AN ECOLOGICAL NETWORK IN THE CZECH REPUBLIC

VERONICA

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VERONICA magazine has paid attention to the Czech concept of an ecological network in the landscape since its inception in 1986 when the first popular-scientific article about the principles of territorial systems of ecological stability (TSES) by Jan Lacina and Jiří Löw, were published. One of the reasons for this attention is that the fathers of the territorial system of ecological stability theory, co-authors of the publication, are also among the founders of our magazine, and other experts who participated in completing the concept write for us. The birth of the TSES concept at the beginning of eighties was accompanied by an interesting, open and creative atmosphere of co-operation which went beyond any scheme of that time. The substantial part of TSES came from outside the official, state-decreed tasks of the research and planning institutions. An unusual team of scientists (zoologists, botanists, ecologists, geographers), forestry, agriculture and water-management engineers, territorial planners, architects and others got together over several years. The enlightened landscape architect Jiří Löw, from what was then Agroprojekt, asked scientists questions they were not used to, and some of which remain unanswered. "What parameters do biocorridors have to have for animals and plants to migrate through them? How dense should they be in the countryside? How large do biocentres have to be so that populations of individual species could survive and propagate?"

At the end of the eighties, what was then Czechoslovakia had a consistent theory of the ecological network, including the approach to territorial planning, as well as the mapping required, in several South Moravian districts and the support of the district clerks and agricultural enterprises - i.e. the ground had been prepared, so to speak, for biocorridor plantings. The first ones were carried out in 1991. In 1992 came a success that had not been anticipated by even the greatest optimists prior to November '89. The concept of TSES became a part of the new Czech legislation and is part of law No. 114/1992 Coll. on Nature and Landscape Protection and other laws. This rapid development of the concept and the legislation for the Czech ecological network has far overtaken what has actually been implemented. The concept progressed quickly in the planning sphere, but omitted however the most important partners in the whole game - the owners of agricultural land. Thus it has happened that TSES have been planned for large areas of the republic but their realization lags behind. The questions of the financing and maintenance of the biocorridors and their ownership, and a whole complex of problems connected with land restitution, remain unsolved.

It shows that overcoming such barriers is impossible without social support for the idea of ecological stability renewal, and thus without extensive education from the level of farmers up to that of Parliament. This is a niche for NGOs which work on practical countryside protection (particularly for the Czech Union for Nature Protection), and their co-operation with state organizations, local authorities, the owners and users of the land and their professional bodies. VERONICA devoted the whole of a special issue in 1993 to the popularization of the TSES concept, which was targeted particularly at municipalities and was sold out 2 years ago. We have continued to organize seminars and other activities such as the introduction of some tried and tested West European and American concepts of private countryside protection - e.g. landscape stewardship. We co-operate with international organizations including IUCN, CEEWEB, Euronatur, WWF, Atlantic Center for the Environment and others.

The purpose of issuing this English text is to present the Czech concept of an ecological network to an international public, and to show that the Czech Republic is both in principle and in practice ready to support the idea of an European Ecological Network, accepted at the conference of environmental ministers in Sophia in autumn 1995, and that it might significantly enhance this common project with its fifteen years of experience.

Miroslav Kundrata, editor

VERONICA is the quarterly journal of the Czech Association of Nature Conservationists (CSOP); it has been published in Brno since 1996. The title itself links the name of the speedwell family of plants (Veronica) with its symbolic cultural significance for the countryside in the Brno area, as expressed by the poet Vítězslav Nejedlý. Thus the name also expresses our aim: to link regional ecological educational and public awareness efforts with the cultural context of human relationships with the world of nature.

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2. INTRODUCTION

The Czech National Council endorsed Act 114 on the Protection of Nature and the Landscape on February 19th 1992. Nature and landscape conservation will be guaranteed by law in several stages, the first of which will be the protection and establishment of territorial systems of ecological stability of the landscape.

The incorporation of such an ecological network into law is a significant victory for the interdisciplinary team of scientists and planners responsible for the concept of territorial systems of ecological stability. This group of experts, taken from a variety of professions (botanists, zoologists, landscape ecologists, forestry and agricultural planners, and landscape architects) started their work in the former Czechoslovakia in the late seventies. The objective that they set for themselves was to halt the trend towards the technocratic destruction of landscape systems in the pursuit of claimed instant economic returns.

In those times in Czechoslovakia a number of large-scale and ecologically controversial projects were initiated. These included the dams at Nové Mlýny Several generations of naturalists and lovers of nature have admired the floodplain landscape found beneath the limestone rocks called Pavlovske vrchy in South Moravia. These wetlands with pools, floodplain forests and meadows with scattered trees used to be an Eden with many rare species of plants and animals. Nowadays, you can no longer view this 'treasure island' because it disappeared with the filling of the Nové Mlýny reservoirs. One of the key objectives in designing territorial systems of ecological stability is to forestall the repetition of such crimes against wildlife. Photo: Jarmina Kocourková
in South Moravia and Gabčíkovo in South Slovakia as well as the vast open cast brown-coal mines in North Bohemia. The landscape was deteriorated in most parts of the country with monoculture forestry, the channeling of watercourses, the draining of wetlands, the ploughing of meadows, the consolidation of agricultural land and the over-use of pesticides and commercial fertilizers.

The physical plans made concerning future land use were confined to such technical developments as transport and settlement systems, water management, etc. Merely respecting the network of protected areas that then existed was not sufficient to ensure ecologically acceptable development of the landscape. Many areas of great value for their biodiversity were not part of that network.

This is why the concept of delimitation of the skeleton of landscape ecological stability, a system of existing ecologically important patches, was the first stage in the methodical development of an ecological network in the Czech Republic. However there is a dearth of such patches in the most intensively used agricultural or industrial areas such as the agricultural landscape of South and Central Moravia and Central Bohemia, or in the industrial landscapes of North Moravia and North-West Bohemia. The majority of localities with a high degree of biodiversity are isolated and lack the connections necessary for the preservation and development of the natural populations of flora and fauna.

The passive conservation of existing ‘islands of biodiversity’ alone would not be enough to lead to the creation of a functioning ecological network in the Czech Republic. This is why the interdisciplinary team came up with the idea of the gradual creation of a system of landscape ecological stability as a system of biocenters connected by biocorridors.

The second stage of their work concentrated on the development of a means of planning and realising such systems of ecological stability. It was not easy to find a way of incorporating ecological requirements into the physical plans. The process they suggested was first tried out on a variety of landscape types that had been subjected to differing types and degrees of usage.

At present systems of ecological stability are part of all new physical plans in the Czech Republic. In some areas the realisation of such biocenters and biocorridors has already begun.

As a consequence of the central position of the Czech Republic in Europe it is not possible to create such a network in isolation, without connection to neighbouring states and the European ecological network. A comparison of the plan for the territorial system of ecological stability in the Czech Republic with the conception of the European EECONET has shown that it is possible to ensure the necessary connection. The aim of this publication is to summarise the approach to creating an ecological network in the Czech Republic and to suggest how it relates to the broader European context.

The wealth and diversity of the Czech Republic’s nature is a consequence of its central European location, the distinctive geology of the parent rock formations, its big relief amplitude and the diversity of climatic conditions. Man has influenced the variety of the wildlife. A mosaic of landscapes emerge that differ not just in natural conditions but also in the type, duration and intensity of human influence. The range of ecosystems is greatly varied; from the remnants of primeval forest (Hojná voda and Zohránský prales in South Bohemia, protected since 1838, are the oldest forest reserves in Europe) to the successionaly youthful nural communities on slag heaps of coal-mining areas in North Bohemia and North Moravia.

The major part of the Czech Republic belongs within the biogeographical province of Central European deciduous forest. Bohemia and West Moravia belong to the Hercynian sub-province while East Moravia belongs to the West Carpathian sub-province. Between the two sub-provinces is a transitional area where Carpathian and Hercynian species mingle. Though most of the plant and animal species are common to both sub-provinces, some occur only in the Carpathian (such as Dentaria glandulosa and Myricaria germanica) or in the Hercynian part (for example the sub-Atlantic species of Galium hercynicum and Chamaelobus alpestris). The Silesian sub-province has a marginal influence in North Moravia.

The biota of South Moravia is quite different, since it is the northernmost extension of the Pannonian province, distinguished by thermophilic steppe and forest steppe communities. Many species have the northern borders of their natural range here (such as Crambe tataria, Frazinus angustifolia and Quercus cerris). Examples of thermophilic animal species in the Czech Republic are the birds Otis tarda and Merops apiaster, and the invertebrate Saga pedo.

The Czech Republic is the main watershed between the Black Sea and the North and Baltic Sea catchment areas in terms of its influence on fauna and flora. The fish Abramis sapu and Catus poecilogus occur in the Czech Republic in the catchment area of the Danube while Barbus meridionalis petenyi and Vimba vimba are found only in the Elbe and Odra catchment areas.

The territory of the Czech Republic used to be an important crossroads in the migration routes of plant and animal species between various population centres. The biota of this area was greatly influenced by fact that

Drawing by Václav Houf
3. THE CONCEPT FOR ESTABLISHING AN ECOLOGICAL NETWORK IN THE CZECH REPUBLIC

3.1. The cultural landscape and ensuring its ecological stability

A landscape is where relief, atmosphere, biota and man and all his creations meet and interact. A landscape is a mosaic of various ecosystems (geobiocenosis and hydrobiocenosis). A cultural landscape results from the long-term influence of man. A cultural landscape is always a mosaic of ecosystems that have been modified to differing extents by human influence with varying structure and species composition that each have their demand for additional energy needed for them to be able to function. Unstable and less stable ecosystems prevail, and will probably continue to do so, in the cultural landscape. Their purpose is the high production of biomass. Agroecoenoses and production forests in particular are distinguished by high levels of net primary production and reduced biodiversity. Similarly unstable ecosystems predominate in urban areas, with the prevalence of built-up territories and a low share of permanent vegetation. The aim behind ecological optimization is to reach a state of harmonious cultural landscape, where the ecosystems destabilized by man are balanced by suitably located areas of ecologically more stable natural, and semi-natural ecosystems.

Ecologically more stable areas mostly remain where natural conditions have restrained the development of the most intensive forms of land use. Thus ‘islands’ of biodiversity remain in our cultural landscape as though in the land was ice-free throughout the Pleistocene ice age. Due to its relative lack of isolation during the late-glacial and post-glacial dispersion of biota, the Czech Republic has only a small number of endemic species. Prunus cerasifera, Cerastium alsinifolium, and Dionysus moraviicus are examples of endemic plants while the woody plant Sorbus sudentica is endemic in the Krkonose mountains. Almost all the endemic fauna are invertebrates, such as for example Eophila hradcana, Clausilia corcoroidea and the butterfly Erebia sudentica.

‘The living landscape’ is a mosaic of forests, fields, meadows and pastures, orchards and copses and lines of trees and bushes. The harmonious cultural landscape of the Moravskoslezské Beskydy mountains has developed under man’s influence for centuries. Ecologically less stable areas are well balanced and divided by stable communities, in this kind of landscape. It is an example of a landscape that remains a common home for people, plants and animals.

Photo: Miloš Španěl.
'sea' of our present agro-industrial landscape. It would appear that the basic patterns from the biogeographical theory of islands holds true for this situation as well. The biogeographical theory of islands provides a theoretical basis on which to propose the ideal layout, size and separation of ecologically stable patches of landscape. The basic postulate of this theory is that the smaller and more distant from each other the islands are, the lower the number of species that find conditions for life there.

A realistic chance of ensuring the ecological stability of a landscape is based on the precondition that the ecological stability of the cultural landscape as a whole is to be understood not as a simple average of the degree of stability of individual patches but is comprehensible only as also being a function of their arrangement, of their positioning within the landscape as a whole. It is necessary to isolate the ecologically labile parts of the landscape by a system of stable and stabilizing ecosystems to retain both the high and permanent productiveness and ecological stability.

The system of stabilizing elements that already exists is called the ecological stability skeleton of the landscape. There is often a shortage of such stabilizing elements in the landscape. That is the reason for the conception of creating territorial systems of ecological stability of the landscape as an integrated network of connected patches providing at least the minimal spatial conditions for the conservation of the biodiversity of the landscape.

Biodiversity implies a variability of all living organisms including the ecosystems and ecological complexes that they are part of. An ecological network in the landscape is to be composed of all the existing and proposed stable components that can contribute to the conservation of its biodiversity. The aims of such a network in the landscape are:

- conserving and supporting the development of the landscape's gene-pool,
- having a positive impact on the surrounding less ecologically stable parts of the landscape and isolating them,
- supporting a multiplicity of functions of the landscape,
- preserving important landscape phenomena.

At present, the larger vertebrates are penetrating the Czech Republic from their localities in the slovak Carpathians - having previously been exterminated here - these include the bear (Ursus arctos), the lynx (-Lynx lynx), wild cat (Felis silvestris), the wolf (Canis lupus) and the raven (Corvus corax). Moose (Alces alces) have migrated here for many years now from North-East Poland and have created a permanent population in South Bohemia which is spreading on to Austria. Beaver (Castor fiber) have settled in South Moravia in the last decade reintroducing populations in Austria that have entered the river Morava.

If it were not for man's impact, forest communities differentiated by the prevailing climatic, geological, geomorphological and pedological conditions would exist in the Czech Republic. Altitudes range from 115 m in the Elbe valley on the border with Germany to 1603 m on the top of Snezka in the Krkonose mountains. The variety of ecosystems is conditioned by the variety of climatic conditions. Average annual temperatures in different parts of the country range between 2 and 9 °C, the length of the growing season is 60 to 180 days and average annual rainfall varies from 500 to 1 600 mm.

The natural ecosystems are divided into nine altitudinal zones according to altitude and climatic conditions: 1. Oak (3% of the country), 2. Beech/Oak (12%), 3. Oak/Beech (18%), 4a. Beech (36%), 4b. Oak/conifer (5%), 5. Fir/Beech (22%), 6. Spruce/Fir/Beech (2%), 7. Spruce (0.6%), while only in the highest parts of the Krkonose and Jeseniky mountains are there 8. Dwarf pine and 9. Alpine vegetation zones.

The dead natural spruce forest on the top of Kněhyně in the Moravskoslezské Beskydy is evidence that an internally stable forest ecosystem cannot resist all external influences caused by man. A community of mountain spruce forest that had developed over many centuries - corresponding with the mountain climate and soil conditions - was damaged by the effects of pollution within a decade. Mountain spruce forests are surrendering to the negative influence of phytotoxic emissions all over Europe. Photo: Vladimír Fejtek.
3.2. The ecological stability of the landscape

Ecological stability is the capacity of an ecological system to retain and preserve its essential characteristics by means of autoregulation. It is the ability of an ecosystem to compensate changes induced by external and internal factors and to preserve its natural properties and functions. We make a distinction between internal (endogenic or local) and external (exogenic or global) ecological stability.

Internal ecological stability is the ability of an ecological system to exist under the influence of normal environmental factors including such extremes as the system has become adapted to over the long-term. Internal ecological stability is governed by the strength and number of internal relationships within the system. Successionally mature ecosystems with a climax character have a high degree of inner stability. These are ecosystems that spontaneously developed in a way that is closely dependent on the permanent ecological conditions of their environment. They are usually distinguished by great diversity, closed biogeochemical cycles, and complex energetic, trophic and informational relations between producers, consumers and decomposers. There are naturally developed ecosystems (especially natural forests, rock communities, peat-bog communities, etc) and human-dependent ecosystems with a natural biotic development (post-agricultural fallow land, meadows and pastures with naturally growing species, some ponds and wetlands, etc) in our cultural landscape.

External ecological stability is the ability of an ecosystem to resist the effects of extraordinary external factors to which the ecosystem is not adapted. These external factors are strange from the point of view of those under which the ecosystem spontaneously developed and as such are unpredictable and can be catastrophic in their consequences. These factors are mainly the
Inappropriate changes in the structure of agricultural land had a catastrophic impact on ecological stability. Even the Žďárské vrchy protected landscape area did not escape large-scale draining, the straightening and channeling of streams, the ploughing of meadows and the creation of vast continuous areas of arable land. If an inappropriately high consumption of industrial fertilizers and pesticides is added to these negative changes, we cannot wonder that even formerly common species have disappeared from the landscape.

A great variety of parent rocks and soil types characterises the Czech Republic. Crystalline rocks (granite, gneiss, granodiorites) prevail in the Hercynian region, while the Carpathian part is created by specific flysch series of strata of sandstone and claystone. Limestones and serpentines have their specific biota. There are vast areas of loess topsoil with chernozem, wide floodplains with alluvial soils in the lowlands. Large areas of peat are found in some places in the South Bohemian basins and the Hercynian highlands.

Since the advent of Neolithic agriculture, man’s influence has steadily become a more and more important factor, changing the mosaic of ecosystems in the landscape. A primaeval permanent settlement of farmers emerged about seven thousand years ago in the low areas of South Moravia and Central Bohemia. As a consequence, the post-glacial development of ecosystems was changed in these large areas. The forests were no longer continuous and steppe and forest steppe ecosystems developed. People did not settle in the virgin forests of the Hercynian and Carpathian highlands until the medieval colonization between the eleventh and thirteenth centuries. Now, almost all of the patchwork of ecosystems on the territory of the Czech Republic has been modified by man.

Man’s influence has been greatest in the most highly populated and urbanized areas and those that have been damaged by mining (some five percent of the country). The biota of the agricultural landscape has also been transformed. Fields make up some forty-one percent of the Czech Republic while meadows and pasture make up only ten percent. The total area of pasture and meadowland was reduced by a hundred thousand hectares during the period of the seventies and eighties when large-scale agricultural production was being promoted. Forests cover a third of the land. Commercial forests, with a modified woody species-structure predominate, especially monocultures of Norway spruce (Picea abies) and Scotch pine (Pinus sylvestris). Forests with natural tree species composition make up less than five percent of the area of the country and are mostly found in the Carpathians. The current distribution of species in the forests is as follows:

> Continues on p. 8 >
3.3. Component parts of the ecological network

The ecological network in the countryside consists of existing and proposed ecologically significant landscape segments. Landscape segments are clearly delimitated areas of varying sizes that differ significantly from the surrounding land. Their role as ecologically significant landscape segments is in providing the ecological stability of the landscape. They are parts of the landscape where ecosystems with relatively higher ecological stability prevails. They have the permanent biota and ecological conditions that make it possible for the species of the natural gene-pool of the landscape to exist. Such ecologically significant landscape segments can be for example the remnants of a beech wood in the midst of a spruce monoculture, a species-rich wetland community in an agricultural landscape, the riparian vegetation bordering a stream, a pond with a natural riparian community, an abandoned quarry naturally over-grown, an old orchard with its feeding opportunities for birds and hedgerows on balks.

Ecologically significant landscape segments can result from natural biocenosis typical of a certain biogeographical region or from biocenosis that have been modified by the activities of man. The first group includes the remnants of forests that retain their natural tree composition while the second

Natural forest communities are undoubtedly the most stable ecosystems in the Central European landscape. In the climate of the Czech Republic, it is the final and therefore most mature community resulting from long term natural development. Without human intervention the landscape here would be almost entirely covered with continuous forests. In the central areas of the highlands, beeches would prevail in this vegetation cover. In Bohemia and the western part of Moravia beechwoods are preserved only very rarely. Forestry was concentrated on the growing of artificial spruce and pine monocultures. Timber production can be greater as a result, but they have a little significance for ecological stability. The variety of species found in coniferous monocultures as against natural forests is several times lower.

Photo: Igor Michal.
is comprised of various types of derelict land, semi-natural meadows with a preponderance of natural species and ponds. Ecologically significant landscape segments can be divided according to spatial and structural criteria (size and shape, degree of homogeneity of ecological conditions and present state of biocenosis) into:

- ecologically important landscape elements
- ecologically important landscape units
- ecologically important landscape areas
- ecologically important linear communities

According to their main function we can divide the ecologically significant segments into:

- biocentres
- biocorridors
- buffer zones of biocentres and biocorridors
- interacting elements

According to biogeographical significance (size, degree of biodiversity, representativeness and uniqueness of communities, or the occurrence of endangered or rare species and communities) we can distinguish between the ecologically significant landscape segments as having significance on the following levels:

- local, - regional, supra-regional, provincial, - biospherical

3.3.1. Spatial Structure Division

An ecologically important landscape element is a small area (usually between one and ten hectares) with homogeneous ecological conditions, usually composed of only one type of community. Examples could include the remnants of a deciduous forest stand in the midst of a coniferous monoculture, a wetland meadow in the middle of cultural meadows and fields, a small pond with riparian communities, an isolated rocky outcrop with natural vegetation, a group of trees or even a single large tree in de-afforested agricultural land.

An ecologically important landscape unit is a larger area (usually between ten and a thousand hectares) where a variation in the ecological conditions make possible the existence of more types of community. Characteristic examples of such units would include the deep valleys of the upper and central parts of streams or rivers with forest, rock and riparian communities. We can distinguish a series of ecologically important elements within the unit. This is important especially when individual elements differ in the means and intensity of the management and conservation that they require.

An ecologically important landscape area is a large territory (normally more than a thousand hectares) distinguished by its variety of ecological conditions and the diversity of communities in which a large proportion are ecologically stable natural and semi-natural. To this type of segments belong not only a majority of protected landscape areas but also many other large areas with a preponderance of forests with a natural tree species composition and meadows with a high degree of biodiversity. There are also pond areas with a typical mosaic of water as well as wetland and terrestrial communities which are of great importance. [It is always useful to delineate smaller areas with distinctive communities as a landscape units or elements].

Line communities on balks and scattered groups of trees and bushes on rocky outcrops are important interaction elements. Many species that we so much need in the landscape find a refuge there. In particular the pollinators of various agricultural crops, and predators: the natural competitors of the field pests. For example bumble bees, shrikes, kestrels, lizards, adders, all find their biotope here.

Photo: Lubomír Zelinka.

spruce (Picea abies) 55.3%, pine (Pinus sylvestris) 18.1%, larch (Larix decidua) 2.8%, fir (Abies alba) 1.3%, oak (Quercus petraea, O. robur) 5.8%, beech (Fagus sylvatica) 5.4%, birch (Betula verrucosa) 2.6% and the other deciduous species (hornbeam, maple, ash, alder, willow and aspen) 5%.

Almost half of the country could be referred to as harmonious cultural landscape, with balanced proportions of fields, meadows and forests. The "pond" countryside that developed mainly in South Bohemia in the Middle Ages is one specific type of harmonious landscape.

The effect of human activity on nature has intensified during the last two centuries. In the second half of this century and above all in the seventies and eighties, vast regions of the country were under the influence of anthropogenic factors disturbing the ecological stability of the landscape. Air and water pollution have had a highly detrimental effect on ecosystems and their biodiversity. Populations of spruce in North Bohemia have been the most damaged by phytotoxic emissions. The forests have run out over large areas and clearings have emerged that will be very difficult to re-afforested. The structure of the agricultural landscape changed with the formation of large expanses of arable land and a reduction in the area of meadows and pasture and a majority of linear communities on balks disappeared. Streams and rivers were regulated and channelled. Huge areas were drained and their wetland communities went into decline. The intensive use of commercial fertilizers and pesticides reduced the level of biodiversity. The trend towards forestry monocultures continued with the area under lable spruce forest plantations increasing.
Ecologically significant linear communities are a specific formation of cultural landscape having an elongated narrow shape and characterised by a majority of transitional ecotones at their edges. They are composed of herbs or trees and break up the surrounding fields and meadows or forest monocultures. The densest network of linear communities, often reaching several kilometers in length, in our cultural landscape is made up of riparian stands with continuous biocoenosis of alder, willow and ash with wetland and hydrophilic undergrowth. Shorter in length, but no less important are linear communities on the remains of balks, terraces and rocky outcrops. Among the most valuable linear communities are alleys of native deciduous trees (especially linden, maple, oak, more rarely beech and in places birch and rowan). Linear communities made up of exotic species (such as poplar cultivar, horse-chestnut, robinia, etc.) are of less significance. These delineated ecologically significant landscape elements, units, areas and linear communities function as biocentres, biocorridors or interacting elements.

3.3.2. Biocentres

A biocentre, (a centre of biotic diversity) is a territory that can sustain the continuous existence of species and communities from the natural gene pool of the landscape as far as is possible within the limits of its size and ecological conditions. It is possible to identify the patches of the landscape, the existing biocentres, which make possible the existence of at least some species from a biotope’s gene pool. The role of existing biocentres depends on their size and the ecosystems represented. They can be satisfactory or not depending on spatial parameters. Those that are satisfactory from this point of view are those of at least the minimum size. We can also distinguish between biocentres that are optimally satisfactory, satisfactory and partly satisfactory depending on the state of the ecosystems represented there. Biocentres with natural communities having a high degree of ecological stability throughout their area are optimal.

The various negative influences on biodiversity that are due to man have a mutually synergic character. The downwards trend in biodiversity can be seen from data concerning threatened and lost plant communities. Only thirty-five percent of the communities that occur in the Czech Republic are not threatened by man’s influence. Some forty-three percent are in decline, nineteen percent are in danger of disappearing and three percent (eighteen communities) have already been lost. To a variety of extents, more than half of the two thousand native species of vascular plants are endangered: thirty-seven species (2%) have become extinct with a further thirty-nine species (2%) unaccounted for; some 267 species (14%) are critically endangered, 240 species (13%) are seriously endangered, 239 (13%) species are endangered and 330 species (17%) are rare enough to demand further investigation. The animal gene pool is in a similar position. More than half of all species of vertebrates are endangered. Seven species of fish, six of birds and three species of mammals have disappeared. Some 61% of species of fish, 95% of amphibians, 91% of reptiles, 52% of birds and 59% of species of mammals are endangered to some extent.

This erosion of our biodiversity must be halted. Traditional, passive forms of conservation are not sufficient. This is why an ecological network is being built, a system of existing and newly-created ecologically stable territories in the Czech Republic.

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CONCEPT OF ECOLOGICAL NETWORK
satisfactory. Those where such communities take up only a part of the area can be called satisfactory. Those biocentres that include ecosystems with a medium degree of ecological stability are referred to as partly satisfactory.

**Suggested biocentres** are patches of landscape, at present strongly under the influence of man and having a low degree of ecological stability, that need to be recreated to make them once more suitable for existence of natural gene pool species.

Depending on the origin and degree of development of the ecosystems that constitute the biocentres it is possible to distinguish between those that are natural and those that have been influenced by man. **Natural biocentres** originate from natural and seminatural ecosystems that develop depending on the given geocological and biogeographical conditions. Such ecosystems are identical to or closely resemble potential natural ecosystems. In the Czech Republic these are mostly forest communities. **Biocentres conditioned by man** come from near natural ecosystems with anthropic origin and with high levels of biodiversity that depend on the repetition of certain operations. These are in the main grassland communities (meadows, pasture and fallow land) and aquatic pond communities.

The landscape of limestone rocks of the Pavlovske vrchy is an example of various types of ecologically significant landscape segments. Individual parts of the ecological stability skeleton stand out as islands of ecological stability in a sea of labile field cultures. A small solitary rock called Kočičí skály, (in the foreground on the right) is a typical ecologically significant landscape element. The larger rocks of Stolová hora and Děvín are ecologically significant landscape units. The whole complex of limestone rocks forms an ecologically significant landscape area. Kočičí skála rock has the function of a local biocentre in the territorial system of ecological stability, Stolová hora fulfills the function of a regional biocentre while Děvín with Děvičky form a supra-regional biocentre representing the communities of the northern part of the Pannonian biogeographical province.

Photo: Petr Macháček.
We can also distinguish between biocentres according to how representative, or how unique they are. A **representative biocentre** would contain the prevailing ecosystem typical of a given biogeographical region - such as the fir-beech primeval forest in the biogeographical region of the Moravian Silesian Beskydy. A **unique biocentre** will include a special ecosystem originating in specific ecological conditions - an example would be the peat bog with pine (*Pinus rotundata*) in the Žďárské vrchy biogeographical region at Velké Dříko pond.

It is also possible to draw a distinction between **simple biocentres** containing only one kind of vegetational community (forest, meadow, aquatic, etc.) and **compound biocentres** including more than one type of community (such as a pond surrounded by wetlands, grassland and alder forest). Designating the type of biocentre according to the prevailing vegetation is a consequence of this distinction (e.g. a forest biocentre) or even according to a more specific description (e.g. forest biocentre of debris maple woods, oak/beech woods, grassland biocentre of White Carpathian flower meadows).

From biogeographical location it is possible to draw a distinction between central and contact biocentres. **Central biocentres** are usually to be found in the core of a given category of biogeographical division (province, sub-province or region). The species composition of a biocoenosis is representative of the biogeographical unit. **Contact biocentres** are located on the border between two or more biogeographical units. They make possible biogeographically essential contacts between species with different distribution (such as for example the contact between the pontic-pannonian and Central European species in the regional biocentre of Květnice u Tříšnova on the borders of biogeographical regions.)

Depending on the spatial relationships within the landscape, we can talk of connected and isolated biocentres. A **connected biocentre** is linked to its other parts within the ecological network. It will have at least one biocorridor providing for the contact and the migration of organisms. **Isolated biocentres** are surrounded by ecologically unstable or less than stable communities to such an extent that for many species migration is either impossible or much less likely.

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In a landscape of vast fields even an isolated spruce-wood is an ecologically significant landscape segment. It functions as a local biocentre because it provides the conditions for the existence of at least some species of plants and animals. In a project for a system of ecological landscape stability a change of tree structure would be proposed for this wood. It would favour the original deciduous tree species. An isolated biocentre also has to be connected with other biocentres by a system of biocorridors. A suitable route for a biocorridor can be a belt of trees along a current path through fields.

Photo: Josef Ptáček.
3.3.3. Biocorridors

Biocorridors (biotic corridors) are ecologically significant landscape segments that connect biocentres and support the migration, spreading out of and contact between organisms. Biocorridors therefore delineate the flow of biotic information in the landscape. Unlike biocentres they do not have to provide a viable permanent habitat for all the species that use them. The functionality of biocorridors is dependent on their space parameters (length and width), the prevailing ecological conditions and the structure and species composition of their biocoenosis. On the local level, as biocorridors function mostly ecologically important linear communities. However their significance for the cultural landscape is not restricted to acting as a conduit for the migration of

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Bank vegetation hemming streams and rivers are amongst the most significant types of biocorridors in the cultivated landscape. The most valuable are those with domestic trees prevailing, such as alders, ash and various species of willow. A wide spectrum of herbs and grasses usually occur in such bank growths. They are presently a refuge and migration route for a wide variety of animals. At the Bílé potok on the eastern edge of the Czech-Moravian Highlands, the common kingfisher (Alcedo atthis), dipper (Cinclus cinclus) and grey wagtail (Motacilla cinerea) can be seen.

Photo: Josef Páček.
species, since they also divide large areas of ecologically unstable ecosystems created by man (such as vast blocks of fields or forest lignicultures).

The importance of biocorridors varies for different species depending on their manner of movement and distribution. They are a necessity for some species from natural communities in the landscape (such as myrmecochoric plants and the less mobile invertebrates). Biocorridors are a necessary part of the territory of many animals. Even though the significance of biocorridors for certain species is not yet clear, we can say that those that function best provide a continuous environment of a certain type of biocoenosis. The most continuous network of biocorridors consist of flowing water with their riparian communities.

Biocorridors can be separated into several groups according to state, function and degree of biodiversity.

A continuous biocorridor contains communities with a high degree of biodiversity throughout its length, while an interrupted biocorridor is broken up by one or more barriers of human origin such as a road, a field or a built up area.

A modal biocorridor connects biocentres containing the same or similar communities. There are usually four basic kinds of systems of biocentres and biocorridors: The aquatic and wetland biotopes of the floodplains, xerothermic, mesophilic (the most common in the Czech Republic), and biotopes with a mountainous character usually with Arctic/alpine and boreal species.

Contrast biocorridors connect biocentres containing distinctly different communities. Such corridors allow for contact between and migration of only a limited number of species. The differences between the biocentres thus connected are not merely a matter of the communities of which they presently consist but also the differing environments that they provide. Scientific knowledge about how such biocorridors work is still in its infancy.

e) the establishment of a network of particularly protected areas and their care;

f) participation in the establishment and approval of forestry plans, with the aim of ensuring environmentally appropriate sound forestry management;

g) participation in the process of physical planning and building proceedings, with the aim of enforcing environmentally balanced and aesthetically valuable landscape;

h) participation in the protection of land resources, particularly in the lay-out of land;

i) influence of water management in the landscape, with the aim of maintaining natural conditions for life in water and wetland ecosystems while preserving the natural character and appearance of water courses, stretches and wetlands;

j) the restoration and establishment of new, naturally valuable ecosystems, e.g. in the reclamation and other changes in the structure and utilization of the landscape;

k) protection of the landscape for ecologically sound reasons of economic utilization, tourism and recreation.

A two-kilometre long and 15-metre wide local biocorridor planted in the autumn of 1991 at Vracov, links a pine-tree forest on sands of the ‘Moravian Sahara’ with the remains of uncultivated land in vineyards. The biocorridor will presently fulfill the important function of a windbreak in area strongly endangered by wind erosion. See also pp. 22-23.

Photo: Archive of Veronica
3.3.4. Buffer Zones and Interacting Elements

To prevent, or at least to restrict, the penetration of harmful anthropogenic influences from their surroundings is the main role of the buffer zones within biocentres and biocorridors. The zones have a combined function. These zones can only be made by a combination of technical, biotechnical and organisational steps. Just what combination is most effective depends upon the specific conditions in individual biocentres and biocorridors.

Such a zone can be created by making a protective ridge to keep out the chemicals that drain off fields, or by forbidding the spraying from the air of such chemicals or by designating a space in which no introduced tree species are planted to prevent the spread of such plants into the biocentre.

Interacting elements, together with biocentres and biocorridors are basic parts of the ecological network. Interacting elements are ecologically significant elements and linear communities creating favourable conditions for the fauna and flora that are influential in the ecosystems of the cultural landscape. They affect the surrounding ecologically less stable landscape within the local system of ecological stability. Such interacting elements provide niches for a variety of species that are part of the local food chain as well as

Related Legislation (Continuation)

§3

Definition of Terms

For the purpose of this Act some basic terms are defined as follows:

a) A territorial system of ecological stability of the landscape (hereinafter „system of ecological stability“) is a mutually integrated complex of natural and changed though nearly natural ecosystems, which maintain a natural stability. Systems of ecological stability are distinguished as local, regional and above-regional systems.

b) A significant landscape component, as an environmentally, geomorphologically or aesthetically valuable part of the landscape, creates the typical appearance of the landscape, or contributes towards its stability. Significant landscape components are forests, peatlands, water courses, ponds, lakes, floodplains. Other landscape components are also parts of a landscape that the Nature Conservancy authorities register as a significant landscape component, pursuant to §6, particularly wetlands, steppe grasslands, field ditches, tree or shrub islands or clusters, continuous grass stretches, mineral and fossil deposits, artificial and natural rock formations, geological outcrops and exposures. A landscape component may also be valuable growths in human settlements, including historical gardens and parks.

▶ Continues on p. 16 ▶

An entirely isolated, older by generations, beech inside vast artificially planted spruce monocultures, does not have any economic importance but it serves as a refuge for a variety of lichens, mosses, mushrooms, insects and birds that were bound to natural communities. This solitary deciduous tree therefore has the role of an interaction element in the local territorial system of ecological stability.

Photo: Oldřich Láta.

14 CONCEPT OF ECOLOGICAL NETWORK
belonging to neighbouring ecologically less stable communities. They allow for the development of richer and more diverse food webs in the cultural landscape. Thus they help to facilitate the regulation mechanisms that increase the ecological stability of the landscape.

The pollinators essential to cultivated plants as well as the predators that can control the numbers of pests on arable land and forests find a suitable environment at the interacting elements. Typical of such interacting elements are the ecotone (edge communities) of forest margins, solitary trees in fields, small springs, communities on balks, orchards with old trees, alleys, etc. The denser the network of interacting elements, the more effective their stabilizing influence on the landscape systems of ecological stability. Interacting elements mostly have a much smaller area than biocentres or biocorridors and they are often spatially isolated.

The general hypothesis about the role of interacting elements is gradually being proved by the results of basic research. As yet we do not have the knowledge necessary to allow us to create a methodology for the design and realisation of new interacting elements that would put the finishing touches to the ecological network in the landscape.

Biocentres in the wide flood-plains on the lower reaches of rivers can also be represented by various kinds of wetlands. Křivé jezero lake is a typical regional biocentre, placed in the Dyje river flood-plain in South Moravia. It is renowned as a nesting place for the greylag goose (Anser anser) on pollard willow trees. Transitory and permanent pools have a hem of willow trees, in places with the rare Leucojum aestivum which is one of the critically endangered floral species in the Czech Republic.

Photo: Petr Macháček.
3.3.5. Biogeographical significance

The biogeographical significance of ecologically significant landscape segments is related to the degree of representativeness of the species and communities in terms of both individual and typological of biogeographical divisions. Much smaller patches (usually between 5 and 10 hectares) can be said to possess local significance and thus include ecologically significant landscape elements and ecologically significant linear communities with the functions of biocentres, interacting elements as well as biocorridors. They are important for the preservation of at least a part of the wealth of the biota. Examples of patches with local significance include game shelters and linear communities on balks, small remnants of the original forest stands within spruce or pine monocultures, abandoned quarries in which natural succession is taking place, part of a stream with a natural meandering course or a small pond with a littoral edge.

Larger areas, of at least 10 to 50 hectares depending on the kinds of communities that they are composed of, have regional significance. Such places are normally ecologically significant landscape units and ecologically significant linear communities with the role of biocorridors. Their network should represent the full diversity of ecosystems existing within a particular biogeographical region. Individual segments are usually heterogeneous, containing communities from more than one type of ecosystem. Regional importance have ecologically significant segments which include the continuous remnants of natural and near-natural forest, complexes of meadowland with an admixture of the naturally occurring species, large ponds with littoral edges and wetland communities and natural stretches of river with continuous riparian vegetation.

Large ecologically significant landscape units and areas where the area of the ecologically stable communities should be of the order of a thousand hectares have supra-regional significance. Species with large territorial requirements (such as the larger vertebrates) can be found in such areas. Supra-regional significant areas should provide the essential conditions for the characteristic communities with the complete biodiversity from within a given biogeographical region. Examples of such areas would include the complexes of oak and beech forests at Chřiby with its core Holy kopec reserve, or the Hodonínska valley in Svrátecká hornatina (Mts.) with its preserved beechwoods, maple-woods and alder woods with its core of Čepickuv vrch reserve. Very large ecologically significant landscape areas that represent a great variety of our biotas at the biogeographical province level have provincial and biospherical significance. The core areas with natural ecosystem development should be larger than a thousand hectares, or ten thousand hectares in the case of biospherical significance. Natural communities covering an area of ten thousand hectares provides the conditions for populations of big birds and mammals with large territorial requirements (lynx, wolf, elk, bear, golden eagle, etc.). Only a few places in the Czech Republic, such as the Dyje valley in Podyji National park, Modravské slaté in the Šumava National Park and the Prameny Úpy reserve in the Krkonoše National Park, can be said to have provincial significance. There is nowhere in the Czech Republic that could be said to fulfill the criteria for biospherical significance. In the former Czechoslovakia the Javorina reserve in the High Tatras National Park could be said to best fit the spatial requirements, with forest and alpine communities including the typical species of the large vertebrates were protected within an area of some 11 589 ha. The golden eagle and the capercaillie nest there and populations of chamois, bear, lynx and wolf can be found.

In the intensively farmed landscape, ecologically significant segments of the landscape remained only where natural conditions did not allow farming. For example in the Třebčí region groups of syenite rocks with a mosaic of lichens with lots of herbs and grasses - creating a „mole“ on the landscape - are ecologically significant landscape elements.

§4 Basic Obligations in General Nature Conservation

1) The specification of a system of ecological stability, ensuring the preservation and reproduction of natural wealth, a favourable effect on the surrounding less stable part of the landscape, and the establishment of a foundation for the multilateral utilization of the landscape, is determined and assessed by the physical planning and Nature Conservancy authorities in cooperation with the authorities for water management, agricultural land resource protection and the State Forestry Administration. The protection of a system of ecological stability is the liability of every owner or user of land that forms this system; the establishment of such a system is a public in-

► Continues on p. 18 ►
3.4. Biogeographical Data for the Creation of an Ecological Network

It is necessary to use two kinds of biogeographical division of the landscape so that all representative and unique ecosystems find their place in the ecological network. A similar approach has been taken when producing a proposed global network of biosphere reserves. Biosphere reserves are chosen so that they capture the diversity of biomes found within the biogeographical provinces of the Earth.

3.4.1. The Biogeographical Scope of the Ecological Network

To capture the differences in the wealth and diversity of nature anywhere from local to planetary level requires two systems of biogeographical division - individual and typological.

The aim of each individual division is to describe the different biota that result from the geographical location which gives rise to its characteristic chorology as manifested in the species structure of its communities. The unique complete parts that differ in their flora and fauna are delineated by individual regionalisation. The higher units of individual division used in the Czech Republic during the creation of an ecological network follows the world system of biogeographical provinces used by IUCN.

The aim of the typological division is to delimit landscape types with rela-

Ponds are among those man-made ecosystems that allow for the natural development of communities with a higher level of ecological stability. The continuous littoral communities of the banks are especially important. In the reeds, high grasses and other vegetation, a number of water birds nest. An ideal situation is when the littoral zone connects with the bank stand of trees and bushes, as can be seen at the biggest pond in Southern Moravia - Nesyt.

Photo: Petr Machďek.
tively homogeneous ecological conditions, which correspond to similar natural (potential) communities. Territorially fragmented patches that occur in the landscape are placed together with similar types of biocenosis that require similar ecological conditions. The system of geobiocenological units according to A. Zlatník is used. The principal units are the types of geobioceno-
ses that are grouped together on the basis of a similarity in ecological conditions as demonstrated by similar phytocoenosis. Superstructural units are altitudinal vegetation zones and ecological ranges.

A biochore is a higher typological unit within this system of biogeographical differentiation. It is a typical combination of groups of types of geobioceno-
ses within a certain biogeographical region. Each biochore is distinguished by the extent of individual representation, structure, contrast between and complex-
ity of geobiocene types.

For the creation of an ecological network in the Czech Republic the follow-
ing system of biogeographical units is used:

a) Individual Divisions:

- **Biogeographical Regions**
  The area of the Czech Republic is divided into 90 regions. Biogeographical regions provide a basis for the evaluation of the representativeness of component parts of the regional ecological network and for the choice of supra-regional biocentres.

- **Biogeographical Sub-Provinces**
  The Hercynian, Silesian, West Carpathian and North Panonian sub-provinces all penetrate the territory of the Czech Republic. Sub-provinces provide a basis for the choice of provincial biocentres.

- **Biogeographical Provinces**
  The prevailing province on the territory of the Czech Republic is that of Central European deciduous forest, with some penetration of the Panonian province in South Moravia. The world network of biosphere reserves is demarcated in terms of provinces.

b) Typological Divisions

- **Type of Geobiocenoises**
  A unit for the local level. It provides the scope within which to propose the species structure of newly established biocentres and biocorridors.

- **Groups of Types of Geobiocenoises**
  Provides a scope of similar ecological conditions used for delineating local biocentres and biocorridors. There are roughly 200 groups of geobiocenoise types in the Czech Republic. This unit corresponds with associations or alliances of phytocoenological classifications.

- **Biochore**
  A unit at the regional level necessary for the delineating of regional biocen-
tres and biocorridors. At least one representative biocentre of regional signifi-
cance must be present in every type of biochore.

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Related Legislation (Continuation)

terest shared by the land owners, by the community and by the state. The Ministry of Environment of the Czech Republic (hereinafter „Ministry of Environment“) shall specify the details for defining and assessing a system of ecological stability, and the details for the plans, projects and measures in the process of its establishment, in a generally binding regulation.

2) Significant landscape components must be protected from damage and destruction. They shall be solely used in a manner which does not impair their renewal and does not endanger or weaken their stabilizing function. Whosoever intends to carry out any intervention that might lead to the damage or destruction of a significant landscape component, or could endanger or weaken its ecologically stabilizing function, must procure a binding standpoint from the Nature Conservancy authorities. Such interventions include the placing of buildings, land conditioning (lay-out), plant rotation, land drainage, regulation of water courses and reservoirs, and mineral extraction. Details for the protection of significant landscape components shall be specified by the Ministry of Environment in a generally binding regulation.

3) A binding standpoint of the Nature Conservancy authorities with regard to the protection of a system of ecological stability, is also required for the approval of forestry plans, for the deforestation and afforestation of land exceeding 0.5 ha, for the building of forest roads and down-drives, and for forest drainage systems. A standpoint of the Nature Conservancy authorities is not required for cultivation and timber production in forests, carried out in accordance with the forestry plans, and for random cutting.

4) With the exception of necessary facilities which serve navigation purposes, the maintenance of water courses, ponds and lakes, or for operational purposes, the placing of buildings within a distance of 50 m from registered border of ponds or lakes, or within a distance of 20 m from the waterside, is prohibited. This limitation does not apply to built-in areas in human settlements.
3.5. Biogeographical Differentiation of the Landscape

In order to set out and propose an ecological network in the landscape, we need information about both the nature of and the present condition of the ecosystem. Gathering and evaluating such information is possible via the process of biogeographical differentiation of the landscape by a geobiocenological approach. This process arises from the theories of Professor A. Zlatník, founder of the Czech school of geobiocenology. This theory is based on the hypothesis of the unity of natural and human-influenced communities. The type of the geobiocenose represents a unit of topical level, created by the typing of analyzed basic segments of nature. It is a natural unit associating contemporary natural segments of one type of geobiocenosis with all changed segments arising on the areas of the same type of permanent ecological conditions.

The methodology of biogeographical differentiation of the landscape consists of the following operations:

- Distinguishing the natural (potential) state of the geobiocenosis in the landscape,
- Distinguishing the present state of the geobiocenosis in the landscape,
- Categorizing the geobiocenosis according to the extent of human influence and the degree of ecological stability,
- Evaluating the function or role of the communities in the landscape,
- Categorization from the point of view of nature conservation and landscape management.

The basis of biogeographical differentiation is a map of natural (potential) geobiocenoses in the landscape. Such a map is a model of the ecosystems that would exist under present ecological conditions in the absence of man’s influence. The natural state of the geobiocenoses is the only unbiased starting point for the evaluation of all present and future changes of biota in the landscape. The distribution of the different groups of types of geobiocenoses is shown on the map. The groups of types of biocenocenes are characterised by their belonging to a certain altitudinal vegetation zone (vegetation tier) and a certain trophic and hydrological range.

We distinguish between nine different vegetation tiers by reference to the main species of tree found in the natural forests of the Czech Republic: 1. oak, 2. oak/beech, 3. beech/oak, beech or respectively oak/conifers (in basins and valleys), 5. fir/beech, 6. spruce/fir/beech, 7. spruce, 8. dwarf-pine and 9. sub-Alpine and Alpine. These vegetation tiers cover the range from the warmest lowlands to the climatically harshest mountains.

Trophic ranges express the the differences in the mineral wealth and acidity of soils. There are four basic ranges:

- A - oligotrophic (poor and acidic)
- B - mesotrophic (fairly rich)
- C - nitrophilous (nitrogen rich)
- D - eutrophic (rich in nutrients, found on basic rocks, esp. limestone)

Transient ranges occur frequently. Groups of geobiocenoses belonging to transient trophic levels include A/B (oligo-mesotrophic), B/C (mesotrophic-nitrophilious), and B/D (mesotrophic-eutrophic) are frequent while C/D (nitrophilious-eutrophic) is rare.

Hydric ranges express the differences in the moisture regime of soils. Their are six ranges:

1 - dry, 2 - limited, 3 - normal, 4 - waterlogged, 5 - permanently waterlogged, 6 - peat bog

§6 The Registration of Significant Landscape Components

1) The registration of significant landscape components is carried out by the Nature Conservancy authorities, which at the same time notify the owner or tenant of the concerned land, the territorially appropriate building office and community, of this registration. If a larger number of landowners are involved, this notification may be made in the form of a public notice.

2) The notification, pursuant to clause 1, must include a specification on the significant landscape component, a brief substantiation for its registration, and the legal consequences thereof (§4, clause 2).

3) The owners of the concerned lands are entitled to raise written objections to the registration of a significant landscape component, and send them to the Nature Conservancy authority which made the registration within 30 days of the date on which they received notification thereof, or of the date on which the public notice was issued. This Nature Conservancy authority must discuss the objections with the owners and decide whether to confirm or cancel the registration.

4) The Nature Conservancy authority, which made the registration, may cancel the registration of a significant landscape component, if this cancellation is not pursuant to clause 3, only if it is in the public interest to do so.

Drawing by Jan Hrubý
The groups of types of biogeocenes as a framework of certain ecological conditions and the corresponding potential biocoenoses are called the **geobiocoenological formula**. First the vegetation tier is given, secondly the trophic range and thirdly the hydric range. For example the geobiocoenological formula 5 B 3 means a group of geobiocoenoses of typical fir/beech wood (Abietifageta typica) of trophic range B (mesotrophic) and with a normal hydric range of 3.

The results of research carried out throughout the whole country into forests and agricultural soils and processed according to similar criteria, were used for the construction of maps representing the natural ecosystems for the landscape. For the proposed local ecological network, maps representing groups of geobiocoenoses on a scale of 1:10 000 were used.

The present condition of the biota in the landscape is the result of prevailing ecological conditions and man’s activities. The present use of the ecotopes in the cultivated landscape is shown on the map of the present state of the geobiocoenoses. The information given by the map corresponds to the results of the mapping of biotopes that is developing in the Czech Republic in line with the European programme CORINE-BIOTOPES. Plant communities form the basis for the classification of types of biotopes and delineating their boundaries.

These communities are the most distinct and easily differentiated bio-indicators of the state of ecosystems in the landscape. The mapping of biotopes is therefore based on the mapping of actual plant communities. The basic mapping of biotopes on a scale of 1:10 000 has been developed in the Czech Republic since the eighties. The delineation of the most valuable biotopes as ecologically significant segments of the landscape is part of the mapping.

By comparing maps of the potential conditions with the present state of geobiocoenoses it is possible to evaluate the biocoenoses according to the degree of human influence and the consequent **degree of ecological stability**. Various sets of criteria that express the extent of the differentiation of the actual communities from the natural state are used for the categorization of the intensity of human influence. A six-point scale is used to evaluate the significance of the existing communities from the point of view of ecological stability:

- 0 - no significance,
- 1 - very little significance,
- 2 - little significance,
- 3 - medium significance,
- 4 - great significance,
- 5 - extraordinary significance.

As an example, built-up areas and roads with asphalt or concrete surfaces have no significance. Fields, artificial lakes and streams with impermeable strengthened banks all have very little significance. Grassland, intensive orchards and vines, intensively cultivated meadows and pastures and ruderal communities are all examples of land having little significance. Of medium significance are extensive orchards and gardens, semi-cultural meadows, forest monocultures, parks, close-to-natural derelict land with a proportion of ruderal species. Meadows with a prevalence of natural species, forests with a tree structure close-to-nature, and aquatic nearly natural ecosystems contain communities with great significance for the ecological stability of the landscape. Those with extraordinary significance include natural forests, natural grassland communities, wetlands, peat-bogs, streams and areas of water courses with natural banks and bottoms and having characteristic aquatic and riparian communities.

Another stage in the biogeographical differentiation of the landscape is the evaluation of the significance of the various functions of the actual communities found within the groups of types of geobiocoenoses. The productive, water-regulatory, soil-conservation and recreation functions are those most commonly evaluated. The evaluation of the significance of individual communities in the conservation of the biodiversity of the landscape is most important for the creation of the ecological network. The resulting differentiation of the landscape from a protection point of view is essentially based on its role as a gene pool. The most valuable areas form the skeleton of ecological stability of the landscape.

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**Related Legislation (Continuation)**

§59

**The Ensuring of Lands for Establishing Systems of Ecological Stability**

1) To ensure the conditions for establishing a system of ecological stability, measures, projects and plans according to §4, clause 1, are carried out in agreement with the land owner.

2) If the establishment of a system of ecological stability requires a change in the land utilization, which the owner of this land does not agree to, the Land Fund shall offer to exchange his land for land in the state ownership, adequate in area and quality to his original land, and if possible, in the same community where the major part of the land is located.

3) Provisions on the protection of agricultural land resources and the protection of forest land resources do not apply to lands required for the implementation of measures, projects and plans for the establishment of systems of ecological stability, pursuant to §4, clause 1.

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**§60 Expropriation and Obligatory Transfers of Management Rights**

1) It is possible to expropriate real property or the property rights to this property for nature and landscape protection in cases specified by a separate regulation.

2) Procedures of separate regulations on expropriation shall be applied in cases of expropriation pursuant to clause 1, and based on a proposal of the Nature Conservancy authorities.

3) A Nature Conservancy authority may transfer the management rights to state-owned property to itself for reasons and to the extent specified in clause 1. The transfer of management rights is free of charge; it may only be charged if the transferor acquired the real property for a charge.

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**§76 The Scope of Activities of Communities**

2) Authorized community offices (municipalities)

a) register significant landscape components, pursuant to §6;

b) issue binding standpoints according to §4, clause 2, to interventions in registered landscape components;

c) assess and demarcate local systems of ecological stability;
In planting a biocorridor near the village of Krčánovice, a non-traditional method of weed protection was used. It involved covering the soil surface with recycled textiles for the first two years after planting.

We can see in this photo taken the fourth year after planting the biocorridor, the perspective of the lime trees growing in the spine of the corridor. Continuing in the margins of the biocorridor are bushes, with the prevailing bush being the wildrose.
is located on the 1st oak vegetation degree. Therefore, the oak Quercus robur became the main tree species of the biocorridor. A number of other species - the linden Tilia cordata, the maple Acer campestre, the cherry Cerasus avium and Padus racemosa. Bushes are represented there by Prunus spinosa, Ligustrum vulgare, Corylus avellana, Eryngium europaeum and Cornus sanguinea. The development of the plantings in the biocorridor and changes in soil conditions, vegetation and fauna have been monitored by a group of experts from the beginning. After five years they could say that the planting was successful and the corridor has started to fulfill its principal mission. The main tree species of the corridor - the oak is already attaining a height of 3.5m and increments in 1995 were often greater than 1m. The tree storey is fully developed, and the basic skeleton of the linear community is therefore stable. In the third year already several typical forest species of the model group of insects - Carabidae, have been found. Ornithologists were happy to find the nests of partridges (Perdix perdix) and an increased number of other species nesting on the ground and those hunting for food in the air. They concentrate above the biocorridor as it is where there is a higher occurrence of small insects. The corridor has started functioning and fulfilling its role.

Photo AEROFIT, 1993
The Biocorridor at Vracov

The planting of the first structural elements of the territorial ecological stability systems in the Czech Republic was preceded by many doubts and uncertainties. Would the planting of trees and bushes in agricultural soil full of industrial fertilizers and pesticides succeed? Would the plants be destroyed by game? How would local people react? Would the biocentres and biocorridors function, and if so when? These and a number of other questions can be answered only on the basis of a study of a concrete example. Thus, several biocorridors were planted in the eastern Moravia at the beginning of the 90s. The plantings and subsequent research were organized by Ing. L. Samánek from the State Soil Improvement Administration in Brno. One of them was a 2 km long and 15 m wide biocorridor near the village of Vracov.

The principal role of the Vracov biocorridor is to increase biodiversity in the open agricultural countryside. The plan for a local territorial system of ecological stability included the proposal to connect an extensive complex of pine forests on drift sands with a local biocentre that had been established where the planted biocorridor currently ends. The tree species composition was suggested according to the character of the constant ecological conditions within the geobiocenosis type groups. The biocorridor
Coeficient of Ecological Stability - Levels of Landscape Types

A - landscape quite changed by human activities
B - landscape harmonious with a balanced relation between human activities and nature
C - relatively natural landscape in the Czech Republic

Particularly Protected Areas in the Czech Republic
4. DEFINING THE SKELETON OF LANDSCAPE ECOLOGICAL STABILITY

The first step towards the creation of an ecological network in the landscape is to define the skeleton of ecological stability that is formed by the existing ecologically significant segments of landscape. These ecologically relatively stable “islands” in the cultivated landscape were mostly preserved in those locations where economic utilisation would have been more problematic due to unfavourable natural conditions, or in places that for some reason were not open to use, such as military areas. The skeleton of ecological stability is marked out on the basis of a comparison between the natural (potential) and actual state of ecosystems in the landscape.

The remnants of natural communities with the highest ecological stability are placed in the first level. Examples include the remains of forests with a natural tree structure, meadows with a predominance of native species, wetlands, various types of abandoned land with high levels of biodiversity, natural riparian vegetation and vegetation on balks and stoneworks, stretches of streams with natural beds, natural rock communities, and significant solitary trees and their groups.

There are usually few relatively natural remnants of communities with high levels of ecological stability in the intensively utilised agricultural, industrial or suburban landscape. Thus we have to fall back on the principle of relative choice - including less valid communities into the skeleton of ecological stability. This, for example is the way in which a robinia forest in a deforested agricultural landscape can become part of the skeleton by providing shelter for some animals, or an old grassland orchard that provides nesting sites and food for birds. Within the landscape damaged by industry, parts of the skeleton can be comprised of post-industrial derelict land - abandoned quarries, tips in the first stages of succession or flooded depressions areas with various types of wetland. Parks, especially those with mature domesticated trees, are important parts of the skeleton in urban landscape.

RELATED LEGISLATION

Collection of Laws No. 395/1992, Volume 80

395
NOTICE

DELIMITATION AND EVALUATION OF THE TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY (FOR §4, SECTION 1 OF THE ACT)

§1

The following terms from the territorial system of ecological stability (hereinafter ‘system of ecological stability’) are defined for the purposes of this notice:

a) a biocentre is a biotope (§3 letter i) of the Act) or a set of biotopes in a landscape (§3 letter k) of the Act ] which by means of its conditions and size allows the permanent existence of a natural or an adjusted but near-natural ecosystem (§3 letter j) of the Act].

b) a biocorridor is a locality that does not allow for the permanent long-term existence of a decisive number of organisms, but allows their migration between biocentres and thus creates a network out of the divided biocentres.

▶ Continues on p. 26 ▶

Only inside vast forest complexes does the shy black stork (Ciconia nigra) build its nests. One of the objectives of the delimitation of a skeleton of ecological stability is the preservation of the conditions for the existence of species that have large requirements for space.
Photo: Petr Macháček.
Fields are among the least ecologically stable ecosystems. Functioning of these man-dependent systems is fully dependent on additional energy entering in the form of fertilizers, pesticides and agrotechnical measures. These deliberately maintained monocultures allow the existence of only a tiny number of species of native plants and animals. Viewed from the point of view of ecological stability, it is important to divide up this vast agroecosystems with a network of more stable areas.

Related Legislation (Continuation)

§2

(1) Nature conservation organisations will define local, regional and supra-regional systems of ecological stability in the plan for an ecological stability system.

(2) The plan for an ecological stability system includes:

a) a plot of the existing and proposed biocentres and biocorridors on a map, with marking of the particularly protected part of the landscape, with a scale of 1:50 000 and bigger for supra-regional and regional systems of ecological stability, and at a scale of 1:10 000 and bigger for local systems of ecological stability.

b) tables and descriptions characterizing the function and spatial indices, especially the biodiversity of the ecosystems, characteristics of particularly protected parts of the landscape, spatial links, necessary data on the premises (the minimum area of the biocentre, the maximum length of biocorridors and their minimum essential width) and their present state.

c) detailed reasons including proposals for rough measures for its preservation and improvement.

§4

(1) Projects for the creation of the system of ecological stability (further only "projects") are sets of scientific, technical, economic, organizational and property-linked legal documentation. They are necessary for the execution of landscaping.

(2) The source for the building up of the project is the approved landscape planning documentation or a plan of the system of ecological stability.

(3) The projects according to section 1 are provided by the legal and natural entities defined in §4, section 1 of the Act. Their processing is carried out by qualified persons.

§5

(1) The plan of the system of ecological stability is approved by the appropriate bodies for landscape planning in the documentation or as decisions concerning land-use.
5. TERRITORIAL SYSTEMS OF ECOLOGICAL LANDSCAPE STABILITY

A territorial system of ecological landscape stability consists of a mutually integrated complex of natural and, modified but near-natural ecosystems which maintain natural stability. It is made up of ecologically significant landscape segments, efficiently located on the basis of functional and spatial criteria. It is thus an optimally functioning system of biocentres, biocorridors and interaction elements.

In contrast to the skeleton of ecological stability, the territorial systems of ecological stability consists of what exists at present as well as what has been proposed. There are only a few regions where the existing system is ecologically significant landscape segments functions as an efficiently connected territorial system in the Czech Republic. The patches of landscape that form the skeleton are often isolated, haphazard in their arrangement and covering an insufficient area.

Not for these reasons a team of Czech and Slovak scientists and planners came in the eighties with an approach to the design of territorial systems of ecological landscape stability. The head of the team was Jiří Loff, a landscape planner from Brno.

Their approach to the creation of such systems corresponds to the most recent landscape ecological concepts from abroad (Biotopvernützung - Germany, National Ecological Network - The Netherlands, and Greenways - U.S.A.).

The five basic criteria listed below are used in the design of the systems:
- the diversity of potential natural ecosystems,
- the spatial relationship of biota in the landscape,
- spatial parameters,
- the present state of the landscape,
- socioeconomical limits and intentions.

We had to include in design first the diversity of the potential natural communities corresponding with the diversity of the ecological conditions. At many places in the cultural landscape of the Czech Republic, the whole range of communities was not preserved to a sufficient extent and that is why they could not be included in the network of small protected areas. An evaluation of the way in which characteristic communities are represented in a particular region is an important part of the methodical process of designing these systems. On the basis of such an evaluation we can say from the point of view of how representative it is, whether the skeleton is suitable as it stands, or which communities need to be added. Later on during the process we will find out whether the existing biocentres and biocorridors correspond to the spatial parameters, and we will place the missing biocentres, biocorridors and interacting elements. We will attempt to link the biocentres with identical or similar communities. It is necessary that we compare the plans of the territorial system with the needs of the various interests for the use of the land and come up with a compromise. It is not until that point that the suggested territorial system can be considered definitive.

The most difficult and at the same time the most important task was to set temporal and spatial parameters for biocentres, biocorridors and interacting elements. Using all the available scientific knowledge, the experts on the three-member team arrived in the end at a compromise solution in the search for the minimum spatial parameters necessary for the functioning of the biocentres and biocorridors. They are however only tentative values which can only be made more precise after a period of long-term scientific research. To state only what we know for certain: smaller biocentres and longer or thinner bio-

Related Legislation (Continuation)

(2) Prior to approval the appropriate body for nature conservation submits a proposal of a plan for the system of ecological stability or a processed project of the system of ecological stability to assess and negotiate with the state administration authorities and participant in the proceedings.

(3) Nature conservation bodies may obtain an assessment from the relevant qualified entities, prior to an objective evaluation of the proposal of a plan for an ecological stability system or for a project for an ecological stability system.

§6

(1) A measure to create a system of ecological stability is understood as a proposal and the realization of partial or simple additions to a system of ecological stability, especially a local one which is not so demanding in technical, economic, organizational and property-rights terms, do not require the previous processing of a plan or a project according to §4 and 5 (for example the additional planting of a current biocentre or biocorridor, establishing a smaller game refuge, planting or additional planting of lines of vegetation).

(2) The measures according to Section (1) are provided by the relevant legal entities given in §1 of the law.

§7

The Protection of Significant Landscape Elements
(Section (2) of the law)

(1) Registration (§6 of the law) is carried out by entry into the list of significant landscape elements. Registration includes a list of cadastral areas and quotation of the affected plots stating their owners and tenants, brief characteristics, a certificate of announcement (§6, sections (1) and (2) of the law), or possibly of the results of discussion (§6, section (3) of the law) or cancelling the registration (§6, section (4) of the law) and drawing in maps of the appropriate scale (1:5 000 and larger).

(2) The owner, potentially the tenant of the plot in question, the appropriate Construction Office and municipal authority will be notified of cancellation of the registration of a significant landscape element, by the nature protection authorities.
### HISTORY OF THE CONCEPT AND PLANNING OF THE ECOLOGICAL NETWORK IN THE CZECH REPUBLIC

#### Table: The spatial parameters of biocentres and biocorridors

Minimum sizes of biocentres:

<table>
<thead>
<tr>
<th>Type of community</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>a) Local biocentres</strong></td>
<td></td>
</tr>
<tr>
<td>forest</td>
<td>3 ha</td>
</tr>
<tr>
<td>aquatic</td>
<td>1 ha</td>
</tr>
<tr>
<td>wetland</td>
<td>1 ha</td>
</tr>
<tr>
<td>meadow</td>
<td>3 ha</td>
</tr>
<tr>
<td>steppe</td>
<td>1 ha</td>
</tr>
<tr>
<td>rock</td>
<td>* 0.5 ha</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>b) Regional biocentres:</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>forest</td>
<td></td>
</tr>
<tr>
<td>(vt = vegetation tier):</td>
<td></td>
</tr>
<tr>
<td>1. oak and 2. beech/oak vt</td>
<td>30 ha</td>
</tr>
<tr>
<td>3. oak/beech and 4. beech vt</td>
<td>20 ha</td>
</tr>
<tr>
<td>5. fir/beech vt</td>
<td>25 ha</td>
</tr>
<tr>
<td>6. spruce/fir and 7. spruce vt</td>
<td>40 ha</td>
</tr>
<tr>
<td>8. dwarf pine and 9. alpine vt</td>
<td>30 ha</td>
</tr>
<tr>
<td>flood-plain forests:</td>
<td>30 ha</td>
</tr>
<tr>
<td>wetland alder-woods</td>
<td>10 ha</td>
</tr>
<tr>
<td>aquatic</td>
<td>10 ha</td>
</tr>
<tr>
<td>wetland</td>
<td>10 ha</td>
</tr>
<tr>
<td>meadow</td>
<td>30 ha</td>
</tr>
<tr>
<td>steppe</td>
<td>10 ha</td>
</tr>
<tr>
<td>rock</td>
<td>5 ha</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>c) Supra-regional biocentres:</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>core area</td>
<td>10 - 50 ha</td>
</tr>
<tr>
<td>total area</td>
<td>1 000 ha</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>d) Provincial biocentres:</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>core area</td>
<td>1 000 ha</td>
</tr>
<tr>
<td>total area</td>
<td>10 000 ha</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>e) Biospherical biocentres:</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>core area</td>
<td>10 000 ha</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lengths and widths of biocorridors:</th>
<th>Local</th>
<th>Regional</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum allowed length</td>
<td>1 - 2 km</td>
<td>0.4 - 1 km</td>
</tr>
<tr>
<td>Minimum necessary width</td>
<td>10 - 20 m</td>
<td>20 - 50 m</td>
</tr>
</tbody>
</table>

Corridors do not function. The parameters (area, length and width) differ obviously according to the level of significance of the territorial system. The area required is smallest in local systems and increases on moving from regional to supra-regional and further.

Only those parts of the territorial system of landscape ecological stability fitting the minimum size parameters are able to completely fulfill their function. We must attempt a gradual enlarging of the present smaller patches and the missing biocentres will need to be created. More frequently than biocen-

1972: Ecologically significant elements, units and areas were determined in Moravia within the framework of a General Project of Care for the Landscape in the field of water management adaptations. (Terplan - I. Michal). The results of the study were not used in the management of landscape changes.

1978: Ecologically significant segments in the surroundings of the Dukovany-Dalešice power system (Geografický ústav ČSAV [Geographical Institute of the Czechoslovak Academy of Sciences] - A. Buček, J. Lacina), and in Brno city area (Geografický ústav ČSAV - Antonín Buček, Jan Lacina and Ústav systematické a ekologické biologie ČSAV [Institute for systematic and ecological biology of the Czechoslovak Academy of Sciences] - K. Hudec), were determined.

In the framework of the territorial plan for Pohořelice and Draholec (Bečlav region) the proposal of an ecological approach to the landscape, in the form of biocentres and biocorridors (Löw et al - Agroprojekt Brno) was made.

1979: The balance of significant landscape elements in the Czech Republic (Terplan Praha - I. Michal in co-operation with the nature conservation authorities and district offices) was made.

1980: The creation of the team for the Ecopogramme "A Skeleton of Ecological Stability", a multi-disciplinary team which contributed to the sorting out of the theoretical starting points for the securing of the landscape stability concept. It worked up until 1985.

1981: The first skeleton of a territorial system of ecological stability was determined in the area of the JZD Luhačovice agricultural cooperative (Geografický ústav ČSAV - A. Buček, J. Lacina).

1983: A team of Czechoslovak experts started working on building-up a method of planning territorial systems of ecological stability.

1983: The first proposal for a local territorial system of ecological stability was created - located at the bottom of Děvín hill in the Pálava biosphere reserve (Agroprojekt Brno - Löw et al).

In the Czechoslovak Republic was made (Geografický ústav ČSAV Brno and Terplan Praha). It determined the regional skeleton of ecological stability and proposed the first preliminary selection of biocentres of supra-regional significance.

The territorial general plan called the Regional Territorial Systems of Ecological Stability for the South Moravian Region was finished (Agroprojekt Brno - J. Löw et al.).

1987: In Vyškov district a systematic inventory of ecologically significant landscape segments was completed on the basis of the current situation of the landscape in a scale of 1:10000 (Útvar hlavního architekta [Department of the Head Architect] ONV Vyškov - L. Binová et al.).

1987: An instructional film called Territorial Systems of Ecological Stability was made (Filmmové studio Zlín, director Jaroslav Břanský).

1988: The Instructions for Proposing Territorial Systems of Ecological Stability was published as a company method of Agroprojekt Brno (J. Löw et al). The project for TSES became part of the working procedures for the renewal of forest management plans (Lesprojekt Brno - J. Macku).

1990: Supra-regional system of ecological stability for Bohemia, Moravia and Silesia was prepared (Terplan Praha - I. Michal). Detailed plans were made for local biocorridors in Vracov, Radějov and Tvarožná Lhota (in the Hodonín region) and Křížanovice in the Vyškov region.

1991: The general plan of the Slovakia supra-regional territorial system (Urbion - J. Huseniová, J. Ruzicková et al.). The first local biocorridors were planted according to the plans made in 1990. In cooperation with the Ministry of Environment, I. Striteský made the documentary “Landscape Planning” which records the first planting of biocorridors.

1992: The Czech National Council passed the law No. 114 on nature and landscape conservation, including the determination of territorial systems of ecological stability, on the 19th of February.

1992: A map called Ecological Stability was published in the Atlas of the Environment and Health of the population of the Czech and Slovak Federal Republic including also the supra-regional biocentres and biocorridors. (FVŽP and Geografický ústav ČSAV - J. Lacina, A. Buček).

1992: The processing of general plans of local territorial systems of ecological stability in maps of 1:10000 scale for the en-
and it breaks up the prevailing unstable arable land or forest monocultures. The axes of the local system produce the system of biocentres and biocorridors which follow the interacting elements. They help to stabilize the surrounding landscape. The parts of the local territorial systems usually have several functions - it is not the case that an area can serve only as a gene pool and nothing else. Even a commercially cultivated forest with a natural tree composition can be a local biocentre. Local biocorridors can also help to combat erosion. However the other uses of parts of local territorial systems must not conflict with their main purpose nor should it damage ecological stability.

Projects for local territorial systems of ecological stability are gradually being processed all over the Czech Republic on a scale of 1:10 000. These projects will become an integral part of territorial plans, agricultural land-use plans and forest management plans.

Care for the landscape does not end there but it does start from the creation of a project for a territorial system of ecological stability that includes both already existing and proposed biocentres, biocorridors and interaction elements. One of the most demanding tasks is the gradual addition of the missing biocentres and biocorridors. It is no coincidence that planting biocorridors has started in the agricultural landscape of South Moravia, because it was here that the landscape was excessively destabilized, frequently with catastrophic consequences. In 1990 the first detailed projects for three biocorridors were made. In 1991 two-kilometre long, 15m wide biocorridors at Vračov and Radějov in the Hodonín region and near Křižanovice in the Vyškov region were planted in accordance with these projects. It will be several years before they begin to fully and positively influence the landscape. And it will take much longer still, certainly several decades, before the skeleton of ecological stability is successfully completed so that the territorial systems of ecological stability function as a living ecological network providing room for the existence of natural communities.

Harmonious cultural landscape of the east part of the Českomoravská vrchovina Highlands. Photo by Vilém Reichmann.

tire Czech Republic, was started (expected completion 1996).
1993: General plans of regional territorial systems of ecological stability in maps of 1:50000 scale for the entire Czech Republic, were completed.
1994: A new version of the supra-regional territorial system of ecological stability of the Czech Republic was produced (L. Binová, M. Culek et al).
A detailed method for planning local territorial systems of ecological stability was completed (J. Löw et al, and the Ministry of the Environment of the Czech Republic).
1994: Methods for landscape mapping and the mapping of phytoecososis for the purposes of ecological network creation were published (J. Pellantová et al - [Czech Institute of Nature Conservation], H. Vondrušková et al - [State Reclamation Administration], P. Repka et al).
1995: A proposal for a European ecological network in the Czech Republic was made (L. Binová, M. Culek, I. Michal, IUCN).
1995: VERONICA organized CEEWEB workshop on EECONET in South Moravia. NGO members of the Central and Eastern European Working Group for the Enhancement of Biodiversity were trained in designing, planting and care of the ecological network.

30 TSES, HISTORY
6. The Czech and European Ecological Network

An awareness of the international aspects of nature conservation and landscape stewardship has, at least in the 90's, become obvious. The common experience of European states shows that the partial, usually separate objectives of care for the countryside are in fact mutually dependent, functionally connected and in practice indivisible. They are:
- the protection of abiotic components of the environment (soil, water, air and space),
- the protection of organisms and the communities they belong to,
- the protection of the landscape as the cultural and historical basis of society's environment (the protection of the 'landscape character' resulting from the long term habitation of that particular area).
Truly effective stewardship of the land should always be the consideration when cultural activities are taking place in the landscape and it is one of the defining characteristics of sustainable development.
The separate, but closely comparable ideological concepts within this framework: the German 'Biotopverbundsystem', the Dutch 'Ecological Network' and the Czech-Slovak 'Územní systém ekologické stability' which, notwithstanding some difficulties, are starting to establish themselves as a common pillar of the future protection of European nature on national, international and decisively local levels.

In June 1991 - in the period of optimistic visions of a quickly uniting Europe, in the period of European integration euphoria after the fall of the communist regimes, a time of simplified ideas as well as exaggerated expectations, the first European conference of ministers of the environment was held in Dobřiš (in what was then Czechoslovakia). At this conference, aside from other things, the Czech 'Territorial system of ecological stability of the landscape' and the Dutch 'Ecological Network' together demonstrated the close relationship of their independently arrived at conceptual approaches. In their schematic expression these correspond.

<table>
<thead>
<tr>
<th>Czech and Slovak approach</th>
<th>Dutch approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>(supra)regional biocentre</td>
<td>score areas (min. 500 ha)</td>
</tr>
<tr>
<td>(supra)regional biocorridors</td>
<td>corridors 1)</td>
</tr>
<tr>
<td>zones of exceptional and above-average levels of landscape stewardship</td>
<td>nature development areas</td>
</tr>
</tbody>
</table>

The Dutch concept was approved by their parliament as a part of the 'Nature Policy Plan of The Netherlands', including funds from the state budget that have been smoothly rising between 1990 and 1995 from 41 to 155 million guilder. The building of the Ecological Networks in this way became an integral part of the state politics of the environment, systematically used in the decision-making process.

In December 1991 the Dutch government handed over a report on the results of the international study 'The Path towards a European Ecological Network' (EECONET) to the Council for the Environment of the European Union. According to this document, the priorities for the protection of species and their habitats should be set from a European point of view to harmonize the way in which the landscape is treated. This initiative was presented for the first time in its full form at a European seminar on mapping biotopes within the Corine programme (Strasbourg 1991).

The majority of European programmes handled to date stick to 'big concepts'. However the Dutch define in their ideas the ecological network as
we do into the most defined network, which means from national parks to individual field balks. The Dutch and Czech approaches fully agree that it is necessary to design the network through adequate processes on various levels from the supra-regional (European) via regional to local biological infrastructure and to choose the criteria for the setting up of individual elements and the corresponding stimuli for their suitable usage.

The basic programme document of EECONET was drawn up for the states of the European Union; we observed with pleasure that its extension to the former Czechoslovakia, Hungary and Poland was included in parallel in the IUCN programme. This extension followed three objectives:
- the development of a national network on the territory of each country,
- the development of national plans for nature protection that would ensure the creation of a properly functioning network,
- the preparation of a supra-regional European network and international action to set it up, that is the gradual connection of the various systems that have been created separately to form one that is adequate in size and function.

In this way, the Dutch initiative stimulates the ideas for a pan-European network of biological landscape infrastructure that could preserve a network of precious biotopes in large landscape units and in landscape details, not only on the area of today's European Union but also in the other countries of the continent.

The result of this international co-operation, initiated and coordinated by the Dutch government was a pilot study in 1993 'The Development of Rural Areas in Europe: The Claim for Nature' (Netherlands Scientific Council for Government Policy, editors N.T. Bischoff et R.H.G. Jongman) in which maps and surveys entitled 'A Tentative Ecological Main Structure' were published for the best time on behalf of all the twelve members of the European Union. We will try to show that the information base gathered to date in the Czech Republic allows us to directly follow this material and to proceed, together with our neighbours - the new member of the EU, Austria, as well as the other candidates for membership - Poland and Slovakia.

The main steps towards a 'European Ecological Network', also called EECONET or a 'Tentative Main Ecological Structure' are:
1) choosing the core areas characteristic for every biogeographical region that are to be protected,
2) on the basis of the finding of mutual ecological relationships, defining corridors for the spread and migration of the key species and their populations living in the core areas connected by the corridor,
3) applying ecologically considerate policies around these structural elements of the system so that they were protected against unwanted outside influences,
4) adding to the ecological network by the revitalization of damaged biotopes or by the creation of completely new biotopes.

He who knows the development of strategy of the Czech territorial systems of ecological stability, knows that the Czech Republic has developed a great deal from the principles formulated for the creation of EECONET and the Tentative Main Ecological Structure since the end of the 70s. Regarding 1) choosing the core areas, the present state of project preparation makes it immediately possible to choose appropriate biocentres of regional and higher significance. 2) defining connecting corridors and ensuring mutual ecologi-
cal relations between the core areas are provided for to a minimum extent by the existence of corridors of higher biogeographical significance able to function. So we have the two basic steps towards the creation of EECONET or the Tentative Main Ecological Structure not only already elaborated to an advanced stage, but also legally assured in a suitable fashion.

What is the situation with the other two steps?

Compromise usage of land ensuring 3) the protection of elements of the system against the unwanted external influences, was one of the aims of so called zones of enhanced care of the landscape defined within the framework of the concept of development of settling and urbanization of the former Czechoslovak Republic in 1986 (before the planning of territorial systems) for the purposes of the management of building based not only on scientific values but also on cultural, historical and landscape-aesthetic values as well as respecting the legislative protection of the area for water-management reasons and for the requirements of the protection of medicinal resources.

Appropriate maps of 1:50 000 scale of the whole of the Czech Republic are available and areas similar to the 'Nature Expansion Areas' category in the

The core of an ecologically significant landscape unit of the Czech-Moravian Highlands is wetland surrounded by communities of grass with a preponderance of naturally-occurring hydrophilic species. Likewise, the amphibians that are among the most endangered species, find favourable conditions for their lives in this local biocentre.

Photo: Josef Ptáček.
'Tentative Main Ecological Structure' of the European Union cover a total of 18.5% (out of that the zones of extraordinarily enhanced care of the landscape take up 6.6% and zones of of above-average care for the landscape, 11.9%). It is useful to say for the purposes of comparison that 'Nature Expansion Areas' in the individual states of the European Union occupy according to a survey from 1993 (in descending order) in Holland 30.1%, Greece 28.6%, Spain 24.4%, Great Britain 22.7%, France 18.8%, Germany 17.9% (out of that, 30.0% of the former Eastern and 17.9% Western Germany) and in Italy 10.7%.

The experience gained in specifically Czech conditions leads us to the firm persuasion that implementation of the European Ecological Network must be organically connected to the implemented landscape planning and it must be planned into the economic politics of every state. Examples from abroad can certainly stimulate the future development in the Czech Republic in an important positive direction.

That is also valid for the last of the steps of EECOMET or the Tentative Main Ecological Structure, that is for 4) creating of new elements of ecological stability through the revitalization of damaged biotopes or the creating of new ones. This activity has an utterly novel character (maybe with the exception of some water reservoirs and the experimental founding of biocorridors from the tree species in deforested countryside). Common recultivation cannot be considered a revitalization of biotopes so far because the majority of recultivation of recent times followed the fastest possible way to return the devastated areas to as intensive economic usage as possible without any regard to natural values. We know today that such a process is not only not desirable everywhere but it is also unacceptable. To ensure that the founding of new near–natural forest, meadow, marsh and water biotopes was an organic part of the present inhibition of agricultural production so that it was economically attractive for land owners is still pie in the sky for us so far.

Basic references:


This picture by Miroslav Kundrata records an erosion gully on the light sandy soil of a vineyard at Němčice in the Moravský Krumlov region, after the floods of June 1990. Renewal of the Land owners rights together with the creating of new elements of ecological stability is vital of prevent disasters.
7. CONCLUSION

One of the key political principles of the unification of Europe at the turn of the millenium is sustainable development, which apart from other considerations does not lead to a reduction in biodiversity, and preserves the natural functions of ecosystems. The necessity of putting our common knowledge of nature conservation into such projects means that we will be able to integrate it into all areas of our social activities.

The answers to seemingly, as well as truly opposing interests, demand having generally accepted requirements and conditions for the usage of the land clearly specified. There are the legislative sources for execution of land planning that include territorial systems of ecological stability, in generally compulsory documents of land development in the Czech Republic. If there is the political will to put them into practice then there is no doubt about the successful reconstruction of the Bohemian and Moravian landscape. It is obvious that the speed of such reconstruction will be dependent on the volume of available means and it will be a long-term process and many successive governments, which an open society brings, will take part in it.

Antonín Buček, Jan Lacina, Igor Michal, authors
1996, prepared for VERONICA

The realisation of projects for territorial systems of ecological stability is very complicated. The creation of new biocentres or the addition of new species to the existing ones, is very demanding, both physically and in terms of expertise. Part of the population of Leucojum aestivum in the flood plain of the lower lake of Nové Mýty was transported by volunteer nature conservationists to replacement biocentres. Such a solution to the protection of endangered species should in future happen only rarely.

Photo: Karel Hrubý

The occurrence of native species of plants is an indicator of the degree of ecological stability of permanent grass cover (meadows and pastures). Primula elatior in a meadow in Beskydy indicates a higher degree of ecological stability. Despite the fact that the preservation of the meadow community is subject to periodic human actions (mowing), its internal ecological stability is much higher in comparison with that of field cultures. Meadows and pastures with a prevalence of naturally growing species are characterized by a great variety of species of plants and animals - one of the principal features of ecologically stable communities.

Photo: Vlčen Reichmann.
8. Methodical illustrations

8.1.1. THE NATURAL STATE OF PLANT COMMUNITIES

Appendix 8.1.

Steps to define the skeleton of ecological stability and its links with the territorial system of ecological stability (TSES)

A harmonious agricultural-forest landscape on the eastern edge of the Czech-Moravian Highlands - part of the Synalov and Osíky cadasters north of Tisnov. The hilly relief of the Sykor highlands is a precondition for the diversity of the natural environment - climatic and soil conditions. Natural communities (groups of types of geobiocene) of three vegetation tiers - 3rd oak-beech, 4th beech and 5th fir-beech belonging to various trophic and hydric ranges. The present state of distribution of actual plant communities in the landscape - a consequence of long-term influence and changes in the natural communities resulting from man's activities - is very diverse. Forest vegetation of various tree composition (coniferous, mixed and deciduous) mingle with permanent grass vegetation (cultural, semi-cultural and uncultivated), fields with lines of naturally-growing trees and fruit trees and rural settlements surrounded by orchards. These types of actual vegetation differ in degree of ecological stability and significance for the protection of the gene pool of wild plants and animals. From these perspectives, the most valuable parts of the landscape are selected as ecologically significant segments of landscape in the skeleton of ecological stability. In particular, there are the remnants of forest vegetation with the natural tree structure (i.e. mostly deciduous), heathlands and lines of natural-growing trees.

6. Linden maple-woods with beech (Tilia-acereta fagi) - 4C3
7. Ash alder-woods (Fraxini-alneto) - 4B/C4
8. Horsetail fir spruce-woods (Abieteti-piceeta euquiseti) - 5A/B4
9. Spruce alder-woods (Picei-alneto) - 5B4-5
10. Fir beech-woods (Abieti-fagetata) - 5A/B3
11. Typical fir beech-woods (Abieti-fagetata typica) - 5B3
12. Maple beech-woods (Aceri-fagetata) - SC3
13. Beech maple-woods (Fagi-acereta) - SC3
14. Border of vegetation tiers
15. Border of natural communities (geobiocene type groups)

Geobiocene types groups

1. Typical oak beech-woods (Querco-fageta typica) - 3B3
2. Linden-maple oak beech-woods (Querci-fageta tiliae-aceris) - 3B/C3
3. Oak-fir beech-woods (Fageta quercino-abietina) - 4A/B3
4. Typical beech-woods (Fageta typica) - 4B3
5. Beech-woods with maple (Fageta acero-so) - 4B/C3

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Ecologically significant segments of the landscape are selected as biocentres and biocorridors of supra-regional, regional and local significance according to spatial-structural parameters given by the method of definition of the TSES. In the parts of biocentres and biocorridors where the present species composition does not correspond with the natural communities nor with the function of the TSES, it is necessary to propose a gradual change of the species structure, sometimes even a change of the type of the current community (for example planting a line of native trees as a biocorridor across fields and meadows). Some ecologically precious localities defined in the ecological stability skeleton were not included in the territorial system of ecological stability. This fact does not mean though that these parts can be freely used. In accordance with CNC law No. 114 on nature and landscape protection, they are significant landscape components that also need to be protected against damage.
CORE AREAS OF EUROPEAN IMPORTANCE IN THE CZECH REPUBLIC

The concept of the EECONET in the Czech Republic has the following components:
1. **Biocentres of Central European significance**, forming - in terms of EECONET - core areas with concentrated natural values of national and European significance.
2. **Biocorridors of Central European significance**, enabling mutual exchange of genes and individuals between core areas, with makes them biologically indispensable for the permanent existence of biocentres. At the same time they provide indubitable long-distance migration routes for living organisms.
3. **Zones of intensive landscape care**.

The proposed biocentres (core areas) are arranged according to their estimated significance for the European Ecological Network.

**1. SUMAVA**

The core area covers about 1200 sq.km., of which 1040 sq.km. are in the Czech Republic and about 160 sq.km. in Bavaria (FRG). With regard to biota it is the best preserved area in the Hercynian sub-region. The ecoloype consists mostly of acid paragnissises and small masses of granitites and granites. Along its boundaries there are marked mountain ranges and wide valleys, the central part containing an extensive remainder of flattened surface at elevations of over 1000 m above sea level.

The core area comprises regions of mountain valley peat bogs and upland bogs, probably the most extensive and most typically developed in the whole of Central Europe. It contains over 30 sq.km. of valley peat bogs and some 30 sq.km. of upland bogs, mostly covered with dwarf pine. The prevailing cultural spruce forests are very much like natural spruce forests. Natural spruce forests with beech trees are amply represented together with climax spruce forests preserved on mountain tops above 1200 m above sea level. On the Bavarian side there are mountain beech woods, on the Czech side there is an extensive area of rock and debris ecosystems on the Knížecí stolec.

The most valuable areas are around the glacial corries, some with glacial mountain lakes which are the largest lakes of this type in the whole Hercynian sub-region (Cerné jezero - Black Lake - 18,5ha). The corries contain highly variagated rosk and debris communities with the occurrence of elements of sub-alpine flora (such as dwarf pine).

**8.1.3. THE EVALUATION OF ECOLOGICAL STABILITY**

Ecological stability:

1. very low,
2. low,
3. medium,
4. high,
5. very high

38 METHODOICAL ILLUSTRATIONS
2. KRKONOŠE (GIANT MOUNTAINS)

The core area covers about 115 sq.km., of which about 85 sq.km. are in the Czech Republic and about 30 sq.km. in Poland. The ecotope consists of high mountain slopes with glacial corries and relatively large flattened surfaces above them at an elevation of some 1400 m above sea level. The rocks are mostly coarse-grained granites.

Krkonose is the highest Hercynian mountain range. It is also the only mountain range from the whole sub-region rising significantly above the upper forest boundary which results in a considerable diversity of sub-alpine and alpine communities, grasses, dwarf pine and the highest Hercynian peat bogs. Most valuable, however, are the glacial corries with extraordinarily diverse mountain biota in which Krkonose endemics occur.

3. THE TŘEBONŠKO REGION

The core area covers 180 sq.km. The ecotope consists of a flat basin floor, filled with sand terraces and depressions with peat bogs, river marshes and flood plains. The peat soils form the largest continuous areas in the Hercynian subregion. The best developed peat bogs are covered with bog pine (Pinus rotundata). Considerable areas consist of gravelsand terraces covered with local pine ecotype, the so-called Třebon sulphur pine. The number of typical ecosystems includes large ponds with littoral communities - important waterfowl nesting sites.

4. THE PODYJI REGION

The core area covers some 110 sq.km, of which some 65 sq.km are in the Czech Republic and 55 sq.km in Austria. The ecotope consists of a rocky valley, 100 - 250 m deep, with perfectly eroded river meanders and the surrounding benches. Almost the whole core area is covered with woods. Only its south-eastern edges consist of unique secondary heaths with an extraordinary representation of thermophilous and steppe elements. The woods are highly valuable, natural, as a rule, comprising a whole range of communities from thermophilous oak to beech woods.

5. THE CONFLUENCE OF THE RIVERS MORAVA AND DYJE (SOUTOK)

The core area covers some 200 sq.km, of which some 50 sq.km are in the Czech Republic and about 150 sq.km in Slovakia and Austria. The ecotope consists of loamy-clayey alluvial flats of the rivers Morava and Dyje with slightly protruding "hrudy" - remnants of sand dunes and low sandy terraces. Until the end of the eighties the prevailing part of the core area was regularly flooded by both rivers. After their canalization the flooded areas were limited. 90 % of the area is covered with woods, the remainder with semi-cultural grass. The woods generally are of high quality (with prevailing oaks and ash trees).

8.1.4. THE SKELETON OF THE LANDSCAPE ECOLOGICAL STABILITY

1. Ecologically significant segments of landscape of regional significance
2. Ecologically significant segments of landscape of local significance
3. Ecologically significant linear communities of local significance

METHODOICAL ILLUSTRATIONS 39
8.1.5. THE TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY

1. regional biocentre, 2. local biocentre, 3. supra-regional biocorridor, 5. interaction element, 6. parts of TSES with the necessary gradual change of vegetation species composition, 7. parts of TSES with necessary changes in the current type of vegetation, 8. significant landscape components

6. THE KŘÍVOKLÁTSKO REGION

The core area covers about 190 sq.km. The ecotope consists of basic palaeovolcanites with the deep (30 - 300 m) eroded valley of the river Berounka with numerous large meanders. The core area comprises also the adjacent benches of Algonkian shales with protruding lydite knobs. Almost the whole area is covered with woods of natural species composition. The prevailing beech woods merge with mixed oak and beech woods. The rocky tops are covered with thermophilous oak woods with occasional clear patches.

7. THE DOUPOVSKÉ HORY MOUNTAINS

The core area covers about 300 sq.km. The ecotope consists of Neogene stratovolcanic rocks of the basalt lava and tuff beds. The Doupov Mountains are the highest volcanic mountain range of bushes and thermophilous flora.

8. THE CENTRAL BOHEMIAN HILLS AND THE LABE BREAKTHROUGH

The core area covers about 110 sq.km. The ecotope consists of Cretaceous marls with neovolcanic cones as much as 400 m high projecting from them. The river Labe (-Elbe) broke through this mountain range, thus forming a rocky valley as much as 300 m deep with steep slopes. The most valuable communities are rocky woodsteppes.

9. THE POLOMENÉ HORY MOUNTAINS

The core area covers some 110 sq.km. The ecotope consists of thick-bedded and mildly calcareous sandstones. There are only minor rock formations. On the other hand floors with acid sands and depressions with peat bogs and several big ponds are frequent. Neovolcanic cones rise 100 - 200 m above the flat landscape. About 90% of the area is covered with woods. The remainder contains important nesting ponds with littoral reed zones, wetlands and meadows. The ponds are an important nesting site of waterfowl registered in the framework of the Ramsar Convention.

➤ Continues on p. 42 ➤
Appendix 8.2.

The Continuity of local, regional and supra-regional TSES

In the first phase of designing territorial systems of ecological stability, a network of supra-regional biocentres and biocorridors was preliminarily defined for the whole area of the Czech and Slovak Republics. The objective was, if possible, to catch the full scale of natural communities occurring in various geographical regions of our countries. Biocentres and biocorridors of higher significance (provincial and biospherical) are obviously also part of this network. The selection of supra-regional (or higher in significance) biocentres was done on the basis of the parts of landscape with the remnants of natural and near-natural communities whose legal protection has been provided for (various kinds of small-scale protected areas). Such parts, including their surroundings, have presently to fulfil spatial requirements. The principal orientations of supra-regional biocorridors connecting biocentres were divided according to the general groups of plants and animals for which the biocorridors were to allow for migration. Nature, obviously, is not aware of artificial state borders. The proposed routes of supra-regional biocorridors therefore head towards significant biocentres in neighbouring states.

In the second stage, during 1991 and 1992, a general plan of regional territorial systems of ecological stability (RTSES) was designed for the area of the Czech Republic. The network of supra-regional biocentres and biocorridors in it is enriched by many more regional biocentres and biocorridors. In comparison with supra-regional TSES a great many deal of biocentres and biocorridors that have yet to be created in a landscape changed by intense human activity, were proposed. The third stage of the proposing of TSES is organized on a local level, and in the Czech Republic has been in progress since 1992. The biocentre and biocorridor network is becoming denser and denser, but the minimum spatial parameters are substantially smaller than on the regional and supra-regional levels. It is at this stage when the local people can also show their "love of nature" by deciding to protect and care for certain ecologically precious parts of their cadaster, to grant life not only to themselves but also to wild plants and animals.

8.2.1. REGIONAL STABILITY TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY

ACCORDING LÖW ET AL., 1991

1. Regional biocentres
2. Supra-regional biocentre
3. Regional biocorridor
4. Supra-regional biocorridor
10. THE LABE SANDSTONES

The core area covers some 180 sq.km, of which 140 sq.km are in the Czech Republic and 40 sq.km in Germany. The ecotope consists of acid thick-bedded sandstones cleft by erosion into deep valleys, ravines and rock cities. The biggest of them is the Labe canyon as much as 320 m deep. Highly characteristic is the Kamenice ravine. Rock cities form a substantial part of the core area, including also the biggest natural rock bridge in central Europe - The Pravice Gate. The whole area is covered with woods, mostly of spruce, and on the rocks pine trees. The ravines are characterized by a unique temperature and vegetation inversion. Therefore, the species characteristic of higher positions prevail.

11. THE MORAVIAN KARST

The core area covers 125 sq.km. The ecotope consists, on the one hand, of Devonian limestones, on the other hand of granodiorite. Rocky valleys 100 - 200 m deep developed in limestones, acquiring the character of ravines here and there (Pustý žleb, Suchý žleb). A significant element of the area is the Macocha abyss, 138 m deep. In the granodiorite area the river Svitava eroded a narrow valley as many as 300 m deep. The Moravian Karst is dominated with woods of natural species composition.

The whole area is characterized by marked temperature and vegetation inversions. The floors of karst ravines are the habitat of rocky biota, while thermophilous biota can be found on the upper edges of the valleys. The Macocha abyss is an extreme case of vegetation inversion: its floor is the only site of Cortusus matthiiolan subsp. moravica in the Czech Republic. The specific features of the area include also ample cave fauna and extensive wintering sites of a great number of bat species.

12. THE JAVORINA - ČERTORYJE AREA

The core area covers about 110 sq.km in the Czech Republic. The ecotope consists of high, not very steep mountain ridges on top of a calcareous clayey flysh base. In the higher eastern part typical Carpathian beech woods prevail. Lower down there are about 22 sq.km of flowering Carpathian meadows with representation of a number of protected thermophilous species, in first place orchids and solitary oaks.

8.2.2. THE SUPRA-REGIONAL TSES?


1. Biocorridors of mountain species
2. Biocorridors of mesophytic species
3. Biocorridors of thermophytic species
4. Biocorridors of flood-plain and aquatic species
5. Provincial biocentres
6. Supra-regional biocentres
7. Settlements
8. Area with high and very high degrees of ecological stability
8.3.1. A PROPOSAL FOR A LOCAL TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY

(According to Ateliér ekologického rozvoje, Brno 1991)

1. The route of the planned ecological local biocorridor
2. Proposed local biocentres to be created
3. Regional and local biocentres existing in the landscape

Appendix 8.3.

An example of a local territorial system of ecological stability project

While the agro-forest landscape of the Czech-Moravian Highlands was characteristic for the sufficient number of ecologically significant segments from which local biocentres and biocorridors could be chosen, it is necessary to create parts of the territorial systems of ecological stability in strongly changed landscapes. That is due to not even small-scale remnants of close-to-natural communities being preserved.

Part of the agricultural landscape at Tesany, south-east of Brno was chosen as an example of such highly anthropogenically changed land. The unforested landscape on the border between Dyje-Svratka valley and the Central Moravian Carpathians suffers severely from wind erosion. This "shadeless land", a land of vast fields and channelled streams without accompanying bank vegetation, must be divided up by a network of biocentres and biocorridors. Instead of the poplar cultivars traditionally used as the main wind-breaks, more diverse structure of trees and bushes must be brought into the newly-created local TSES. Those species that grew here under the natural conditions were of the 1st oak vegetation degree on brown soil and marl.

A stripe along a straightened stream has been selected as suitable for the 15m wide local biocorridor. Fast growing trees (domestic species of poplars and willow-trees) are used especially as assisting trees - to create a suitable microclimate for the growth of other trees and bushes and to serve temporarily as wind-breaks. In the course of the decades they will be replaced by longer lived trees - in this case pedunculate oak and linden.
13. THE HRUBÝ JESENÍK MOUNTAINS

The core area covers 145 sq.km. The eco-
tope consists of high mountain ridges, the
only ones in East Sudeten reaching above
the upper forest level in a major area. Sig-
nificant features are deep eroded valleys
and waterfalls as well as minor peat bogs.
Over 90 % of the area is covered with
woods. The areas covered with sub-alpine
communities lack autochthonous dwarf
pine, as a result of which the loose spruce
forests at the upper forest boundary change
directly into sub-alpine grassland. The tops
of the bare ridge host a number of rare tax-
ons, such as the Jeseník endemics - Cam-
paucla bohemica subsp. gelida (the Bohe-
mian bluebell) and Poe riphea.

14. THE LITOVEL MORAVA BASIN

The core area covers 70 sq.km. The eco-
tope consists of the broadened sandy-loamy
floodplain of the river Morava and mildly
rolling hills on top of Kulm greywackes
and gleyfield loess loams. It includes also a
small limestone hill near Mladěj. The river
Morava follows its natural bed with a num-
ber of meanders. Its floodplain is covered
mostly with natural floodplain woods.

15. THE AUSTERLITZ FOREST
(SLAVKOVSKÝ LES)

The core area covers some 105 sq.km. The
eco-tipe is created by a tectonically raised
block, with a flattened surface and relative-
ly steep peripheral slopes. The rocks consist
mostly of granites and amphibolites.

The area has the largest serpentinite island in the
Czech Republic in a mountain position.

Most of the core area is covered with
woods. Mountain peat bogs (the largest of
them has an area of some 140 ha) form a
significant part of the core area. Some of
them contain springs of mineral waters.

16. THE PÁLAVA REGION

The core area covers some 45 sq.km. and
consists of a number of highly different eco-
topes, mostly of unique character, without
any possibility of expansion. It is situated in
the warmest region of the Czech Republic.
The most valuable territory is the rocky
klippe (lost mountain), the most
significant in the Czech Republic. Its sou-
thern slope is covered with rocky and grassy
steppe, partly secondary, with a number of
rare thermophilous fauna and flora species.
17. THE RIVER ORLICE BASIN
The core area covers some 110 sq.km. The ecotype consists of lowland rolling country with the 1.5 km wide floodplain of the River Orlice in its axis. In this section the river is not canalized (it is the best preserved water course in the Bohemian basin) and forms numerous meanders and dead branches. About 90% of the core area is wooded.

18. THE ZDÁRSKÉ VRCHY HILLS
The core area covers some 145 sq.km. The ecotype consists of flat gneiss ridges with projecting rocks and extensive boulder fields. The eastern edge is occupied by a uniquely developed floodplain with the meanders of the river Svatka. About 90% of the area is covered by wood.

19. THE DRAHANY REGION
The core area covers about 110 sq.km. The ecotype is monotonous and consists of the Kulm greywhacke and conglomerates. The area has an upland character with a dense network of deeply cut valleys, mostly without bedrock outcrops. The whole area is situated in an army training region, and is almost completely covered with extensive forests with prevailing beech woods.

20. THE LABE FLOODPLAIN
The core area covers some 20 sq.km. The ecotype consists of sandy and loamy floodplain broadened by the sandy terraces of the river and minor sand dunes. The dominant feature is natural floodplain woods.

21. THE JIZERA MOUNTAINS
The core area covers some 120 sq.km, 110 sq.km of which are in the Czech Republic and 10 sq.km in Poland. The mountain range consists of a granite massif. At its north end there is a steep rocky slope with waterfalls, the southern part consisting of peak benches with peat bogs. In the southeast there is a basalt knob and the eroded bouldery river-bed of the Jizera with a great fall. Almost 100% of the area was initially covered with forests, mostly spruce forests with some beeches. These forests were practically destroyed by emissions, leaving only extensive peat bogs with dwarf pine cover. On the north slope there is still the largest complex of mountain beech woods in Bohemia, covering some 2 000 ha. In spite of heavy pollution these beech woods are in relatively good state, only the intermingled spruce trees withering and dying.

22. THE MOHELNO SITE
The site covers only about 5 sq.km and ranges among unique small-area biocentres. Its unique character is due to its serpentine bedrock and the marked morphology of the eroded, approximately 100 m deep valley with deep river meanders as well as a warm and dry climate. The southern slopes are covered by the so-called Mohelno steppe - a loose growth of serpentine pine woods with major clear patches and rocks.

23. THE ORLÍK - RANÁ SITE
The site covers some 10 sq.km. The ecotope consists of basalt cones of the Central Bohemian Highlands, 150 - 200 m high, with a warm and very dry climate. The cones are covered with so-called continental steppes which, however, are conditioned anthropogenically to a certain extent. The southern slopes of the hills are grassy, the northern slopes being covered with woods. The prevailing part of the area at the hill foot is covered with secondary meadows, often with bushes.

24. THE SOOS SITE
The site covers only 2 sq.km. The ecotope consists of the basin floor with numerous mineral water springs and gas emissions. The core of the site consists of a shield practically devoid of vegetation, merely with gas and mineral water emissions and salt efflorescence. The site represents the most extreme location with mineral springs in the Hercynian subregion.

25. THE POUZDRÁNY HILLS
The site covers about 2 sq.km. The ecotope consists of steep slopes on hills on a calcareous sandy flysch base with loess cover. Its unique character is due to very warm, dry climate and long-term extensive exploitation. The site is mostly covered with partly original, partly secondary kavyl steppes.

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**EECONET in the Czech Republic - the first draft**

**LEGEND OF AREA ELEMENTS**
- Core Areas (Keystone Areas) of EECONET
- Nature Development Areas of EECONET (Particular Landscape Management Zones)

**LEGEND OF LINES ELEMENTS**
- Course of Bioscorridors of EECONET
- Boundary of Distict
- Boundary of the Czech Republic

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