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**International Workshop for CEE Countries**  
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Sucha Beskidzka, Babia Gora National Park, Poland

**CASE STUDY**

**The tourism potentials and impacts in protected mountain  
areas**  
**SUMAVA BIOSPHERE RESERVE**  
**Czech Republic**

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# 1 General Introduction

## 1.1 Situation

The Sumava Biosphere Reserve includes a substantial part of the northeast-facing amount of Bohemian Forest, a large Hercynian middle-mountain range to the north of the Alps, almost at the geographical centre of Europe. The main mountain ridge, barely apparent in places, straddles the border between Czech Republic and Germany or, in the southernmost part, Austria.

For most of its 90 km length, the Sumava BR is about 10 km in width, though in parts it is 20 km wide. In summary Sumava varies in altitude from 1.378 m at the summit of Plechy, on the Austrian border in the southeast half of the Biosphere Reserve, to 490 m, in the northwest corner of the Reserve, where the Uhlava river leaves the Nyrsko reservoir. With more than 450 km<sup>2</sup> situated higher than 1.000 m, the Sumava BR (and National Park) represents the largest continuous area of this altitude in the Czech Republic (Jenik & Price, eds. 1994)

## 1.2 Nature Characteristics

Following part, describing basic nature characteristics, is focussed mainly to the area of National Park because of the fact the most precious and representative ecosystems can be found there.

### 1.2.1 Geomorphology, geology and pedology

#### Geomorphology

The area of the Bohemian Forest (termed Sumava in Czech, but hereafter used for the Czech side of the Bohemian Forest only) belongs to the largest and eldest mountain range in central Europe, with extensive relicts of mountain plains lying at several altitudinal levels above 1.000 m a.s.l. These relict areas are located in the central part of the mountain range and are known as the Sumava Plains. The Bohemian Forest mountain range, which has a remote geomorphologic position with respect to the main European erosion base, creates part of the divide between the Black Sea and the North Sea. The Sumava Plains are considered as one of the eldest relicts of palaeorelief in Europe.

The present topographical relief of Sumava is a result of the intensive processes of tropical weathering that took place before the cycles of denudation. In the Pleistocene (Early Quaternary), cryogenic and glacial processes prevailed.

From the point of view of the exodynamic development of the relief, central Sumava might be divided into four units of denudation - the result of the more-or-less long-term polygenetic and polycyclic impact of denudation on the geological structures of the Šumava Mountains.

These are:

- 1) Relicts of Palaeogene to Mesozoic peak palaeorelief at three altitudinal levels above 1.000 m

The highest and, most likely, also the eldest remains of old relief can be found on the flattened peaks of Velký Javor (1.457 m) and Roklan (1.453 m). On the very top of Roklan, a

resistant quartz vein is apparent, while the area of Javor peak has probably been influenced by tectonic activity.

Altitudinal levels about 1.300 m are more extensive and located mainly in the vicinity of Polednik (1.315 m) and Zdanidla (1.308 m). Their preservation has been helped by more resistant quartzite areas on Polednik and migmatites on Zdanidla. Another high-altitude group is created by Blatny vrch (1.367 m), Luzny (1.373 m), Velka Mokruvka (1.370 m), Cerny vrch (1.315 m) and Straz (1.308 m). All the forenamed peaks contain more resistant bedrock.

The largest extent of paleorelief relicts at the altitudes of 1.000 to 1.100 m are found around the Kvilda Plains, with smaller areas at the Kochanov Plains.

#### 2) Foothill relicts of Late Palaeogene planation palaeorelief at 700 - 850 m

These are represented by relatively extensive levels at elevations between 800 and 850 m, fringing the area of the Kremelna stream and its spring tributaries. These levels create the upper part of the lower palaeorelief that is located in the Sumava foothills at an altitude of about 750 m.

#### 3) Morphologically-important, faulted and structurally-exhumed relief

This unit is represented by denuded faulted areas of the Sumava foothills fault system. Here, the Palaeogene planation stopped and a 300 to 400 m high denudation step was created that divides the older palaeorelief relicts of the Sumava Plains at an altitude of 1.000 to 1.100 m from the younger palaeorelief relicts of the Sumava foothills at an altitude of about 750 m.

#### 4) Plio-pleistocene erosion valley network

The unit of deep-erosion valleys of the River Otava and its tributaries has the different character of the plio-pleistocene period, which more or less divides all the palaeorelief levels of Sumava. The valley of the Vydra River divides the units of Kvilda and Kochanov plains. Retrograde erosion used the zone that was weaker as a result of tectonic activities, containing as it does faults in a North-East, North-West and North-South direction. Abundant intensive erosion and gravitational processes have occurred on the erosion slopes. The network of deep valleys differ markedly from the flat, shallow valleys that model the relicts of upper palaeorelief. Both systems are usually connected by way of a deep erosion step in the stream bed (Zelenkova, eds. 2000).

### **Geology**

From the point of the region's geology, the territory of the Sumava National Park is formed from two basic geological units – Moldanubicum and Moldanubic pluton. Moldanubicum is characterised by medium to strongly metamorphic rock, with a predominance of paragneiss and migmatites, often with an intercalation of quartzites and erlans. In the given region they are considered to belong to the so-called monotonous unit. In Šumava, Moldanubic pluton is represented by several larger granite massifs, as, for example, Prášily Massif, Massif of the Vydra River, and the Massif of Plechy. In surrounding areas, there are several smaller granite units. These intrusions are, in general, of Variscan or Upper Palaeozoic times; the granite of Weinsberg type is considered to be older (349 mill. years), while the granite of Eisgarn type is younger (316 mill. years - after Scharbertova 1987). At the southeastern edge, the granite of Rastenberk type reaches the territory of the National Park. The accompanying veins are represented mainly by granite porphyry and so-called veined granite.

Of quaternary sediments, the most common are eluvial (colluvial) deposits of solifluction origin; very abundant, also, are peat deposits, while less abundant are fluvial and eluviofluvial deposits, and sediments of glacial origin are rare. As far as the stratigraphy is concerned, sediments originate mostly from the Pleistocene, and pertain also partly to the Holocene and Recent period. The composition of colluvial deposits is highly variable, from clay to loamy sands, clayey-stony sediments to block deposits of varying thickness. Boulder fields are found resulting from weathering and the erosion of granite areas.

Fault zones, oriented WNW–ESE, NNW–SSE (to N–S) and NNE–SSW, represent important tectonic systems. Their age is estimated to be of the Late Palaeozoic to the Tertiary period (Zelenkova, eds. 2000).

## **Pedology**

The Sumava region has an overall mountain character with a predominance of acidic rocks. The high mean altitude of the territory (only small areas are below 600 m), the relatively flat land surface (suitable for the development of semihydromorphic and hydromorphic soils), and generally mild climate, are the specific features that are decisive in making Sumava soil types differ from the soils of other mountain areas of the Czech Republic.

The most important soil types are the following:

- **Cambisol** (acidic brown soil) is predominantly of a zonal character and occurs, in larger areas, at lower altitudes of the territory, mainly up to 800 m. Usually found on medium-thick weathered bedrock. Native vegetation cover would be herb-rich beech forest.
- **Cambic Podzol or spodo-dystric Cambisol** (rusty soil) creates a more or less continuous altitudinal belt between 1.000 – 1.200 m. At the northern edge of this zone, the Cambic Podzol substantially alternates with Podzols. Found on medium-thick weathered bedrock with a higher percentage of skeletal material. The original vegetation cover would be mainly acidophilous mountain beech forest.
- **Podzol** (podzol) occurs on the highest continuous altitudinal belt above 1.200 m (on areas with a suitable substrate and microclimate it may occur at an even lower elevation). Its continuous extension is, however, by about 200 m, at a higher altitude than in the mountains of northern Bohemia. Skeletal weathered bedrock creates a substrate for podzol; native vegetation cover would be mountain spruce forest.

On exposed landforms or scree substrate occur **Lithosol** (raw soil) or **Ranker** (ranker). Also important is the occurrence of semihydromorphic soils, found usually in land depressions filled with Pleistocene sediments of the type polygenetical clay, often mixed with skeletal material, or on deeply-weathered bedrock. A typical feature of this soil group is the periodical stagnation of surface water. Here should be also mentioned: **Dystric Planosol** (pseudoglej), **Stagnogley Planosol** (stagnoglej), **Fluvisol** (nivní půda, alluvial soil) forming on alluvial sediments or **Gleysol** (glej). A typical phenomenon of Šumava is **Histosol** (peat) (Zelenkova, eds. 2000).

## 1.2.2 Climate

### Air temperature

Mean annual temperatures range from 6.0 °C (at 750 m) to 3.0 °C (at 1.300 m). Exceptions are found in some inversion localities in valleys and forest clearings that, on average, are colder than would be expected at their particular altitude. In this respect should be mentioned the valley of the Vltava River between Horni Vltavice and Lipno Reservoir, and unforested clearings in the area of Šumava Plains (Plane), i.e. Jezerni slat (peatbog), the settlement of Horská Kvilda, and peatbogs southwest of Modrava. In the extreme conditions of the Jezerni peatbog, summer months are on average 2°C colder, and winter months up to 4°C colder, than peak exposures at the same altitude. Narrower valleys, for example, of the Otava River, are relatively cold but not as cold as the above-mentioned areas. The warmest month is July, the coldest January.

Average temperatures can also be characterised by the number of ice-days ( $t_{\max} < 0$  °C), that, in Sumava, amount to 70 ice-days per year at the altitude of 1.200 m and to about 40 ice-days per year at the altitude of 700 m. Similarly, there are about 170 and 140 frost-days ( $t_{\min} < 0$  °C) per year, respectively, but the relief has a strong influence here, i.e. in inversion localities at higher altitudes there might be, on average, up to 250 frost-days per year.

### Air humidity

The average annual air humidity is about 80% in most areas. Fluctuations in humidity during the year are relatively low. The maximum humidity is reached in December, while the minimum is usually between May and July.

### Wind

Wind direction and speed are strongly affected by local topography among the Sumava Mountains. On average over the year, the highest wind speeds are recorded over open (unforested) convex exposures, ranging between 5 to 8 m/s. In contrast, in enclosed deeper valleys, mean wind speeds may be about 1 to 2 m/s.

The prevailing wind direction over the whole year is from the west to southwest, more so in winter and summer periods, while in spring, the frequency of northerly winds increases, and in autumn, also that of southerly winds.

### Cloudiness and sunshine

The average annual number of cloudy days, at lower altitudes, is about 58% (however, this figure from Lenora is most likely to be an underestimate), while at higher altitudes, and especially along the state border, it is between 64 to 70%.

The opposite ratio to cloudiness is the total duration of sunshine over a given period. In Sumava, there is sunshine for about 35 - 40% of the time, i.e. some 1.600 – 1.800 sunshine hours per year.

The highest frequency of days with fog (about 200 days) is on peaks above 1200 m, peaks that are often covered by clouds. There is less fog towards lower altitudes, with the lowest frequency (< 50 days) found on sloping localities at lower altitudes. On enclosed, concave-shaped ground, there is again a higher frequency of foggy days, due to the occurrence of low or ground-level radiation fog.

### Precipitation

Within the given area, the lowest average annual precipitation is along the north-eastern edge, amounting to 800 - 900 mm. Towards the mountain range along the main border, the

precipitation substantially increases, to about 1.400 – 1.500 mm, with the highest values being found south of Brezník, some 1.600 mm or more. Between Strazny and Nove Udoli, annual precipitation is about 1.200 – 1.100 mm. Such a pattern of distribution is caused by the orography of the area, where, due to the prevailing westerly winds, most precipitation falls in Bavaria and along the state border, whilst the north-eastern slopes remain on the leeward side. The main precipitation maximum falls in June and July, a secondary maximum then being in December, connected with the increased frequency of westerly winds during that period.

### **Snow cover**

Most snow falls on the highest altitudes along the state border, mainly in the area between Debrník and Cerna Hora, and from Tristolnicnik to Smrcina. The least snowfall is at the lowest altitudes in the north-east. Continuous snow cover is present, on average, for 90 to 100 days a year at the lower altitudes, and can be for more than 200 days at the highest altitudes. The average maximum height of snow cover is between 40 cm, at lower levels, and up to 150 cm and more at higher altitudes (Zelenkova, eds. 2.000).

### **1.2.3 Flora and Vegetation**

As far as phytogeography is concerned, and within the context of broader relationships, the whole Sumava mountain range is situated in the central European province of the central European temperate zone floristic district.

The Sumava foothills and lower parts of the Sumava mountain range belong to a mesophytic phytogeographical area, characterised by zonal vegetation of central European deciduous forest, located in a supracolline to submontane vegetation belt, with a climate that borders between mild oceanic to mild continental.

Not complying with these mesophytic characteristics is an extrazonal cold-loving montane flora – oreophyticum, where, with only a few exceptions, warm-loving species are completely missing. Oreophyticum is found in a montane to supramontane vegetation belt (and outside the Czech Republic also in a subalpine vegetation belt).

In addition to the three principal zonal vegetation units – belts of species-rich beech forests, acidic montane beech forests, and climax spruce forests - a number of natural climatic azonal communities, or entire ecosystems, are present, usually as a result of edaphic conditions, i.e. high groundwater levels, paludification processes, high content of soil skeletal material, rocky relief, etc. These communities are usually mires, floodplain forests, waterlogged spruce forests, relict pine forests and forest-free boulder fields, scree mixed forests, the ecosystems of glacial cirques, rare relicts of natural, mainly wetland and frost-induced, forest-free areas, forest-free spring ecosystems, and ecosystems of standing and running waters.

Nowadays, typically characteristic vegetation belts have been broken up, partly due to deforestation but mainly because of the replacement of original forest communities by spruce monocultures.

The total number of higher plants within Sumava NP is about 500 species, 69 of which are protected species. A more detailed synopsis of plant taxons important for conservation has been prepared in the form of tables that also stipulate the vegetation formation in which a given species is most often found. For the preservation of the current species diversity of the Sumava National Park, it is essential to preserve the unforested, grassland communities that require different levels of management.

## Natural forest communities

Species-rich beech and fir forests – were once the most common, widely-spread, zonal vegetation unit of Šumava, reaching up to elevations of 1000–1050 m. These forests were dominated by spruce (*Picea abies*) and beech (*Fagus sylvatica*), with lower percentages of fir (*Abies alba*), intermixed with sycamore (*Acer pseudoplatanus*) and wych elm (*Ulmus glabra*). These communities have a rich herbal under storey represented by 30-50 herb species.

Acidic mountain beech forest used to cover a variably wide zone between the species-rich beech forest and climax spruce forest, at elevations up to almost 1300 m. Only in the area of the Sumava Plains, and at Kralovský Hvozd ridge, were they once more extensive.

Climax spruce forest is native at elevations above 1200 m, i.e. covering the highest ranges and peaks of the Sumava mountains. The tree canopy is formed by the Sumava ecotype of Norway spruce (*Picea abies*), with scattered rowan (*Sorbus aucuparia*). In the under storey, villous small-reed (*Calamagrostis villosa*) usually dominates.

Azonal vegetation units within the Šumava NP include waterlogged spruce and fir forests that cover comparatively large areas adjacent to mires, as do spruce stands on peaty soils. Valley-bottom alder stocks (or spruce-alder stocks), dominated by grey alder (*Alnus incana*), occur at lower altitudes along larger streams. Scree and ravine forests are deciduous or mixed forests with high percentages of sycamore and wych elm within the belt of species-rich beech forests, differing only by having a higher proportion of some species in their under storey. Relict pine woods and pine-birch woods grow on rocky outcrops (tors) and on boulder fields, and are mainly found in the central part of Sumava (Povydrí) or in the valley of Losenice. The most important azonal vegetation formations of Sumava are the communities of mires.

## Mires

Two mire types are distinguished in Sumava:

- minerotrophic mires (fens) – these create the vegetation complex of peaty grasslands and spring mires, located mainly in the man-induced unwooded areas, and whose development, even if not directly, has been influenced by the traditional cultivation of the landscape and by their direct contact with spring areas, and
- ombrotrophic (oligotrophic) mires (bogs) – valley-raised bogs (in the valley of Vltavský luh) or high-plateau bogs (e.g. Sumava Plains). Ombrotrophic mires are characterised by the dominance of the hybrid-creating, markedly-variable populations of pines, *Pinus mugo* - *Pinus rotundata*, also connected, through hybridization, with *Pinus sylvestris*.

## Edaphic vegetation complex of lakes and glacial cirques

The complex of azonal communities of Sumava lakes and glacial cirques consists of subalpine, short-stem grass and shrub communities; stands of dwarf pine on exposed bedrock; tall-herb and fern floodplains; and tall-stem, subalpine grasslands at the foot of rocky crags.

## Edaphic vegetation complex of Sumava Plains

Of high value is the complicated vegetation complex of the Šumava Plains, which possesses the biggest concentration of edaphic climax communities creating a highly diverse mosaic of habitats of climate climax communities (acidic mountain beech wood, climax spruce stands). However, these have been replaced with spruce monocultures or clear-cut areas which are difficult to re-afforest. What has been preserved has been mires in different stages of succession, including spring mires, spruce stands on peaty and waterlogged soils, spruce stands on scree, non-forested

scree areas, and rare natural wetlands and frost-induced grasslands (subalpine meadow springs).

#### **Edaphic vegetation complex of the Upper Vltava River basin**

The diverse complex of aquatic, wetland and mire vegetation in the Upper Vltava River basin consists of communities of floating and submerged vegetation in streams, stands of tall and short sedges, reed beds of the stream littoral, tall-herb alluvial grasslands, littoral and waterlogged tall-herb stands, and in places, extensive stands of the shrub *Spiraea salicifolia*, birch wood on peaty soils, and scattered waterlogged and valley mires with *Pinus rotundata*.

#### **Vegetation of human-induced grasslands**

Highly important and valuable, and inseparable from Sumava, are the human-induced communities of grasslands. These grasslands are usually not primary (in the sense of a geobotanical reconstruction of vegetation), however, in many places they have a highly natural character. They are mainly wet, waterlogged or peaty meadows to meadow mires (also tall-herb alluvial grasslands), mesophytic meadows and pastures (montane meadows with *Agrostis*, *Trisetum* and *Polygonum*, and short-stem pastures), semi-xerophytic grassland communities and scrub communities of heaths and stony ground (Zelenkova, eds. 2000).

### **1.2.4 Fauna**

The fauna of the Sumava Mountains has reached its present-day appearance since the postglacial period and was, originally, of a purely woodland character. Significant changes in the species composition of fauna have occurred with the increasingly extensive colonisation of Sumava by humans. This, on the one hand, has resulted in the establishment of new species typical of open (non-forested) landscape and also of synanthropic species. On the other hand, the numbers of some animal forms that are dependent on natural habitat have been reduced, the structures of animal communities have changed, and animal populations have become fragmented. Some species have disappeared completely, not only due to the destruction of their habitat but also as a result of hunting (large game, some birds of prey and owls).

As far as zoogeography is concerned, the fauna of the Sumava Mts. is made up of species with a wide holarctic or palaeartic distribution, species typical of the central European region including alpine and carpathian species, but also sub-Atlantic and Atlantic species, or East (Black-Sea)-Mediterranean species, and others. Furthermore, there are several endemic species to be found in Sumava - or, for example, Sumava-alpine species or sub-species (especially important amongst the insects). The faunal communities of some habitats, such as mires and climax spruce forests, are dominated by species with a disjunct distribution of boreo-montane, boreo-alpine or arctic-alpine character.

For the occurrence of native forest species and communities primary ecosystems are important, however, only fragments remain. Original habitat supports the already-mentioned boreo-montane and boreo-alpine fauna, usually relict in character. In most cases, these species form only very small populations. In several cases, their long isolation during the postglacial period has led to the appearance of specific sub-species.

Among the species that permanently occur within the territory of Sumava NP, about 100 species belong to the category specially-protected animal species.

The most important habitats for fauna are given below:

## **Mires**

Mires provide important habitats - especially for invertebrates, which often form specific mire communities with a high number of relict forms. As model taxonomical groups those which have been intensively studied are spiders (*Araneae*) or butterflies (*Lepidoptera*). A high number of tyrphobionts and boreo-alpine species are found amongst the dragonflies (*Odonata*) or the various families of beetles (*Coleoptera*). Additionally, communities of water bugs (*Heteroptera*) found in mires show a high number of relicts. Highly unique are the true-flies (*Diptera*). During a research programme started in 1990, many species new for Bohemia, as well as for central Europe, have been described. These are mostly Nordic forms with a disjunctive distribution.

## **Glacial cirques and lakes**

These are highly specific biotopes with a number of relict or extremely-endangered species of fauna, such as: *Oreonebria castanea* ssp. *sumavica* (*Coleoptera: Carabidae*) – found in Cerne lake, *Glenocorisa propinqua propinqua* (*Heteroptera*) (arcto-alpine disjunction) – found in Plesne lake.

## **Boulder scree slopes**

These habitats have been protected as geological formations for some time. In recent years, their importance for Nordic forms of invertebrates, for faunal forms found in caves or forms typical for scree have been recognised.

## **Streams**

Very valuable are populations of pearl mussel (*Margaritifera margaritifera*), noble crayfish (*Astacus astacus*) and possibly also crayfish (*Astacus torrentium*).

Regarding the biodiversity of aquatic insects, important are some species of mayflies (*Ephemeroptera*), caddis flies (*Trichoptera*) and stoneflies (*Plecoptera*). Almost all streams within the Sumava NP belong to the trout zone, including the Vltava River, where the fish communities, however, are highly influenced by fish species of the Lipno reservoir entering the river. The littoral stands along streams are an important habitat for the nesting of a relatively-rich bird community. The whole of the Sumava Mts. and Sumava foothills forms one of the most important regions in the Czech Republic for otter (*Lutra lutra*). The diverse natural banks of small streams and brooks, especially at higher altitudes, are home to the alpine shrew (*Sorex alpinus*).

## **Natural mixed forests**

In mixed forests of a natural character, important communities of terrestrial molluscs and invertebrates are found. Natural mixed forests are also important refugia for several critically-endangered vertebrate species, for example, the white-backed woodpecker (*Dendrocopos leucotos*), Ural owl (*Strix uralensis*), red-breasted flycatcher (*Ficedula parva*), lynx (*Lynx lynx*), hazel grouse (*Bonasa bonasia*), Bechstein's bat (*Myotis bechsteini*), etc.

## **Natural mountain spruce forests**

These are highly important ecosystems for the biodiversity of the Sumava Mts. A number of boreo-montane and boreo-alpine species, both of invertebrates and vertebrates, are found here, as, for example, the beetles *Harpalus solitaris*, *Leistus piceus*, *Trechus alpicola*, *Carabus arcensis* (*Carabidae*), grasshoppers *Barbitistes constrictus* and *Isophya pyrenaea* (*Ensifera*), butterflies *Erebia euryale* (*Lepidoptera*), birds, Tengmalm's owl (*Aegolius funereus*), pygmy owl (*Glaucidium passerinum*), capercaillie (*Tetrao urogallus*), ring ouzel (*Turdus torquatus*) (*Aves*), and mammals, northern bat (*Eptesicus nilssonii*) (*Mammalia*).

### **Man-induced grasslands**

Secondary (man-induced) grasslands are host to both typical and rare Sumava species, and communities. The most important are remnants of meadows and pastures that have not been influenced by intensive agricultural practices. One particular phenomenon is that of unmanaged grasslands, long abandoned, those are undergoing a spontaneous renaturalization process, and are at different stages of secondary succession. These sites are valuable for important nesting birds.

### **Artificial water bodies**

Small water bodies, including some temporary ones, are essential places for amphibians breeding, mainly smooth newt (*Triturus vulgaris*), alpine newt (*Triturus alpestris*), common frog (*Rana temporaria*), common toad (*Bufo bufo*), and at lower altitudes in the surroundings of Lipno reservoir, tree frog (*Hyla arborea*); and also important for several species of water insects. Unique habitats are provided by Lipno reservoir, host to a characteristic fish community and, due to its large size, is an important stopover for several bird species on migration; in some cases it is also a nesting place of some species that do not otherwise nest in this region.

### **Human settlements, urban habitats, and technical constructions**

Old mining sites often provide suitable habitat for the overwintering of various bat species, including protected ones (altogether 17 species of bats occur within the territory of the Sumava Mts., of which 13 species regularly overwinter in these underground 'caves') (Zelenkova, eds. 2000).

## **2 The human dimension**

### **2.1 Forestry**

Forest ecosystems within the Sumava NP cover more than 54,000 ha as given by the land-register, i.e. 80% of the total area of the NP and such forests determine the character of the area. Including area of buffer zone of BR (PLA) the forests cover more than 60% of the area. That means the forestry represents the main activity from many points of view.

Before establishing of the Sumava NP (1991) most of forests were owned by state and managed by the country's biggest forestry company, state owned The Forests of the Czech Republic (LCR), and by The Military Forests and Estates (VLS). According to the new law a management of forests inside of NP has been assigned to the Sumava NP and PLA Administration in 1993. According to the Czech law CNR 242/2000, the act by which the ownership of some land was given back to municipalities, 6,000 ha of forest land came over to some of local towns and villages.

Since the creation of the Sumava National Park, the aims of forest management within the territory of the NP have substantially changed. The utmost goal of the management of forests within the Sumava NP is the conservation of ecosystems including the conservation of natural processes.

Regarding the geographical location of the Sumava mountains, all nature conservation measures to be applied here have to be carefully considered in relation to the landscape character as well as to the many functions performed by forests, such as their hydrological function, the role forests have in soil protection, and their moderating influence on local and regional climate – functions that go far beyond the borders of the National Park (Zelenkova, eds. 2000).

|   |                  |          |
|---|------------------|----------|
| <b>Total area of the NP</b>                                     | <b>68 064 ha</b> | <b>%</b> |
| forest land according to land-register                          | 54 572 ha        | 80.1     |
| forest-free land (e.g. meadows, etc)                            | 2 550 ha         | 3.7      |
| protection forest (overlapping with special-purpose forest)     | 18 409 ha        | 27.1     |
| special-purpose forest (not overlapping with protection forest) | 36 103 ha        | 53.0     |

The ownership out of NP ha has left on a level before the change of political system in 1989. However, some changes towards private ownership (especially new small owners – farmers) have happened. The structure of ownership in PLA has left similar to the situation in the Czech Republic. LCR manages 63% of forests in the country, private owners 22% and municipalities 14%.

Due to substantial changes in ownership and bad situation on the market with timber (prices in CR fell by around 14% since 1998) many smaller local sawmills went bankrupt and local market with timber fight for its survival. According to some long-term prognosis timber prices are expected to grow by around 5% on the Czech market in the next few month.

## 2.2 Hunting

Hunting has represented a traditional form of activity connected with the large forest abundance in the Sumava Mountains for ages. Till 1991 hunting was a natural part of forest management structure in the region. Commercial hunting was cancelled in the Sumava NP in 1995 and complete hunting management has been done as non-profitable by NP's staff since that time. New Czech hunting law was approved last year but its influence on hunting inside of NP is not substantial.

Out of NP (in PLA) hunting represents a subject of commercial interest and the rules for that activity allow get some profit to the owners.

Large discussions on the topic of animals put on the list of game/protected animals have divided sharply "classical foresters" from "nature protectionists". The special regulations of hunting inside of NP represent a challenge for big pressures of some lobbies as well. Some of new form of landscape management (all year round pasture - unrestricted grazing) has brought some problems how to save a security of grazing animals. After several attacks of lynx local farmers called for new rules of protection/hunting some predators. The Ministry of Environment has tried to solve that problem with creating some compromise solution.

## 2.3 Agriculture

### 2.3.1 History

Traditional agriculture, which successively became more established on most deforested areas of the Sumava Mountains in the past, has contributed to the contemporary picturesque character of the mountain landscape and led to the development of a number of new meadow communities of great species-richness. These systems, created and maintained by human activity, considerably enhance both the species and habitat diversity of the region. An abrupt change in management occurred in the second half of the 20<sup>th</sup> century, by the evacuation of the local inhabitants and the creation of a frontier military zone and other military areas. As a consequence, the traditional agricultural practices had disappeared from the whole of the frontier part of the Sumava Mountains in a very short time span.

Nowadays, a major part of the meadow ecosystems of the Sumava National Park has been degrading as a result of the absence of suitable agricultural management, or, locally, has been devastated by intense agricultural production. The long-term protection of non-forest ecosystems and their natural values needs a certain “renaissance” of wise agricultural management in the Sumava Mountains. The management plan for non-forest ecosystems must, however, also include the rectification of the consequences of the preceding intensive agriculture in the area (Zelenkova, eds. 2000).

### 2.3.2 General principles for active conservation of non-forest ecosystems

- Out of NP using of agriculture as a main tool in the buffer zone of NP – PLA to preserve a landscape biodiversity.
- Inside of NP inclusion of a majority of valuable areas of anthropogenic non-forest areas into Zone II, because active agricultural management is required for their conservation. Only large non-forest areas whose character enables them to be left to their long-term spontaneous development (some wetlands, floodplain segments, successional areas) are parts of Zone I.
- Exclusion of valuable non-forest areas occurring within Zone III from lists of areas scheduled for sale as private property (*author’s note: There is possibility to privatise agricultural land in Zone III of NP according to current Czech laws*).
- The selection of a suitable management is based on an assessment of the current condition of the vegetation .
- The management of non-forest ecosystems requires a certain stimulation through the use of subsidies (Zelenkova, eds. 2000).

#### Aims

- |   |
|---|
| <ul style="list-style-type: none"><li>• Maintenance of anthropogenic non-forest areas in the upper parts of the Sumava Mountains with the aim to preserve the landscape character and biodiversity, to be kept approximately at its current extent.</li><li>• Conservation of most currently-existing areas of secondary grasslands that do not show signs of an advanced development towards forest.</li><li>• Leaving of areas in advanced stages of succession to their natural development.</li></ul> |
|---|

### 2.3.3 Current state of agriculture

At the time of establishing of the Sumava NP in 1991 almost all agricultural land was used by Country Estates and Military Country Estates. During last decade of existence of NP some positive changes have happened. More and more cattle are possible to see on meadows and pastures. Breeding of animals without milk production for market has brought a new system of agriculture to the mountains. The land is used more extensively now and the pressures on landscape have decreased substantially. Now we can speak more about landscape maintenance than about agricultural production. According to the new Czech law CNR 242/2000, the act by which rules for ecological agriculture have been set out, the position of local farmers in such a special conditions of the Sumava NP or PLA seems to be much better than before. Beside of common agricultural management new special management programs have been realized to save gene pool of some special plants and animals.

The structure of ownership of the land is different. Co-operative forms of ownership surviving from the widespread co-operative farms and a new private ownership represent prevalent

forms of use of land in mountains. The most of land in NP is owned by state and land has been rented to present farmers. There are huge pressures to privatise that land, however.

Compare with conditions out of PLA, and especially out of NP, the agricultural management is more supported there and there are opportunities to get subsidies from more sources.

## **2.4 Settlements**

Despite the late colonization the present state of landscape of the Sumava Mountains reflects a long-term human presence in the territory. The Sumava's pastures and meadows were created completely by man and they have contributed to picturesque impression of local landscape.

The picture from the beginning of last century belongs to the past now because of deep changes of the settlement after World War II. A standard density population in the mountains changed rapidly after the compelled evacuation of people of German nationality in 1945. Most of settlements disappeared both from the map and from the surface. Large "Iron Curtain" was erected to separate people inside of "enclosure" from western ideology. The long-term tradition of life close to the nature was tattered.

People coming from inland mostly did not have a relation to a new place, they did not have experience how to live in new such a specific conditions. Most of them left area after short adventure and the rest of people created a base of new local population.

Hardly 1,500 people live in seven villages inside of NP. The density of population is very low in NP, the lowest in such a large area in the Czech Republic. The tendency of people (especially those young ones) going to the cities to get better/easier conditions of daily life has influenced all marginal areas including the Sumava Mountains. About 20,000 people live in the buffer zone of NP, in PLA, deeply under the common level of population density.

In fact no bigger towns are situated in the Sumava BR, however two large cities lie close to the area (not more than and half an hour by car). It will play an important role in future development of the area with all potential both positive and negative aspects.

After 1989, in a period of finding themselves, most of local municipalities created their own imagines of development; new master plans have been created to be a platform for large discussion about future development. The increasing understanding for needs of nature protection as a main potential of tourism business has brought new relations between municipalities and National park administration. Substantial changes of civil service have broken long-term exclusive dependency on state bureaucracy and they represent new demands on local representatives.

A lot of new strategies, studies and plans were done. There is in fact no lack of similar documents. What is needed now it is a reasonable sorting of issues valuable for sustainable life in the region.

## **2.5 Tourism**

The most dynamic field of world economy, clearly the leading activity of the region bringing a prosperity to the region.

The threat for last sensitive remnants of nature run without reasonable limits and accent on sustainability.

The potential of area for tourism cannot be bound to the border of some administrative unit (PLA, NP, or BR) as the region is much larger. On the other hand all types of similar large-protected areas could attract visitors to spend their money there. To reach a regional agreement on sustainable use of the area it has revealed as a main goal for all institutions sharing a local benefit/responsibility.

Most of visitors arriving to the Sumava Mountains are attracted by beautiful Sumava's countryside. Most of them come to visit the National Park, some of them because of fashion. All of them want a service.

The tourism went through many changes in the Sumava Mountains during the last decade. Number of tourists has increased rapidly (e.g. almost 2,000 000 visits per year in NP) and their interest caused the development of accompanying services. Many old neglected buildings have been saved for pensions, cottages, small hotels or other form of services.

Just in NP 500 km hiking trails, 400 km bicycle trails bring an enjoyment to people visiting the largest national park of the Czech Republic.

Winter season plays an important role in a regional offer. Mild and snow-rich area provides a fantastic background for "soft" kinds of winter tourism, e.g. cross-country skiing or walking. People seeking for peace and quiet can find them on 300 km ski tracks leading mainly in beautiful winter scenery of NP. Ski slopes with elevators and cableways can be found close to the border of NP, in regional ski centres in PLA. The importance of winter season for local tourism business has increased rapidly.

The opening of the border has brought new form of cross-border tourism using the territory both of neighbours to common presentation of the region. The number of visitors has stabilised on certain level during last three or four years and the new form of offer should be found on both sides of the border. One of the challenges for future local tourism strategy could be some cross-border co-operation in tourism business to connect strong points both sides of the Sumava Mountains. Several similar smaller projects have been already running there.

Beside the landscape attractivity of the region a big challenge is represented by a revival of culture-historical aspect of the region. In spite the fact that most of old traditions were tattered after World War 2<sup>nd</sup> many of old local skills has appeared both to fulfil a gap in local tourism market and to satisfy natural needs of self-realization. Many of regional projects are focused to revive small workshops, feasts, traditions.

### **2.5.1 Exkurs:**

#### **Tourism monitoring in the Czech National Parks with emphasis to Sumava National Park and Biosphere Reserve**

There has been carried out monitoring of tourist exploitation and flow at Sumava National Park and Biosphere Reserve (Sumava NP) for the last 6 years. The research has been financed by the Czech Ministry of the Environment under a significant co-operation with the Administration of the Sumava NP and is being accomplished by the Institute for Environmental Studies at the Faculty of Science at the Charles University, Prague.

The monitoring is divided into two separate thematic fields:

- The first one is focused on physical counting of tourists (hikers, cyclists, motor vehicles) passing through pre-selected monitoring points – tourist crossings. These four points were selected under proposals of the Administration of the Sumava NP (Kvilda, Horská Kvilda, Antygl, Modrava).
- The second level of the monitoring is qualitative aspect of tourism – a questionnaire inquiry among tourists carried out by personal interview by random selection of tourists. In the year 1998 a similar questionnaire study took place among local people and later, in 2000, among representatives of local communities (9).

The year 2000 had a key importance for the sustainable tourism studies in the National Parks in the Czech Republic, because the research was carried out at all four Czech National Parks parallel (Sumava, Krkonose, České Svycarsko, Podyjí) (4,5,6,7,12) – see the map – Picture 1. Outputs of final reports from these studies allow comparing of various aspects of tourism at NPs and reflections of tourist, local people or local representatives towards the management of the nature conservation.

Purpose of this presentation is to show some possibilities of using and processing data to gather very fruitful information on the situation in the territory we are interested in. These results might help a lot with management system in a Biosphere Reserve.

We would like to present a part of compared data from the Czech National Parks from the year 2000 (4,5,6,7) and then we will focus on the situation at Sumava for the last 5 years (1,2,3,4,11). The amount of information is enormous, more and concrete analysis was made and is possible to gather it at the team of authors.

### **Survey from the National Parks in the Czech Republic (year 2000)**

There are four National Parks in the Czech Republic and all of them are situated at the borders with our neighbor countries.

During the 9-day observing period (August, 12-20<sup>th</sup> 2000) there were 160.801 hikers, 23.961 cyclists and 7.925 motor vehicles totally recorded passing through monitoring points. Each subject was recorded twice at given monitoring point – for the first time coming to the point from a certain direction, for the second time leaving from the point to another direction. That means, that documented number of records corresponds with almost 200.000 monitored subjects at 20 monitoring crossings.

The total proportion hikers : cyclists was measured 6,7 : 1. Regarding the hiking tourism, the most frequented site in Krkonose NP appeared to be the crossroad at Slaski dom (daily average 5.518 tourists), in České Svycarsko NP the crossroad Pravčická brána (1.194), in Sumava NP the monitoring point Antygl (1.176) and in Podyjí NP the crossroad Na Keplech (117). Cycling dominated at Modrava – Sumava NP (daily average 719 cyclists), Turistický most in České Svycarsko (172), in Podyjí crossroad Na Keplech (117) and Lucni bouda in Krkonose NP (8 – cycling is not permitted at any monitoring point in a ridge part of Krkonose). For other characteristics see Table 1.

To summarize the results of the counting at all National Parks, monitoring points at Krkonose NP are most affected by hiking, especially ridge parts influenced to a large extent by nearby funiculars. Monitoring crossroads at Sumava NP take the second place with their easily reachable natural attraction Antygl. In respect to cycle tourism, the most frequented localities can be found in Sumava (mainly Modrava and Kvilda). High densities of cyclists were recorded in the north-western part of České Svycarsko as well (Turistický most, Na Tokani) and in the entire area of Podyjí, where the proportion of hikers : cyclists is nearly 1 : 1.

In the course of tourist opinion poll in this year, 2.822 completed questionnaires were gathered, computer-processed and analyzed (Krkonose NP – 533, Sumava – 665, Podyji – 523, Ceske Svycarsko – 1111). To mention at least some of the qualitative aspects, the nationality of respondents coming to the Czech National Parks differs (see Graph 1). Czech tourists prevailed significantly (94% in Sumava, 72,8% Podyji, 70,6% Ceske Svycarsko and Krkonose 65,7%). In terms of the national structure of foreign visitors, the most frequent are Germans (in Ceske Svycarsko 25,5% of respondents, in Krkonose 23,3% and in Sumava 4,1%). The only exception is Podyji NP where the small proportion of Germans (2,5%) is compensated by a high number of Austrians (21,6%) due to the borders with Austria. Other foreign visitors are of Polish (7,9%) - the Polish border and Dutch (1,7%) nationality in Krkonose, American in Podyji (1,7%) and Dutch again in Sumava (1,1%).

Another example of interesting comparison could be the ratio of the first-time and regular visitors at the Czech National Parks. In Krkonose and Sumava the situation is very similar and very close (in Krkonose the rate is 18,4% to 75,2% respondents, in Sumava 20,2% to 75,9%). That might cohere with a tradition of visiting mountain National Parks that are more attractive than the other two – Podyji NP is probably not so famous, and Ceske Svycarsko is the youngest NP in the Czech Republic. It was declared in spring of the year 2000. But, both of these smaller parks are popular for cycle tourism and there are still many tourists exploring their beauties for the first time. Actually the ratio of the first-time and regular visitors is quite balanced in Ceske Svycarsko (44,2 % to 48,1 %).

Similar output came out of the comparison of the length of stay in the NP. The most frequent period of stay for both mountain parks was one week (Sumava 45,5 %, Krkonose 35,8 %), one-day visits prevailed at Podyji (32,9 %) and Ceske Svycarsko (25,2 %).

### **Survey from Sumava National Park and Biosphere Reserve (1997 – 2001)**

The physical counting of tourists according to the above mentioned methodology has been carried out at the same 4 monitoring points for the whole period of these research studies. The observed crossroads are: Modrava, Antygl, Horska Kvilda, Kvilda. To sum up the quantitative data we can say that the proportion of hikers has decreased of nearly 15% and the proportion of cyclists has increased by nearly 29% during the observed years (comp. between 1997 and 2001).

To understand the purpose of the research we have to look closer to the structure of the questionnaire: There are some 20 questions pursuing 3 basic thematic fields.

- The first one is socio-demographic circle, devoting to age, gender, education, nationality and so on,
- The second one formulates questions related to nature conservation and management of the National Park and
- The third one is looking for the value for the money spent during the stay in the National Park.

All the data are evaluated in relation to the socio-demographic data (especially age and nationality) and other options can be made and compared.

- If we look into the nationality structure of the respondents visiting monitoring points at Sumava for the last 5 years, the highest proportion of Czechs was in 1997 (94,4%), the lowest in 2001 (91,2%). The percentage of Germans is about 5% every year, and is slightly increasing (1997: 4,6%, 2001: 5,9%). The second most represented foreigners are Netherlanders with about 1% every year.
- The length of stay of the respondents has not been changing much during observed

years, useful to know that 48,3% (average for 5 years) of visitors stay for one week followed by one-day visit with 11,1% (see Graph 2).

- Respondents come to Sumava NP mostly with a family (47,6 %) or with a partner (33%) and this tendency has not been changing during last 5 years.
- Most of tourists stay in a demi-pension (= bed and breakfast, boarding house) and there is a slow increase during the observed period (1997: 27,9%, 1998: 29,5%, 1999: 32,1%, 2000: 37,9%, 2001: 33,1% - see Graph 3). Second favourite kind of accommodation is the option "other" (average 20,9 %) that represents staying at relatives or friends, or – and that is important – outdoor, that is prohibited in the territory of the NP, except camping sites of course. Staying or sleeping outdoor (in nature) has a very strong tradition in the Czech Republic; especially young people are keen on sleeping outdoor. Company properties as a typical phenomenon of *period of communism* are decreasing.

One of very important information for conservation of nature is mean of transport used by visitors. We divided this theme into two parts – transport mean used to get to the NP and to get about the NP.

- Absolute majority of respondents come to the NP by car (average percentage for 5 years is 80,5 %), but only 38,2% of visitors move about the NP by car (see Graph 4).
- The second favorite mean of transport used to get about the NP is bicycle – totally 35% use bicycle and cycling is increasing during the observed period.
- Very interesting and satisfactory for the Administration of Sumava NP is usage of the Green Bus for traveling around the park – middling 18,1 % (for the observed period) of respondents use the Green Bus and popularity of this mean of transport is growing during years (the Green Bus is a special ecological bus under the Administration of the NP Sumava ensuring traveling round the NP).
- On the average 20,1 % of respondents are hikers - that means they have trips on foot only.

One example of questions referring to nature conservation is: "Do you think that the access of visitors to the most threatened parts of the NP should be:...." If we look at the answers, we can see a slight change in opinion spectrum:

- In 1997 the prevailing answer was *with some restrictions* that means rather enabled access to the most threatened parts of the NP with 43%. This was the only one year when this kind of answer was leading.
- In other years the respondents thought mostly the access to these parts should be very restricted. It might be explained by genesis of "*post-communistic freedom*", where everything belonged to everyone and it was the same with nature.

We looked closer while processing answers to this question and our hypothesis could have been confirmed perhaps, because foreign visitors mostly thought the access should have been very restricted or restricted. The opinion to enable the access to the most threatened nature part appeared only at Czechs. This bringing opinion of Czechs and foreigners closer together is in slight contradiction of the effort of Sumava NP to gradually make the most threatened parts of the NP more open to public (e.g. border crossing Modry sloup).

As far as the value for the money spent for board and lodging (cost for accommodation and food per person per day) in the NP is concerned, on the average 23,8% of respondents spend 300 CZK (= about 10 EUR) and this is not changing much during the observed period (see Graph 5).

### **3 Planning and management**

#### **3.1 Nature protection**

The only effective way to save rare natural plant and animal populations is to protect adequate areas of their natural habitats and biotic communities. Many rare species become extinct because of gradual decreases in the area of available habitats. Thus, the Sumava National Park combined with Biosphere Reserve (including the Protected Landscape Area) and the adjacent the Bavarian Forest National Park combined with Biosphere Reserve are important, because they preserve natural and semi natural ecosystems, which are valuable biotopes for endangered species and communities.

##### **3.1.1 The Sumava Biosphere Reserve**

From the conservation standpoint, the values of the Sumava Biosphere Reserve must be bilaterally viewed in the frame of the entire Bohemian Forest, and in the European context:

- 1) The area of Bohemian Forest, almost 200,000 ha size, is in the most extensive continuous forest of Central Europe. Almost 80,000 ha lack well-travelled roads and highways, and thus remain as ecologically integrated system.
- 2) The extend of forest cover is high, reaching more than 60% in the BR and 81% in the more homogenous National Park, with many remnant primeval and natural forests, similar to virgin ecosystems.
- 3) The total area of mire ecosystems and adjacent wetland and waterlogged communities is the largest in the Czech Republic. Due to their presence, Sumava can be called a "northern island" in the heard of Europe.
- 4) There are many biogeographically isolated and relic plant and animal populations surviving form the early Holocene because of favourable landforms and habitats, such a glacial cirques, glacial lakes, frost cliffs, scree fields and peat deposits. For these reasons, the Sumava BR has been listed in the "Ecosystem Red Data Book" and "Invertebrate Red Data Book" published by the World Conservation Union (IUCN).
- 5) Sumava is the sole place in Central Europe where middle mountains were left for several decades without management. This has permitted spontaneous secondary succession toward forest, resulting in a unique pattern of seminatural woodland and various successional stages of treeless ecosystems. Thus, the region became a unique "natural laboratory" of spontaneous natural dynamics of non-forest ecosystems, particularly of wetlands sites, with high biodiversity and outstanding landscape value (Jenik & Price, eds. 1994).

##### **3.1.2 The history of nature protection**

The natural values and beauty of the Sumava Mountains led to early efforts to legally protect this landscape. In 1858 the primeval mountain mixed forest of Boubinsky Prales became the third nature reserve in Bohemia. Today, it is one the best known reserves in Europe. In 1963, the Sumava Protected Landscape Area, 163,000 ha in area, was declared, becoming the largest large-scale reserve in the former Czechoslovakia. This presented the initial success of more than 80 years of efforts to protect the Czech side of the Bohemian Forest. One important impulse to the final success was UNESCO's inclusion of the Sumava Protected Landscape Area in the international network of Biosphere Reserves in February 1990; after certain adjustment of the boundaries, more than 167,000 ha thus became a counterpart to the Bavarian Forest BR. Finally, the Sumava National Park was declared in 1991, thus giving the most valuable 68,500 ha highest conservation status under the Czech laws.

The core zone of the Biosphere Reserve is within the National Park, and includes most of the primeval ecosystems. The most important areas are Modravske Slate (over 3,600 ha) in the Sumava Highlands, next to the Bavarian BR/National Park; Vltavsky Luh in the floodplain of the Vltava river (over 1,700 ha); the Trojmezny, Plechy and Smrcina ridges (over 1,000 ha); and the Vydra and Kremelna canyons, including the Kremelna rivulet.

Many parts of the Sumava BR are protected as strict Nature Reserves, with the highest rank of legal protection. These include both scientifically and historically significant localities of European importance, such as the Boubinsky Prales, Cerne and Certovo Lakes (protected since 1911), and the Blanice reserve, including the source and floodplain meadows of the upper stream of this river, with populations of the greatly endangered pearl mussel.

Outside the Nature Reserves, much of the Sumava BR is an interrupted piedmont landscape with a high proportion of forest. This landscape serves as the transition zone for ecologically sound and sustainable management of agriculture, forestry and recreation.

In 1990, the European significance of the Bohemian Forest has been conceptually recognized as part of the "Ecological Brick of Central Europe". The region is involved in many ecological initiatives (Jenik & Price, eds. 1994).

### **3.1.3 The Sumava National park**

The area of the present Sumava National Park has not been chosen by accident. It is a paradox that the long-standing efforts aiming at nature protection reached their fulfilment in 1991 thanks also the fact that it had artificially been locked in a shell of frontier zone. The evil directed towards man has practically done no harm to nature.

Nature conservation in National Park includes mainly the conservation of ecosystems as a whole, including the natural processes of their development. Ecosystems that were severely changed by humans are to be managed in such ways that enable their gradual transition to self-regulation.

On the basis of expert professional knowledge, the area is to be divided according to the specific needs of nature protection (zones, disturbance-free areas, etc.), and rules are to be set for these zones. The essential nature conservation conditions are to be given by law, decrees and visitor regulations.

Ecosystem management is to be directed at the conservation of ecosystems in their integrity, in all their components and relationships.

The management of forest ecosystems, wetlands, man-induced forest-free areas and aquatic ecosystems is to be addressed separately.

The conservation of ecosystems is closely connected to the conservation of species diversity (flora and fauna). For the conservation of certain species, the integrity of undisturbed and sufficiently large areas, especially at certain periods in their life cycle, is vital.

**Table 1:** Land area

|   |                  |
|---|------------------|
| <b>Total area of the Sumava National Park:</b>                                | <b>68.064 ha</b> |
| of which forest land area is estimated to be (according to delineated plots); | 54.184 ha        |
| area of all non-forest land (according to delineated plots):                  | 13.880 ha        |
| - agricultural land (according to delineated plots)                           | 5.868 ha         |
| - water bodies and streams (according to delineated plots)                    | 1.097 ha         |
| - other land (according to delineated plots; and including roads)             | 6.849 ha         |
| - built-up land (according to delineated plots)                               | 66 ha            |

### 3.1.4 Zonation of the National Park

The methods and approaches to the conservation of National Parks (within the Czech Republic) are differentiated according to a zonation of their areas, three zones usually being distinguished based on the natural conditions within each National Park territory. The strictest conservation rules are applied in Zone I (part §17, para. 1, Act No. 114/1992).

The characterization of zones within the Sumava NP is given in part §4:

- Zone I (strictly natural areas) includes the areas of highest natural value found within the National Park, especially natural areas, or those areas that have been only slightly disturbed by humans and are suitable for the rapid renewal of their self-regulatory functions. The overall aim is for the conservation or redevelopment of the self-regulatory functions of ecosystems and the limiting of human interference with the natural environment in order to conserve the natural values of ecosystems.
- Zone II (areas to be steered towards 'natural') includes areas of remarkable natural value, mainly forest and agricultural ecosystems affected by human activities but suitable for a limited wise-use that is close-to-nature.
- Zone III (zone of development) includes areas with ecosystems that are, to a large extent, influenced by human activities, as well as built-up 'urban' areas. The aim is to sustain and support the permanent settlement of this area, including services, agriculture, tourism and recreation, providing that these activities are not against the mission of the National Park. In addition, the role of the buffer zone of the Sumava NP is mainly fulfilled by the Sumava PLA.
- A specific status has been accorded to the so-called "no-intervention area", declared in 1995, in the area along the state borders with Germany, within the Modrava Forest District. [The decision concerned the change of permission to use Directive No. 4/95 Protection of Forest against bark-beetle (*Ips typographus* L.) in the localities of Mokruvka and Pytlacký roh – Forest District Modrava (Doc. No. 51-Vi/2797/95 of 14 August 1995). The no-intervention area was subsequently expanded in 1996 and 1997 [Decision Doc. No. 51 - Vi/3549/96 and 51 - Vi/3550/95 of 20 November 1996 and Doc. No. 51 - Vi/ 1232/97 of 1 July 1997].

The size of the no-intervention zone is presently 1.325.98 ha, out of which Zone I covers 478.68 ha and Zone II covers 847.30 ha.

The no-intervention management areas were created in response to the fact that in the close vicinity of the core zone of the Bavarian Forest NP, and in large areas of Zone I in the Sumava NP, where bark beetle was freely reproducing, it was not possible to effectively reduce the bark-beetle outbreak using the method of wood sanitation. Therefore, the sanitation of wood moved outside to the surrounding areas of mires,

hoping to reduce the spread of bark beetle. No wood sanitation was done in the no-intervention management areas. The upper forest layer died off under the bark beetle pressure (less than 10% of spruce has survived there, mainly in the lower layers, but die-back still largely continues). In the no-intervention area of Zone II, only some tree under planting was performed to complement natural forest regeneration or, in some places, soil was prepared in order to support natural forest regeneration from the year 1995. In recent years, attention has been paid to the planting of seedlings of deciduous tree species that are lacking (mainly rowan, sycamore and less then beech).

**Table 2:** Surface area and percentage cover of individual zones

| Zone | Description                            | Area as of 31. 12. 1999 |       | proposed area in 2030 |
|------|--|-------------------------|-------|-----------------------|
|      |  | ha                      | %     | %                     |
| I.   | Natural                                | 8,807                   | 12.94 | minimum 50            |
| IIA  | Close-to-natural – transitional        | 10,904                  | 16.02 | -                     |
| IIB  | Steered towards natural – transitional | 31,350                  | 46.06 | -                     |
| IIC  | Steered towards natural – permanent    | 13,631                  | 20.03 | up to 40              |
| III. | Zone of development                    | 3,372                   | 4.95  | up to 10              |
|      | Total                                  | 68,064                  | 100   | 100                   |

### Zone I of the NP

Zone I includes the most valuable ecosystems that are close-to-natural ecosystems, and which are best suited to allow natural development. These include mainly remnants of primeval forest, climax ecosystems, first-generation forest following on from primeval forest, succession phases close to nature, natural wetlands and mires, glacial lakes, and streams. These fragments of ecosystems that have been spared of intensive human activities in the past remain mainly on localities unsuitable for farming or other activities, with difficult access, and with extreme or exposed climate conditions. They are usually isolated fragments and do not exist in a continuous complex. To a great extent, this fact has predetermined the mosaic arrangement of Zone I - which, at present, covers only the core area of what will be a Zone I of greater extent in the future. In order to get consolidated and clearly identifiable areas, in some cases Zone I also includes ecosystems that have been considerably affected by human activities.

### Zone II of the NP

At present, this zone covers most of the area of the Sumava NP. It contains, to various degrees, ecosystems influenced by human activities, including forest ecosystems, some water areas, agricultural areas and other land suitable for limited land-use and tourism that would not prevent the conservation and/or improvement of natural conditions.

Forest ecosystems that are included in Zone II are divided into the sub-zones IIA, IIB and IIC, by using such parameters as the level of disturbance, etc., as well as taking into account the intended target zonation. The sub-zones IIA and IIB are of a temporary character and will, in the future, be transferred to Zone I. The sub-zone IIC will be permanently part of Zone II. The areas designated for sub-zone IIA are the best qualified to be transferred to Zone I, and are often adjacent to Zone I. The areas of sub-zone IIB, due to either a higher level of damage or the destabilising influence of the surrounding area, are further away from the target conditions required for Zone I. In most cases, restoration of the forest area has to be undertaken first, i.e. the target conditions are likely to be reached only with the next generation of forest stands. Sub-zone IIC includes ecosystems that have been severely

degraded and also those areas located in the vicinity of settlements. The land use in sub-zone IIC will follow close-to-natural types of management.

### **Zone III of the NP**

Zone III is designated for further development. It contains built-up areas, including agricultural and other land connected to settlements, or areas, which have been intensively farmed in the past and are presently under agricultural production according to part §10 of the Government Decree No. 163/1991. This Zone does not contain forests.

Areas designated for further development within zone III are approved by responsible municipalities in their land-use planning; such approval must be in accordance with land-use planning for the larger region. Recently, an overall plan of land use for the Šumava region (UP VUC) has been prepared and approved, having been up-dated through the elaboration of land-use plans for the districts of Klatovy, Prachatice and Cesky Krumlov (on whose territory Sumava is located). The land-use plans set the principles and conditions for area development and the protection of its values.

### **No-intervention area**

This area classification is not part of the zonation system. It is a specific 'category' that provides a framework for no-intervention management, as far as bark-beetle infestation is concerned, in selected areas under a particular set of conditions. With regards to the enlargement of Zone I, parts of Zone II in the no-intervention area will be transferred to Zone I, thus creating a core complex that will be linked up with the core zone of the Bavarian Forest National Park.

### **Goals**

#### **Zone I:**

- Conservation or restoration of the natural development of ecosystems that will be gradually left to self-regulatory development.
- Research and scientific activities focusing on the study of natural processes.
- Management of visitors to ensure the conservation of valuable ecosystems.
- Conservation of biological diversity - especially of rare, secondary, forest-free areas through the introduction of specific management.

#### **Zone II:**

- Sub-zones IIA and IIB will be prepared for their transfer to Zone I through 'targeted' management.
- Research and scientific activities.
- Conservation of the biodiversity of non-forested ecosystems with the use of suitable 'permanent' management.
- Utilisation of aquatic ecosystems in accordance with the mission of the Šumava NP.
- Tourism and recreation.
- IIC – sustainable use of forests in the surroundings of settlements.

#### **Zone III:**

- Development of settlements while respecting the conservation of the natural environment.
- The use of suitable non-forested ecosystems for agriculture.
- Development of the infrastructure required for recreation in Šumava NP.

(Zelenkova, eds. 2000)

### 3.1.5 Resumee

There is in fact no official planning and management structure for the Sumava BR, and there are no special paid staffs. The basic agenda, data collecting, participation at some events organised e.g. in the frame of MAB programme have been done by the Sumava NP and PLA Authority. There is a small group of people having above mentioned activity in their duties according to their specialisation at the NP Authority.

Because of the fact that area of the Sumava BR consists from the area of Sumava NP and PLA, a lot of management tools are provided through the management both of mentioned organisations. Special visitor management plan for BR probably does not exist. On the other hand many structure documents has been created during last decade after the change of political system. The duties/responsibility for creation of structural documents have been changed several times in a process of finding an optimal system of bureaucracy and now we are at the final stage of creating of that new system. Meanwhile new local governments create new development plans at the background of national strategy coming into existence at the same time.

The Sumava NP and PLA Authority represents one of key players in the region according to its powerful and large professional administrative body. Stabilisation of local municipalities, revitalisation of local structures on all levels has brought new players, new stakeholders and the dominant role of the Sumava NP and PLA Authority has decreased to the benefit of all region. Newly developed structure plans, master plans, projects on all levels called for new way of communication. Despite many misunderstanding especially at the beginning of the process of mutual discussion, many new common strategies, programmes and projects are in life. National park board has been rebuilt to bring new opportunities for members, regular meetings with municipalities and other stakeholders were held, new methods of communication were used. However, the lack/low level of communication (the legacy of former regime) prevents often from finding better solutions contributing to the sustainable life in the region.

## 4 Institutional framework

Probably the main change in the region has represented the establishment of new regional governments. The Sumava BR belongs both to the South Bohemia (Ceske Budejovice) and to the West Bohemia (Plzen) regional government. By the end of this year the district governments will be cancelled and most of powers will be taken over by local municipalities. The Sumava NP and PLA Authority will remain one of important institution in the region with the main goal to preserve beautiful Sumava's nature to future generations as well. This valuable background should play a bigger role in many aspects of sustainable regional life/development.

Regional development agency (mainly local RRA Stachy) together with regional governments will bring know-how and money. Many institutions are able and willing to help with their experience, e.g. Institute of Landscape Ecology Academy of Sciences of the Czech Republic from Ceske Budejovice. International programs (PHARE, SAPARD, GEF, FACE...) bring new skills, experience and incentive money.

**The main device of the region will remain its local people, however. No forms of sustainable tourism can be organized without massive support of local people. The future fate of the region depends in fact on them.**

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