Particularly construction had to be delayed due to various administrative difficulties so the construction itself started in early 2023. the exposition was finalised in spring 2024 and the House of Nature was launched 14 June 2024: in the event Mr Petr Hladík, Minister of the Environment of the Czech Republic and Mr Jan Grolich, President of the Regional Council of the South Moravian Region participated.*

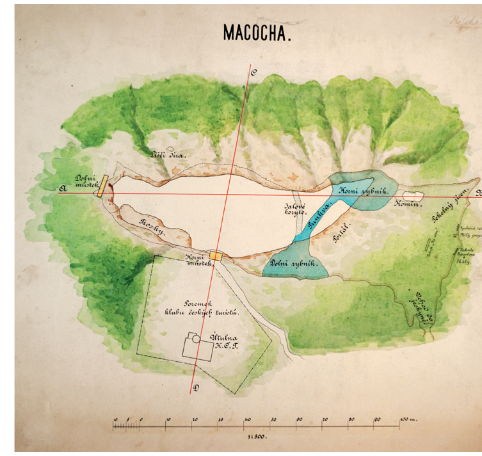
Zajíček P.: Na Turoldu Cave, the Largest Karst System in the Jurassic Limestones in the Czech Republic

The Na Turoldu Cave (South Moravia) itself has a total length of 1,650 metres, of which 280 metres are open to the public as a show cave. The tour takes about 40 minutes and the air temperature is 7-10^{0}C. The relative humidity is lower than in normal caves, namely 70-90%, so the underground spaces give a dry, dusty impression. The tour starts in the Stará síň/Old Hall, where the typical character of the space with massive broken boulders is already visible. The route continues in depth past areas with needle and stick-like sinter decorations to the Balvanitý dóm/Boulder Dome, which was formed at the crossing of tectonic fissures. Another steep staircase leads visitors to other lower areas. The walls and ceilings are covered with the typical Turold decoration mentioned above. The system of spaces flows smoothly into the Netopýří dóm/Bat Dome. The Na Turoldu Cave is the largest wintering ground/hibernaculum for bats in South Moravia. The most numerous species is the Lesser horseshoe bat *Rhinolopus hipposideros*), which winters there every year in numbers of approx. two hundred individuals. Branches from the Netopýří dóm/Bat Dome lead to the Síň konce/Hall of the End, where a small geological and mineralogical exhibition is installed, then to the Jezerní dóm/Lake Dome and finally to the Pohádková síň/Fairy Tale Hall. Visitors then take the same route back. The cave is open from April to mid-November. It is located in the 16.84 hectare Turold Nature Reserve, which is part of the Pálava/Pavlov Hills Protected Landscape Area and Biosphere Reserve.

Kotecký V.: Corporate Sustainability and Czech Nature Conservation

Every January, the World Economic Forum (WEF) publishes a major survey asking hundreds of respondents from global business to estimate the risks they will face in the next decade. Unsurprisingly, standard economic themes often dominate in the responses. However, a new and somewhat unexpected item has been rising up within the rankings for several years. Surprisingly, it is biological diversity decline and loss. It has already ranked as the third strongest medium-term risk to business in the 2024 WEF's survey. Business clearly thinks that biota (a living part of an ecosystem) is not only socially important, but also displays specific practical consequences for financial performance. Traditional perceptions of biodiversity and ecosystem services have been rapidly changing in the senior management of large companies. Therefore, nature conservation is being given a new instrument that can be used effectively in the Czech Republic - and in particular for practical measures to promote biodiversity in agricultural, forest and urban landscapes provided, of course, that it offers solutions that meet the needs and possibilities of businesses. The main benefit of corporate interventions is the leverage effect shifting the market environment. For the time being, agricultural and forestry enterprises deals with purely production incentives. If strong commercial buyers start to demand and seek for biodiversity concerns as well, better conditions may open up for suppliers over time, *e.g.* for more environmentally friendly cultivation practices. This is an agenda quite far from traditional nature protection, conservation and management. However, in the landscape predominantly used for commercial farming the state of biodiversity is derived from market incentives.

From the History of Nature Conservation



Zajíček P.: Karel Absolon's Expedition to the Macocha/Stepmother Abyss Bottom in 1903

Until 1914 the bottom of the Macocha/Stepmother Abyss in the Moravský kras/Moravian Karst (South Moravia) was available only from above using ropes or ladders. From the first climbing down the abyss conducted in 1723 there were many other adventurous expeditions or scientific surveys in the otherwise inaccessible sites. At the beginning of the 20th century Karel Absolon organized in total five climbing down the Macocha/Stepmother Abyss. One of the most important expeditions was conducted in 1903. The participants, six explorers and six workers, had a bivouc with all equipment at the bottom and spent in total four days and three nights there, raising a lot of new knowledge and discoveries. The main reason for organising the expeditions were possible discoveries of new spaces between the Macocha/Stepmother Abyss bottom and the Pustý žleb/Desolate Canyon that had been expected there.. During the expedition, temperature, humidity and pressure were measured at the abyss' bottom. Nevertheless, a publication presenting the measurements has not been found yet. Although the expedition did not reach the current Punkevní jeskyně/Punkva Caves, new small caves, *inter alia*, the Pasovsky's Cave, were discovered. František Straňák, a botanist, also participated in the expedition: he in detail analysed vegetation cover over the bottom and on accessible parts of walls. Two years later, Absolon organized a five-day expedition even with more participants. Consequently, he systematically planned a strategy for further speleological surveys there that resulted in discovering the first part of the Punkevní jeskyně/Punkva Caves underground system in 1909.

Svojanovský R. & Koudelka M.: Historical Development and Current State of Map Documentation of the Javoříčko Caves

The first serious information focused on individual karst phenomena of the "North Moravian Karst" was Josef Blekta's map from 1932. The map depicted the then known surface karst phenomena, sinkholes and ponors, especially the Zkamenělý zámek/Petrified Castle, the Zátvořice Abyss and the Svěcená díra/Sanctified Hole Cave, which had been known since time immemorial and whose spatial connection had been speculated for decades. It was then that the systematic search for caves under Špraněk Hill really began. In 1937, during a targeted search for the continuation of the well-known Svěcená díra/Sanctified Hole Cave, new areas were discovered below it. Already in May 1937, the discovery was mapped in detail by František Meisl from the town of Plumlov, a student of the Mining University in Příbram (Central Bohemia). Even in the coming difficult war period, the discovery of other spaces under Špraněk Hill continued. Bedřich, the son of the game warden and district forest officer Švec, took the initiative and with his friends from the neighbourhood discovered and explored a number of new caves in the Javoříčský kras/Javoříčko Karst. After the end of the war, there was hardly anyone left of the original actors in the area to initiate new explorations and surveys. At that time, a strong movement of young, active and enthusiastic speleologists in the Moravský kras/Moravian Karst emerged. On 1 October 1958, the Regional Institute of Homeland Studies in Olomouc, later the Regional Museum of Homeland Studies, was founded and took over the management of the Javoříčko Caves. In 1957, Jaroslava Loučková-Michovská appeared in the Javoříčko Karst and in her dissertation she evaluated the whole Javoříčský kras/Javoříčko Karst's territory from the geomorphological point of view and from the point of view of its possible genesis. She also introduced the nomenclature of karst phenomena that has been used up to now, hypothesized about the river flows that modelled the landscape and caves in the karst, and used for the first time rose diagrams of the caves' main directions. In 2003, in connection with the resumption of speleological activities, there was a need to review the whole system. Of course, the technological progress in cave mapping has considerably accelerated; today it is possible to use 3D scanners, photogrammetry, and GIS for synthesis of various methods. But even these have their limits in the broken terrain, and it will always depend on the inventiveness of the person who draws the result to provide a really representative view of the site and the truest possible interpretation.

International Nature Conservation

Bobek M.: Conservation of Pangolins Requires a Broader Approach

Until recently pangolins (Pholidota) have been known only to those interested in tropical fauna or professional zoologists. With the exception of the abdomen, the body of these medium-sized mammals is covered by relatively large protective keratin scales: they are the only mammals having scales. Just an enormous demand for scales, meat and other body parts caused intensive poaching of pangolins at first in South and Southeast Asia and consequently also in tropical Africa. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has been trying to control international trade with all pangolin species, but with varying results. The scales are used in traditional medicine in East Asia as well as in Africa. In China the price of pangolin scales can reach USD 3,000 per kilogram. Pangolin meat is prized as a delicacy in parts of China and Vietnam: the consumption evidences wealth and social status there. Extensive demand for skin manufactured for exotic cowboy boots, wallets and belts has also contributed to a sharp decline in pangolins' number. Pangolins occur or occurred in 53 countries: in almost all of them they are officially protected, often strictly. Cameroon has been an important centre in pangolin trafficking. Effective measures to save pangolins in the wild should cover the whole chain of poaching, trading and consumption: first of all, the demand should be reduced. The efforts should include not only restrictions, but also communication with, education of and raising awareness among the general public and the respective target groups. Captive breeding of pangolins has been extremely difficult because the animals do not adapt well to alternative or artificial foods and suffer stress, depression and malnutrition, leading to significantly shortened lifespans. In addition, they are extraordinarily susceptible to various infection diseases. Pangolins also lack some genes important for skin and mucosal immunity and for reducing vulnerability to stress. Therefore, rearing the female Chinese pangolin (*Manis pentadactyla)* called Šiška (Conex), the very first pangolin bred in Europe, in Prague Zoo in 2023 is really a great success on a global scale.

Urban P. & Miňová L.: Are UNESCO Biosphere Reserves in Slovakia Caught in Vicious Circle?

In 2021 the 50th anniversary of one of the most important intergovernmental programmes, the UNESCO Man and the Biosphere Programme (MAB) was celebrated. The programme aims at harmonious relationship between people and their environments. In practice it is implemented by the World Network of Biosphere Reserves (WNBR): as of 1 January 2024, there were 738 biosphere reserves (BR) in 134 countries including 22 transboundary sites, presenting a rich mosaic of ecosystems, cultures and nations and covering in total 5% of the Earth's surface. Each biosphere reserve has three mutually reinforcing functions: conservation, sustainable development and logistic support for scientific research and education, Thus, they reserves are traditionally organized into three interrelated zones, known as the core area, the buffer zone, and a transition area or 'area of cooperation. In Slovakia the following areas were awarded as biosphere reserve: the Slovenský kras/Slovakian Karst (1977), Poľana Mts. (1990), Východné Karpaty/East Carpathians (1992) and the Tatry/Tatras Mts. (1992). The latter was declared as bilateral while the Východné Karpaty/East Carpathians BR became the first trilateral biosphere reserve in the world in 1998. All four BRs overlap with Specially Protected Areas (three National Parks and one Protected Landscape Area). Since the beginning, attention has been paid to the BR's conservation function while other two, particularly sustainable development one, lagged behind not only in monitoring, but also in communication, education and public awareness. Due to the ignorance of the mission and importance of biosphere reserves, the general public has been often considering them as further Specially Protected Area category with related restrictions. At present a comprehensive support from the State has been missing in implementing the UNESCO MAB Programme in Slovakia. The BRs' management is coordinated by the State Nature Conservancy of the Slovak Republic Banská Bystrica. Elaborating and approving a national biosphere reserves development strategy should significantly enhance unifying targets and goals for future running them. Moreover, due to positive development in the Poľana Mts. Biosphere Reserve Vladimíra Fabriciusová, Chair of Slovak MAB Committee and Director of the Poľana Mts. Protected Landscape Area Administration was awarded by the international prize for the best management of a biosphere reserve in the world – the Michel Batisse Award for Biosphere Reserve Management in 2017.

Štěrbová J.: South Korean National Parks

South Kora covers 100,413 km^2 and is populated by almost 52 million inhabitants. Korea National Park Service (KNPS) headquarters is located in Wonju, Gangwon province in north-eastern part of the country. The institution manages approx. one third of the country's step by step declared protected areas, aiming at all 23 National Parks having been declared yet. In South Korea, National Parks cover totally 6.6% of the country's territory and due to high human population density there, they are located particularly in mountain and coastal areas. South Korea has become a pioneer also in wild plant genetic diversity conservation and preservation. A large seed bank launched in 2016 became a part of the famous Korea National Arboretum. The Baekdudaegan National Arboretum Seed Vault Centre is a hidden site in mountains in Bongwa where seeds are permanently kept at minus 20 degrees Celsius to preserve them and 40 percent humidity to keep them viable. The vault is designated as a security installation by South Korea's National Intelligence Service, surrounded by wire fences and dozens of cameras, with restrictions on filming in place and police patrolling on a regular basis: the 46-metre deep tunnel should withstand an earthquake and even a nuclear vast, thus being the safest site in the country. As similarly to Japan, National Parks are considered not only a natural, but also cultural heritage in South Korea. In the country, there are 1,300 Buddhist temples, of them nine were inscribed in the UNESCO World Heritage List. Therefore, all South Korean National Parks have their own temple. The KNPS rangers manage not only nature and the landscape within protected areas, but also cultural monuments/historic heritage.

Plesník J.: The Paris Convention Tries to Preserve Heritage of All Humanity

In 1965 a conference calling for a "World Heritage Trust" to preserve "the world's superb natural and scenic areas and historic sites for the present and the future of the entire world citizenry" was organised just in the official residence and workplace of the U.S. president – the White House. Finally, the Convention Concerning the Protection of the World Cultural and Natural Heritage was adopted by the UNESCO General Conference at its 17th session in Paris 16 November 1972. Natural monuments inscribed on the UNESCO World Heritage List should be natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view. Further they can be geological and geomorphological formations and precisely delineated areas which constitute the habitat of threatened species of wild animals and plants of outstanding universal value from the point of view of science or conservation. The category also includes natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty.

Before properties can be proposed for inscription as a World Heritage Site (WHS) they must be on the tentative lists of the Parties. In July 2024 there were 196 State Parties to the World Heritage Convention. The World Heritage Committee at its session assesses the proposal and takes the decision. The Party should also present a detailed management plan. As of 1 August, 2024 there were 1,223 UNESCO World Heritage Sites, of them 231 being natural heritage sites. In the Czech Republic, there currently are 17 WHS, 16 of them being cultural. The fact reflects an exceptional cultural wealth well-preserved within the country. Since July 2021 the Jizerskohorské bučiny/Jizera Mts. Beech Forest (Liberec Region, northern Bohemia), a component of the serial WHS *Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe* has been the Czech Republic's very first natural UNESCO World Heritage Site.

Ouhrabka V.: Caves in Georgia

The natural wealth of Georgia includes extensive karst areas with a large number of not yet well documented caves and with great prospects for new discoveries. Many caves are freely accessible and used for adrenaline-pumping visits. Only a few caves are classical show caves open to the public. Due to their attractiveness, Georgian caves also receive an extremely high number of visitors, which raises many questions about how to better protect, conserve and manage the caves so that they can continue to be used sustainably for tourism. Currently, many karst massifs are part of existing or proposed protected areas and 24 of the most important karst features are protected as natural monuments. A number of foreign partners, including the Cave Administration of the Czech Republic since 2012, have been cooperating with the Georgian Protected Areas Agency (APA) to prepare documents for providing and improving the protection, conservation and management of the caves and increasing the effectiveness of the show cave operation. Members of the Czech Speleological Society are also involved in the research and documentation, which is a necessary basis for further decision-making about the caves. Since 2016, they have mapped and documented in detail over 10 km of corridors in several caves, including approx. 2.5 km of previously unknown parts.

Zajíček P.: Paclele, a Real Natural Jewel of Romania

Mud volcanoes are created in tectonically active areas and they are mostly related to natural gas and oil deposits. These are small volcano-shaped structures typically a few metres high caused by the eruption of mud and natural gases. Therefore, from a technical point of, the term “mud spring” “or “mud geyser” is more correct. The Paclele mud volcanoes are located close to Berca in the Buzău County in the East Carpathians, namely in Great Wallachia in south-eastern Romania. The occurrence of the phenomenon is linked, as in other world regions, to the highly developed diapirisim of the area; mud migrates at the surface throughout faulted flanks of the anticline, from Middle Miocene deposits at a depth of around 3,000 m. Two sites of the Berca area, namely Pâclele Mari and Pâclele Mici, can be visited there. The mud volcanoes create a strange lunar landscape, due to the absence of vegetation around the cones. The landscape that arises on the surface is a constantly changing one, new volcanoes are constantly being created while the older ones are becoming extinct one by one. The protected area cover 30 hectares there and was also declared UNESCO global geopark..

Although there are mud volcanoes mainly in Azerbaijan, but also in the United States, Italy, Iceland and New Zealand, their occurrence is not common. Therefore, they should be considered to be a rare, unique and highly remarkable natural phenomenon.

Sovinc A.: The Vjosa River in Albania – a new approach to protecting river ecosystems

Freshwater ecosystems - and rivers in particular - are among the most threatened in the world. Results from The Living Planet published by the WWF International analysis highlight a dramatic decline of 83% in species in freshwater ecosystems between 1970 and 2018. River ecosystems are particularly threatened in Europe, where - with the exception of perhaps the far north and east - there is virtually no longer a long river that is still entirely free-flowing.

Nevertheless, one such river was discovered by representatives of international and national NGOs in Albania some two decades ago: the Vjosa. Together with the efforts of local communities and major international actors and with the cooperation of the Albanian authorities, the Vjosa River has been protected as the Europe’s first ‘wild river’ national park since March 2023. The river is the best possible approximation of a European watercourse over 200 km long, uninterrupted by a single dam or hydro-power station throughout its course, and this is also true for the vast majority of its tributaries. The Vjosa River runs from its sources in Greece (where it is called the Aoos River) to its mouth in southern Albania, where it drains into the Adriatic Sea. Thus, the first 80 km are in Greece. The total catchment area covers 6,704 km^2, of which 4,365 km^2 lies in Albanian territory. The Vjosa River and its tributaries can be classified as a gravel-dominated, laterally active, anabranch rivers with high sediment yields, where the bedload supply is higher than the actual transport capacity of the channel. This is reflected, particularly in the middle section of the river, in extensive gravel plains up to 2,000 m wide, crossed by several lateral and parallel rovers, oxbows and side channels. Gravel bars are specific forms of break-off at high flow velocities, which is reflected in the rapid abandonment of the main river channel during extreme flood events, and the formation of a new, parallel river channels in former floodplains. The National Park, in the total length of 400 km, includes the main river and three tributaries (the Drino River with the tributary Kardhiq, Bënça, and Shushica), and the International Union for Conservation of Nature (IUCN) soon joined the partnership when a long-term management plan had already been under preparation. It is currently being adopted by the relevant national bodies. Similarly to many other protected areas worldwide, the Vjosa Wild River National Park faces challenge of tourism development.

Plesník J. & Hanel L.: Inland Water Ecosystems State and Outlook Worldwide

For humans, water is much more than just the chemical formula H_2O. It remains a prerequisite for the existence of life on Earth. Even cosmologists searching for life beyond our planet use sophisticated probes to search for water, to which all known organisms are bound to a varying degree. It was once considered an inexhaustible natural resource, but this has not been the case. The state of the world’s inland waters is not favourable. Although climate variability is causing some changes in the water cycle as a whole, human intervention remains the main driver affecting inland aquatic ecosystems, mainly through pollution of aquatic ecosystems. Water abstraction, particularly for agriculture, is also a major influence. The diverse and increasing impact of human-induced external drivers on inland aquatic ecosystems has been known for decades, as well as the effective solutions to reduce or mitigate it, using both natural and technological approaches. Protecting, conserving and managing inland water ecosystems require surface water and groundwater be considered and managed as a single interconnected resource. In many cases, the application of an ecosystem approach, such as integrated river basin management or circular water management, is often effective. There is some hope that their application in practice can benefit from the current political support given to climate change mitigation and adaptation measures.

NATURE CONSERVATION AGENCY OF THE CZECH REPUBLIC

NATURE IS OUR HERITAGE AND THE FUTURE

The Nature Conservation Agency of the Czech Republic (NCA CR) is a governmental body established in 1995. The NCA CR's main aim is to protect, conserve and manage nature and the landscape on the whole territory of the Czech Republic. The NCA CR directly manages 25 Protected Landscape Areas (PLAs, IUCN Category V) and 132 National Nature Reserves and National Nature Monuments (small-size Specially Protected Areas of at least national importance) outside National Parks and PLAs (IUCN categories Ia, III, IV) across the country.

The NCA CR's range of activities includes inter alia:

- PerformingState/Public Administration in nature conservation and landscape protection in the particular areas, namely the Protected Landscape Areas, as the Public Authority;
- Monitoring the status of, changes and trends in the selected natural habitats and their types and populations of specially protected wild plant and animal species;
- Technical and expert support to other State/Public Administration authorities including methodological and expert activities;
- Carrying out inventories, surveys, monitoring and research for nature conservation and landscape protection;
- Running the Nature Conservancy Central Register and the central governmental documentation on nature conservation and landscape protection;
- Managing the Nature Conservancy Species Occurrence Database (in July 2025, there are more than 39 million records, thus being the most comprehensive database on species occurrence in the country);
- Implementation of practical conservation measures in the field to conserve nature and to protect landscape in the 25 Protected Landscape Areas and 132 National Nature Reserves and National Nature Monuments on the whole Czech Republic's territory;
- Developing & implementing specially protected species action plans & recovery programmes;
- Administration of national subvention programmes/subsidy schemes as well as of some European Union funds serving to conserve nature, protect the landscape and to mitigate climate change or to adapt to it;
- Payment of financial compensations for loss of property in agriculture, forestry and fishpond management;
- State property management in the Czech Republic's Specially Protected Areas including purchasing and exchanging new land;
- Communication with, education of and public awareness among the general public and the target groups;
- International cooperation in nature conservation and landscape protection: the NCA CR is the Czech Republic CITES Scientific Authority, IUCN, EUROPARC Federation and ENCA member and National Focal Point of the CBD SBSTTA and Clearing-House Mechanism (CHM) and of the IPBES.

The NCA CR consists of Headquarters based in Prague and of 13 Regional Branches. As of May 1, 2025, it has 718 staff members, of them 619 with university degree and 52 with Ph.D. degree.

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