Controversial aspects of nature conservation management in Šumava National Park:

submission from Hnutí DUHA/Friends of the Earth Czech Republic to the IUCN mission to the national park, September 2002

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Contents

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1. Summary

Šumava National Park was established in 1991 in a part of the older Šumava Protected Landscape Area. Extended over 169,000 hectares, it protects peat-bogs, fragments of old-growth spruce and beech forests, upland meadows and glacial lakes. Almost 84 % of the park area is covered by forest. There are dozens of endangered species of plants and animals, including lynx *(Lynx lynx)*, capercaillie *(Tetrao urogallus)*, black grouse *(Tetrao tetrix)* and the ural owl *(Strix uralensis)*.

Along with neighbouring Bayerischer Wald National Park in Germany and an Austrian part of the Šumava Mountains, the area represents the largest continuous forested area in Central Europe. The entire territory including the Protected Landscape Area was registered as a UNESCO biosphere reserve and the Šumava peat-bogs are a Ramsar site.

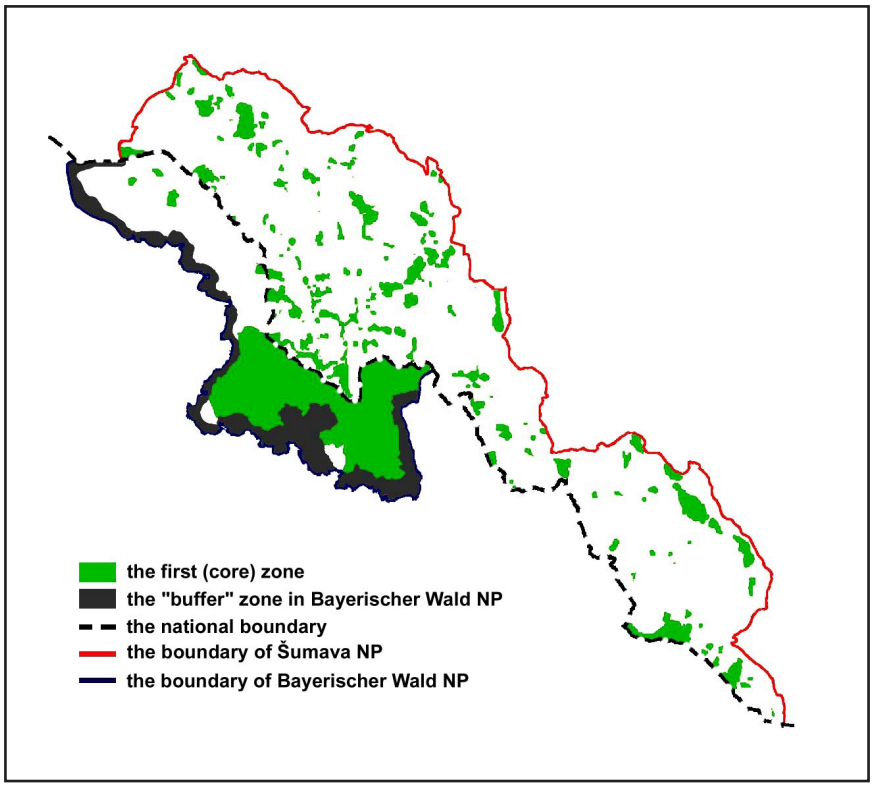
Hnutí DUHA (Friends of the Earth Czech Republic) has been concerned about some aspects of the national park management for several years, and campaigns for radical changes.

1.1. The first zones fragmentation

In 1995 the first zone (core zone) of Šumava NP was reduced and fragmented into 135 isolated parts. At present, the most valuable parts of the Šumava Mts. are located in the first zones: the remains of extant natural ecosystems and other ecosystems where natural processes have been maintained. Their small size following fragmentation does not however allow the main national park goal to be attained – the undisturbed protection of natural ecosystem processes.

See more details in Chapter 4.

Figure 1: Zoning of Šumava NP and Bayerischer Wald NP



1.2. Tree-cutting in the first zones

The natural development of habitats is not protected even in primeval forest of the first zones of Šumava National Park. In 1999 the national park administration allowed spruce trees infested by bark beetles to be cut.

See more details in Chapters 5 and 8.

Figure 2: Waterlogged spruce forests of the Ztracena Slat first zone: the stand without cutting (left) and the stand after bark beetle cutting (right). Photo by Ivona Matějková

1.3. Large-scale clearcuts

The National Park Administration responded to increases in spruce bark beetle by cutting down trees in a large scale. Due to this cutting and the resulting windbreaks, there are now big clear-cut areas arising in the national park. This occurs especially in the high elevations along the border with Bayerischer Wald NP (above 1,300 metres), but also in other places. In the second zone of the park, which in accordance with the management plan should become part of the first zone in the next thirty years, the result of these cuts is a delay by at least some about 100 years of the main goal of the conservation management – conversion of sites affected by humans into the natural forest ecosystem. In contrast to the effects of spruce bark beetles, the clearcuts are a very drastic intervention affecting all parts of ecosystem. Friends of the Earth believe that in the II.A and II.B zones they should not be permitted.

See Chapters 6 and 9 for more details.

Figure 3: Malá Mokrůvka site – 1,330 metres. Photo by Jaromír Bláha/Hnutí DUHA

1.4. Contradictions between the management in Šumava NP and Bayericher Wald NP

Šumava and Bayerischer Wald create one native complex which is protected as a national park on both sides of the border. Park administrations should strive for an integrated approach to its management. But in fact there are diametrically different strategies regarding zonation and bark beetle management, which both of the parks influence importantly. For both the bark beetle calamity and Šumava ecosystem protection, this situation is the worst possible.

Figure 4: Situation at the border (marked with red). On the left, Šumava NP (Czech Republic), on the right Bayerischer Wald NP (Germany). Photo by J. Soukup

1.5. Timber removal and sale

Forest monocultures and timber trade are economic activities whose importance overruns the region. It is profitable for local tradesmen, big forest companies, the timber industry and traders both in the Czech Republic, Germany and Austria. It follows also a strong political pressure against the restriction of bark beetle salvage-logging in Šumava NP.

From an economic perspective and from the National Park Administration approach to this problem, an important question arises which we discuss in detail in the Chapter 9: is the bark beetle the real reason, or just an occasion for logging in the national park?

1.6. Acceptance of the national park by the local people

There are two obstacles standing in the way to the acceptance of the real national park by the local population.

After the Second World War, the German inhabitants were forcibly exiled and they were partly replaced by immigrants from other regions of the country. They often were socially marginalized. This situation is not very favourable to regional economic development strategy based on nature-conservation.

And the current Czech law, especially the tax system, does not provide for the economic improvement of tourism for the region's development. A well run national park would be an important stimulus for local economics, but at present the Šumava communities gain only the minimum from nature conservation.

Together with community representatives, it is nevertheless possible to search for some solutions, and Friends of the Earth has worked on that. See in the Annex 1 the document enclosed: Common Position of Local Communities and NGOs on the Situation in Šumava National Park.

1.7. Declarations vs. reality: Šumava NP Management Plan and Šumava NP management

The official Šumava NP Management Plan does not solve these problems. On the contrary, in disaccord with all the proclamations mentioned therein, the current situation prevents further progress. See Chapter 10.

2. Reccomendations: proposals by Friends of the Earth

Hnutí DUHA/Friends of the Earth Czech Republic has suggested – and campaigned for – a package of measures which would provide for the better management and nature conservation in Šumava National Park, allowing for the effective protection of habitat as well as species.

Compact first (core) zone

Immediately enlarge and consolidate the first zones of Šumava NP to create several large core zones with a non-intervention management policy. As a minimum these should be:

- area of Modrava, Kvilda and Srní – bordering on the core zone of Bayerischer Wald NP
- area of Vltavský Luh
- area of Trojmezná and Smrčina
- area of Křemelná
- Zhůřské and Hornokvildské Slatě (peat bogs)

In those first zones which cannot be consolidated into larger units because of their location, it is necessary to determine individual conservation management strategies. The salvage- cutting of bark-beetle infested trees should be allowed only in exceptional cases based on careful analysis of the situation (e.g. a combination of windfalls and warm, dry weather in previous years).

Planning the enlargement of the first zone

As consensus-based approach should be used to determine the precise areas of second zone which should be converted into first zones as well asthe time schedule for the conversion process. This consensus will be achieved through roundtable discussions between the NP Administration, experts, municipalities and non-governmental organizations. Enlargement of the first zones in the western part of Šumava NP must be coordinated with Bayerischer Wald NP (and its new part between Rachel Mt. and the village of Bayerischer Eisenstein).

Measures to be prescribed for bark beetle infestations in the second zones

To prepare a crisis management plan for the second zones in case of recurrent bark beetle calamity:

- to determine a sanitation zone similar to that in Bayerischer Wald NP, where bark beetle infested trees have been carefully observed and salvaged immediately in order that the calamity does not spread beyond the boundaries of the national park. This sanitation zone would be situated in areas in the park lower in elevation and would make use of various natural barriers (e.g. forest-free areas, streams, mixed forests).
- in areas above this sanitation zone, to desist from all tree-fellings of the advancing bark beetle front that would result in clear-cuts. It is acceptable only to clear single, infested trees and small spots set up by those migrating bark beetles that flew ahead of the front. With the help of these measures, the advancement of a calamity is slowed down and its further spread is also slowed.
- in case the population of bark-beetle collapses before the front reaches the sanitation zone, consistent salvage-logging should be renewed to attempt to prevent another population outbreak
- to make use of attractant and anti-attractant (pheromone and anti-pheromone) barriers in the proper locations and at the right time – but only after a careful analysis of expected effect on bark beetle population.

The renewal of natural habitat structure

Restoration measures should be undertaken in those parts of second zones where, in the past, the age and special diversity as well as species composition of the forests was changed in favour of spruce. These would consist of an intensive opening up of the stands and underplanting of beech, fir and other site-suitable species of trees. Such a strategy should be preferred over efforts to eradicate the bark beetle by intensive felling in the upper parts of the national park.

Restoration measures should be applied primarily in the sanitation zone and so prepare this area for the potential dangers that would result from salvage-logging that would be necessary in case another calamity reached this zone.

3. Introductionary information

3.1. Šumava National Park

Šumava National Park was declared in March 1991 in the central part of the mountain range running along the borders with Germany and Austria. It extends over an area of 690 square kilometers. Forests form almost 84 % of the national park with meadows and pastures accounting for 7 %. The lowest point in the park lies at an altitude of 600 m above sea level (Otava river by Rejštejn), the highest at 1,378 metres (Plechý Mt.). About 1,000 square kilometres of Šumava Protected Landscape Area serve as the national park's buffer zone and protects some natural features of the region that lie outside the park.

Delimitation of national park borders was based not only on expert assessment but also on political consensus. Due to this, very valuable areas on the south bank of the Lipno Dam reservior in the southeast were not included in the national park: an almost uninhabited area, this site is one of three places in the Czech Republic where elk *(Alces alces)* is found and it is its important migration corridor, and also habitat and a migration path for lynx *(Lynx lynx)* and an important black grouse *(Tetrao tetrix)* population. Also the Černé and Čertovo Lakes (glacial lakes) with the area of Královský Hvozd (native mixed forest) in the northwest were not included for the same reason.

The national park is a mosaic of the remains of old growth forest, peat-bogs and peat meadows, successions of areas with vegetation after former villages, glacial lakes, watercourses and forests more or less changed by humans. There are a few small villages inside this natural complex. The overwhelming majority of settlements ceased to exist after a forcible resettlement of the German minority after the Second World War and after closing part of the territory behind the so-called Iron Curtain by the former Communist regime. After the designation of the national park in 1991 there was a unique opportunity to renovate the undisturbed natural processes on a relatively large area in Central Europe, to observe interactions among diverse ecosystems and to create there a vital space for demanding species such as the lynx and potentially also for wolf and bear.

Table 1. The species composition of Šumava NP forests

tree species	current situation	c. 1000 years ago
spruce	86.2 %	37.5 %
fir	1.2 %	18.1 %
pine	6.6 %	17.0 %
European larch	0.1 %	–
other conifers (dwarf pine, long-leaf pine)	1.3 %	–
conifers total	95.4 %	72.6 %
beech	4.3 %	17.8 %
sycamore	0.1 %	3.7 %
other deciduous trees (alder, elm etc.)	0.2 %	5.9 %
deciduous trees total	4.6 %	27.4 %

Source: Hladilin 1999 [1]

The most valuable areas of Šumava National Park are

- the complex of peat-bogs and spruce forest wetlands (waterlogged spurce forests) in the area of Modrava (a part of a Ramsar site), the largest location of its kind in the Central Europe,
- other key peat-bogs (Šumava peat bogs, including Modrava, are a Ramsar site)
- the riparian wetlands of the upper Vltava river and
- Trojmezná natural forest.

Attractive animals or birds such as lynx and black grouse usually recieve most attention, but perhaps the most unique species of Šumava National Park are the relic and endemic insect fauna of isolated peat bogs, stoney habitats, waterlogged spurce forests and remaining fragments of montane forests [2].

Modrava bogs and Trojmezná Forest will be the main points of interest during the excursion of the IUCN mission. Therefore we provide more information on Modrava here; for detailed discussion of Trojmezná see Chapter 8.

Modrava peat bogs

The area is characterized by rough climate conditions. There are mostly higher and inverse positions and points influenced by water on the plateau of the Šumava Mountains – one of the coldest places in the Czech Republic with very short growth period and with frequent summer frosts. These conditions are also decisive for the character of the local vegetation: the spruce naturally prevails even in the elevations typical for beech in other places. Experts argue about the extent of potential natural representation of beech. On a base of historical documents, Friends of the Earth Czech Republic tends to agree with the opinion that natural representation of the beech is very low in this area and that the spruce had been strongly dominating there.

The state of forest vegetation was also influenced by their historical development: exploitation of timber which took place over a large area in the first half of the 19th century only affected the core of the Modrava bogs to a small extent. Wind and huge bark beetle calamities followed in 1868 to 1880. Again the core of Modrava was not affected so seriously by wind damages – they were registered rather between Filipova Huť and the Černá Hora Mt.. But the bark beetle calamity also expanded into this area of the so far undisturbed primeval forests.

Large clear-cut areas after the removal of the wood affected by spruce bark beetle were replanted with predominantly original spruces. Imported seeds from other parts of the Austrian-Hungarian Empire were only marginal [3]. It is not possible to determine from historical resources exactly where the imported seeds were used.

However regarding the extent of the calamity, it is apparent that a significant part of the affected area renewed itself by natural regeneration after the dissemination of survived trees or thanks to existing renewal and low-level (previously subordinate) trees. This means that the trees currently growing in the area cannot be considered as unoriginal spruce vegetation. Their handicap is due to the fact that a lot of them appeared after bark beetle logging had disrupted their age structure. However, there is still a big difference when compared to commercial forests of the same age.

It cannot be determined with certainty whether the extent of current bark beetle calamity is a consequence of weakening the vegetation by these earlier, economic interventions and other influences (pollution), and to what extent it could be a natural phenomenon. Probably both these factors are significant.

3.2. Bayerischer Wald National Park

The German Bayerischer Wald National Park was established in 1969 (officially opened in October 1970). It covers an area of 130 square kilometers, lying at altitudes from 600 m above sea level (Kolbersbach) to 1,453 m (Grosser Rachel Mt.). In its highest areas there are montane spruce forests, on the slopes montane mixed forests and in the valleys mostly waterlogged spruce forests. The species composition and structure of the forest stands have been influenced by various management interventions: 72 % spruce of the total growing stock is relatively higher than the natural proportion would be (40 – 50 %). Fifty-three percent of forest stands are older than 100 years, with an average hectare stock amounting to 412 m^3/ha.

In 1972 the first non-intervention area, covering 2,000 ha, was established. This was allowed to gradually expand so that by 1983 it made up half and by 1991 already 75 % of the park area, forming an unbroken core zone. In 1993, it was decided that the second zone, forming an outer margin to the first zone and in which there are vigorous measures being taken against the bark beetle, could not be narrower than 500 m. This decision was made to assure owners of surrounding forest that their forests would not be blighted by bark beetles flying over from the core zone. The second zone is therefore something like a buffer zone between the core zone and neighbouring commercial forests.

Table 2. Implementation of the decision of the Bayericher Wald NP brought the long-term reduction of logging and exploitation of wood material and with it, expansion in the size of ‚reserves' (without forestry measures)

Year	Area of reserve (km^2)	Wood felling (m^3)	Notes
1969	2	65	before creation of NP
1972	25	55	felling plan
1974	40		
1982	65	27	felling plan
1986	85		
1993	100	2.8	actual felling

Source: Strunz 1994 [4]

In 1997, the Bayerischer Wald NP was extended towards the west and so today covers an area of 242 square kilometres from Bayerischer Eisenstein in the west as far as Mauth in the east. In the new part of the park the non-interference area (i.e. the first or core zone) is also gradually expanding, it should cover the desired 75 % of the area by the year 2017. At the same time it was decided that the second, so-called buffer zone could be widened from 500 m to 1,000 m if necessary.

Unlike the Czech part of Šumava Mts., there are only few remains of the natural forest in the German Bayerischer Wald National Park – most of them are in the new part of the park.

Bayerischer Wald National Park was awarded the Council of Europe Diploma for protected area management in 2001.

4. Zonation

In 1993, Šumava National Park was divided into three zones. The first zone is composed of sites

> *"with the most important natural assets in the national park, territory with natural or slightly altered ecosystems advantageous for rapid renewal of self-regulating functions. The aim is to preserve or to renew the self-regulating functions of ecosystems and to minimize human intervention in the natural environment to maintain this state."* [5]

Thus it conforms to the IUCN protected area Category II, i.e. the international standard for national parks.

Ecosystems of likewise natural value were included in the second zone, in which restrained management methods and gradual transition to the regime of the first zone are anticipated, or it serves as a buffer zone for the first zone. Finally the third zone is composed of ecosystems significantly affected by man, such as settlements and agricultural land.

4.1. First zones

From1993 to 1994, interventions against the spruce bark beetle in the first zone sites were judged individually. There were three non-intervention regions – Modravské slatě (1,900 ha), Trojmezná (370 ha strictly non-intervention, 220 ha intervention limited to salvage of fallen trees) and a small area at Prášilské Lake (9 ha). In the remainder of the first zone, the situation was assessed on a case by case basis. Bark beetle sanitation was in principle permitted, although the nature conservation authority (a part of the National Park Administration) had the authority to decide whether trees blighted by the beetle could be left without intervention.

In August 1994, a new park director, Mr. Ivan Žlábek was appointed. In 1995, in order to intensify anti-bark beetle interventions, his administration enforced a change of zonation. The non-intervention areas were abolished and the area of the first zone was reduced to almost a half, with the provision that it would be left to natural development without human intervention. Thus they were divided even more into 135 individual plots of various sizes.

In the Modrava region, a so called 'non-intervention area' was once more declared, but on a smaller scale of 1,300 ha. The ban applied only to interventions against the bark beetle, not to the planting of young trees.

In order to ensure protection of susceptible endangered species (mainly capercaillie *Tetrao urogallus*), six so-called 'disturbance-free areas' were created as complexes of the first and second zones, where public access is limited.

Figure 5: Comparison of the zonation of Šumava NP and Bayerischer Wald NP

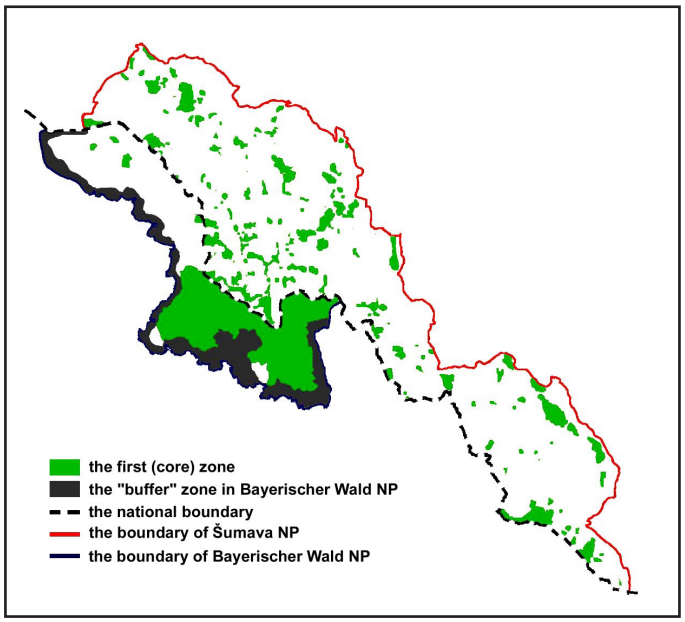


Table 3. Original and new zonation of Šumava NP

	Original zonation		New zonation	
	area [ha]	%	area [ha]	%
first zone	15,195	22	8,840	13
second zone	51,845	75	56,900	82
third zone	1,990	3	3,290	5

Figure 6: 'Disturbance-free areas' in Šumava NP

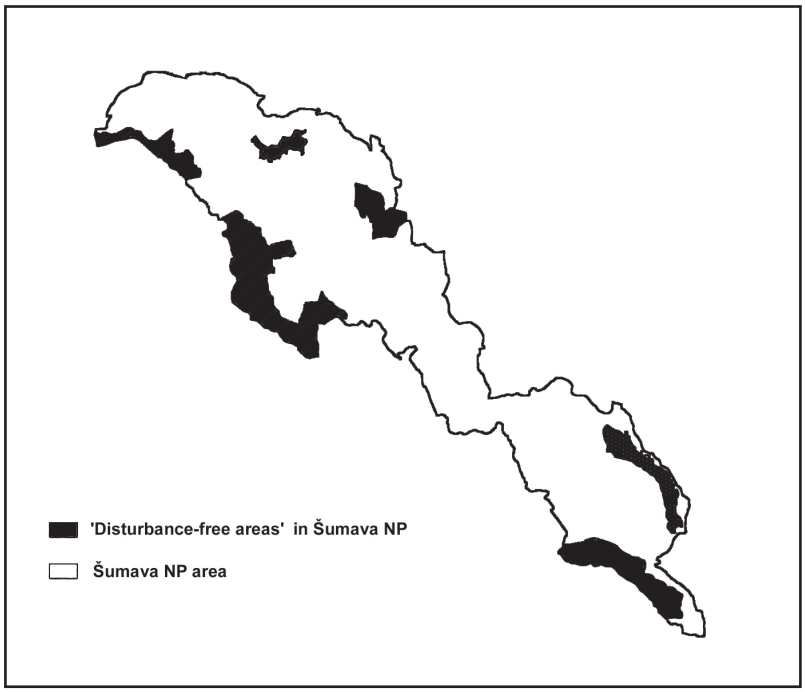


Figure 7: Comparison of number of first zones in several size categories

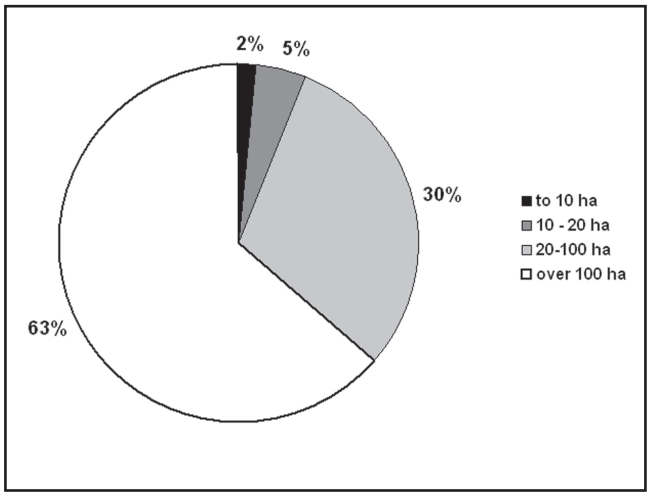
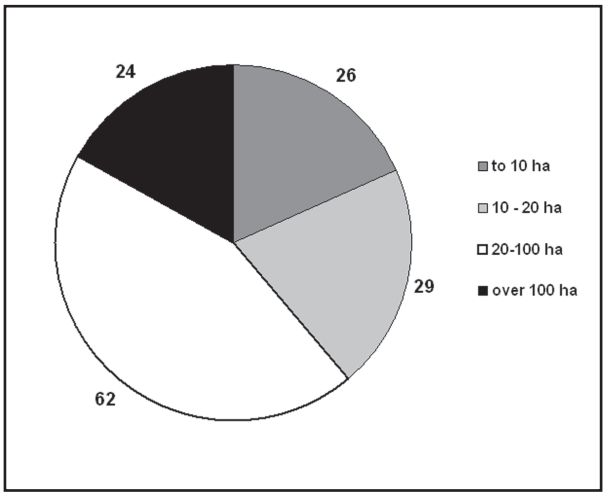


Figure 8: Comparison of the areas of first zones



The first zone areas are now composed of mixed and montane spruces, both natural forests and close-to-nature forests, including primeval forest stands, peat-bogs and peat meadows, glacial lakes and watercourses.

The new zonation was not created in the forest on the basis of detailed evaluation of the region from the point of view of ecosystem, biodiversity and natural processes protection, but exclusively according to forest typology criteria. The key criterion when delimiting the first zone areas was the principle of non-intervention from the forestry point of view, which allows natural development only in strictly original ecosystems. The following were included in the reorganisation:

- precious stands of natural composition, capable of long-term functioning of natural processes without necessary management intervention (for example the Stožec-Medvědice primeval forest, Trojmezná primeval forest and most of the peat-bogs in the national park);
- forests of close-to-nature composition, but influenced by human activity, which can acquire a natural species composition without intervention (for example stands with a primeval forest character, first generation forest after primeval forest, etc.);
- smaller parts of non-original stands (both mixed and spurce), for the purpose of easier boundary setting.

Figure 9: Zonation of the biosphere reserve, 1990

Figure 10: Zonation of Šumava NP, 1993-1995

Figure 11: Zonation of Šumava NP since 1995

4.2. Second zone

The change of zonation in 1995 assumed that the strictly non-intervention first zone areas which formed stable core areas, would gradually increase in size to embrace stands of the second zone, where the development towards a natural species composition will be managed with restrained intervention.

The second zone was therefore divided into three sub-zones:

- II.A – 10,075 ha (14.7 % of the total park area)
- II.B – 37,319 ha (54.4 %)
- II.C – 9,532 ha (13.9 %)

Friends of the Earth and numerous experts disagreed with the reduction of first zones but finally accepted them considering the suggested management strategy for II.A and II.B zones:

The original plan was that sub-zone II.A would become part of the first zone by the end of 2005, sub-zone II.B by the end of 2025, while sub-zone II.C would remain long-term in the second zone.

The sites with close-to-the-nature habitats, which were taken out of the first zone in the 1995 reorganisation, should have been re-integrated within ten years. Within this period of ten years the intervention aimed at developing a species composition and structure should have been implemented. Inside the individual zones the following arrangements should have been implemented [5]:

I. zone:
- development without human intervention

II.A zone:
- managed succession, underplanting and planting of native tree species
- management of tree species composition in both young and advanced growth stages
- selection felling (individual trees and groups)
- leaving all dead wood in the forest
- reduction of salvage logging: allowed only in forest edges and along roads
- ban of chemicals and heavy machinery

II.B and II.C zone
- reconstruction management aimed at restoration of natural and seminatural special structure
- replanting by shelterwood system and selective felling
- ban of chemicals and heavy machinery.

This plan has never been implemented. Borders of II.A zone have never been exactly set and the forestry measures failed to distinguish between the II.A and II.B zones. The re-expansion of the first zone site was postponed by the new Management Plan. Intensive interventions against the spruce bark beetle were in progress meanwhile. Heavy machinery was used for these activities and the large-scale clear-cuts arouse, part of the felled logs have been taken out of forest at the beginning and a part of them later – see Chapter 11. Deep erosion rills were created as the result of the heavy machinery use [6]. For example during the autumn 1996 the Šumava NP Administration re-naturalised 180 km of the skidder lines and the old erosive trenches (erosion rills). To combat the bark spruce beetle, insecticides are still applied. Active vegetation restroration towards native special structure is only marginal. National Park Administration invests huge sums of money into roads reconstruction not only in II.A and II.B zones, but even in the first zone.

The intervention against bark beetle and resulting clear-cuts delayed the reconstruction of the natural habitat for a century. Instead of bark beetle affected forest, clear-cuts will be added to the first zone. This is against the intentions of the zonation as a management instrument of the national park.

4.3. Bark beetle management strategy

In 1999, because of the bark beetle, the non-intervention regime was revoked in 53 first zones and the felling of bark beetle-infested trees started there. Remaining without intervention were peat bogs, mixed woods and, understandably, those spruce forests in the Modrava area affected by the bark beetle calamity where the trees have already died.

In so-called disturbance-free areas, where the entry for the public is forbidden in order to protect disturbance-sensitive endangered species, heavy extraction equipment including helicopters has been used without any restriction.

The new Management Plan, approved in 2001, had divided the first zone into three various sub-categories or 'types'. In other words, the regulation permitting for interventions against the spruce bark beetle was now fixed, a regulation which have been up until then regarded as an exception in the process.

The zonation scheme is completely confusing now. Šumava NP is divided into the following categories:

- first zone type 1: non-intervention management
- first zone type 2: conservation and restoration activities. In the first zones of type 2 where the spruce exceeds 40 %, trees affected by bark spruce beetle are felled, and the Management Plan assumes that this approach will continue.
- second zone divided into three categories, II.A, II.B and II.C zones: all trees affected by the spruce bark beetle are cut down here, the planned regeneration fellings are implemented slowly, and common forestry approach is permanently applied
- third zone: mainly villages and their immediate vicinity
- a non-intervention area (1,200 ha in Modrava forest district): no intervention against bark spruce beetle, withered vegetation is underplanted with young trees. National Park Administration staff cites the non-intervention area, which was encircled with a logged belt, as an evidence of fullfillment of the national park management goals.
- disturbance-free areas (species protection): the entry for the public is forbidden, forest activity is not reduced.

Some forest-free areas of the first zone were declared as the first zone type 3 where 'continuous maintenance management' (meadows cutting, grazing) is applied, but this category is not relevant for the bark beetle management strategy.

The policy of interventions against the spruce bark beetle in relation to zonation was changed three times from 1993 to 2001. The strategy of division of the first zone into small non-intervention islands failed completely.

5. Interventions against bark beetle in the first zones of Šumava National Park

Following the 1995 reorganisation, only small fragments of natural forests[1] and other ecosystems are included into the first zone (see Chapter 4).

Many of them were strictly protected even before the establishment of Šumava NP as smaller nature reserves. Human interventions had been very limited at that time in these areas. The formal regulation required active measures against bark beetle infections, but in reality they have been depending on the individual decisions of local forest managers. Usually, forest staff have been visiting the nature reserves less often than commercial forests in their area.

In 1993-1995, interventions against the bark beetle were evaluated individually, case by case, and sanitation measures were not so strong due to a low abundance of the insect, though they had some negative impact on the natural development of the vegetation. From 1995 to 1998, there was not a single intervention made in the first zones.

A U-turn in policy, leading to systematic interventions against bark beetle in first zones, came in 1999. Some of natural forest fragments were totally destroyed because of the combination of bark beetle abundance in the area bordering Bayerischer Wald NP, and the Šumava NP Administration's approach of felling every infected tree. The new management plan in 2001 confirmed this strategy.

Detailed analysis of all the individual first zones an of the influence of interventions in the surrounding second zone forests has not been finished yet. This research is expected to be completed by the end of 2002. To illustrate typical examples of different situations, we provide data for several first zones here (see Fig. 12):

- the first zones of the Plešný and Železná Ruda forest districts, i.e. at the eastern and western end of the national park, rather far from the centre of the calamity and therefore hardly influenced by it
- the first zones of the Stožec forest district which can be influenced by the centre of the calamity to a small extent (occasional transfer of the bark beetle by wind)
- the first zones of the Kvilda forest district, where part of the first zones is directly impacted by the calamity
- the first zones of the Modrava forest district where the influence of the calamity and of logging in the surrounding second zone is very strong in some places.

There is not enough space for a detailed individual analysis for each case here. Nevertheless, we can point out several results and hypotheses that need to be further investigated by more detailed research into individual localities and factors.

In locations both close to and far from the centre of the calamity, the outbreak follows the same pattern. The highest abundance of bark beetle was in 1996, and the population had decreased since then. This development is not influenced by sanitation measures: bark beetle populations decrease in the first zones both with and without intervention measures. A small, but substantial number of the first zones does not follow this trend as the population oscillates here with no clear pattern.

First zones were influenced by wind damage in 2000 and, to a lesser extent, in 1999. No record exists of the years before and it remains unclear how frequent the damage has been before tree felling in the first zones was allowed. Based on field experience, Friends of the Earth believe that wind damage was more rare before 1999, but we have no evidence for that. Comparison with the situation in neighbouring second zones shows that the frequency of wind damage peaked over the entire national park at that time. Damages caused by wind storms also occurred in the first zones where cutting of trees affected by the bark beetle was not permitted. Also we lack an analysis of the impact of tree felling in forests of neighbouring second zones: generally we can say that a significant influence of such interventions can be seen in the Modrava and partly in the Kvilda forest district.

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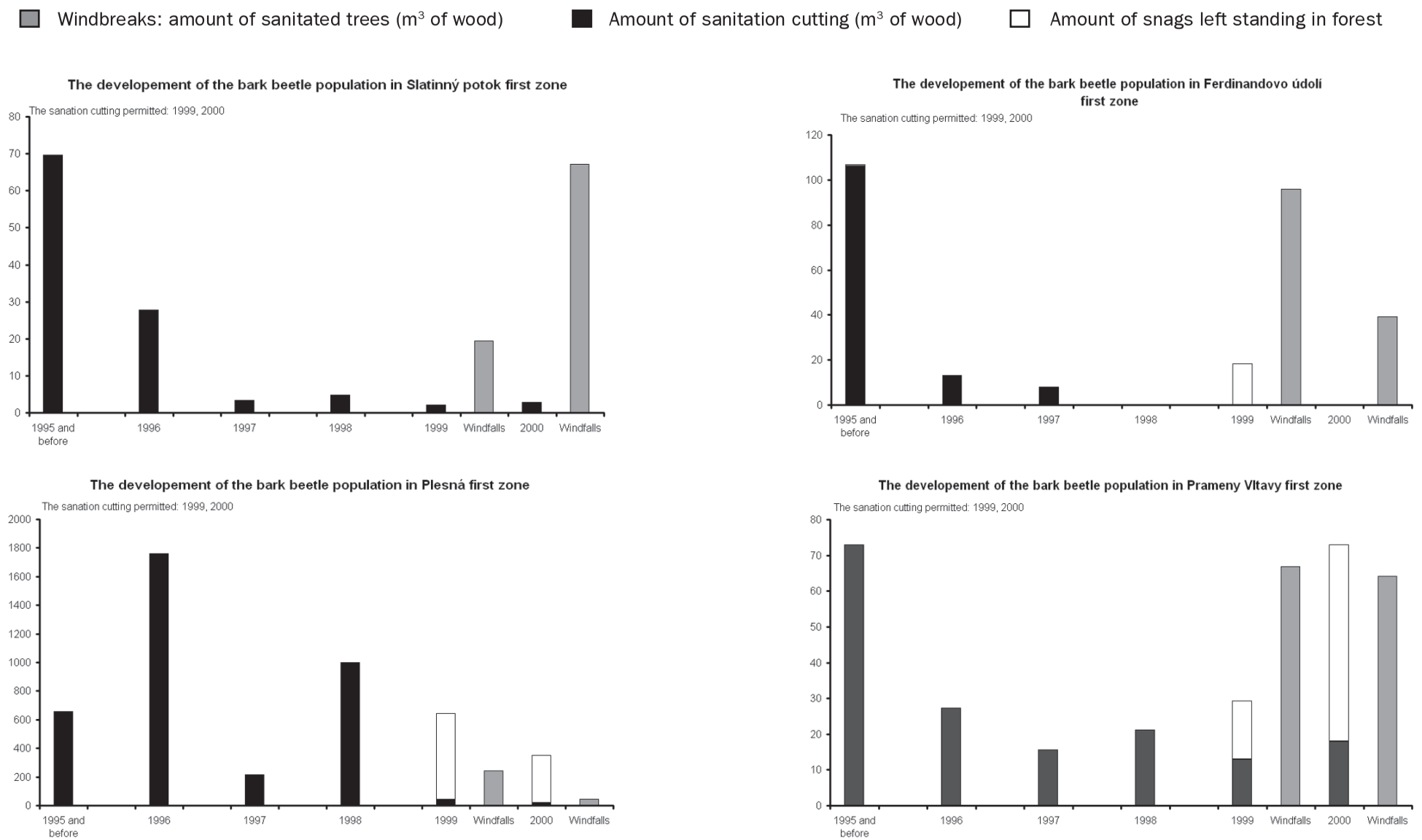
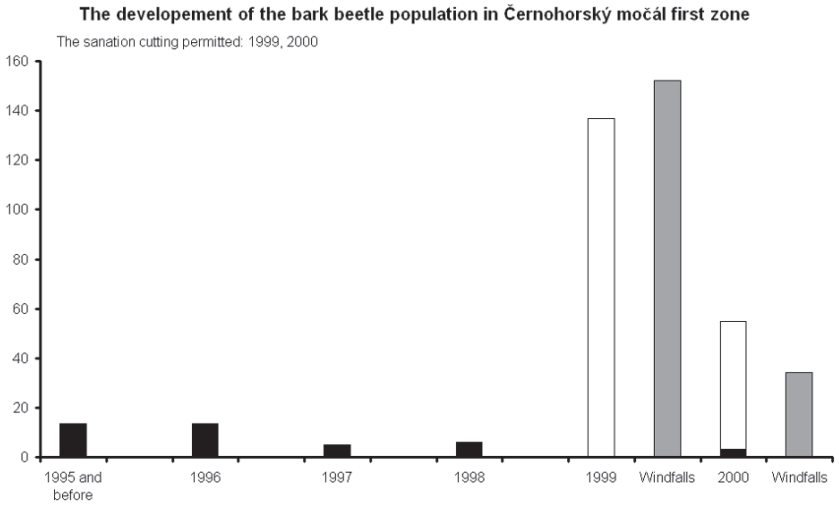
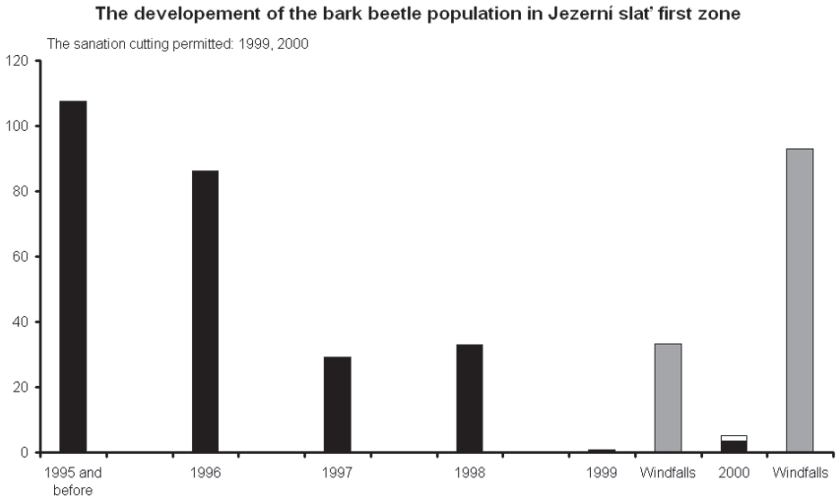
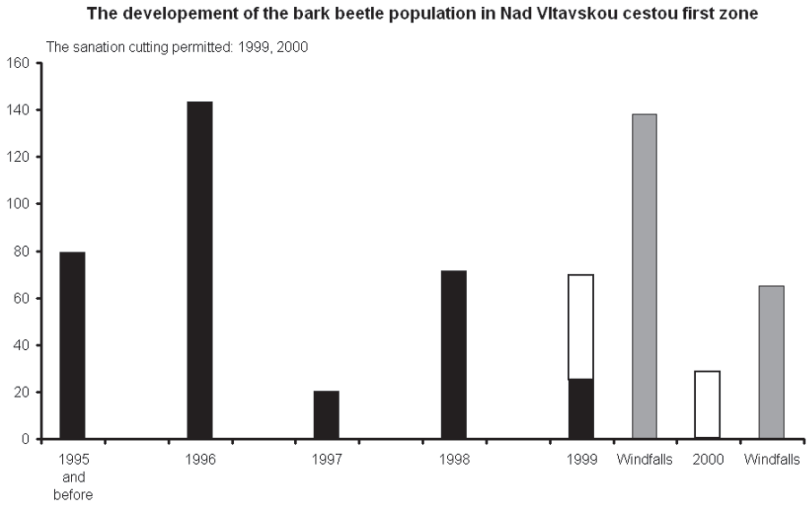
[1] A note on terminology here. In the Czech Republic, not a single natural, old growth forest in its genuine meaning had been preserved until now. Even the best conserved forests were influenced by humans in the past to some extent, though old interventions are not recognisable anymore. The Czech forestry terminology uses a more suitable term 'pralesovitý porost' - 'natural forest-like' or ‚old growth-like' vegetation – for forests where a human impact is recorded in historic documents but the forest has got its natural special and age structure. Natural forest formations of Šumava National Park (e.g. Stožec and Trojmezná Forests) suffered from historical dead wood removal. Therefore they do not have entirely natural status, despite a natural forest-like character in living trees [7]. With this in mind, the forests are usually labelled „natural forests" still and many of them belong between some of the most valuable natural sites in the country.

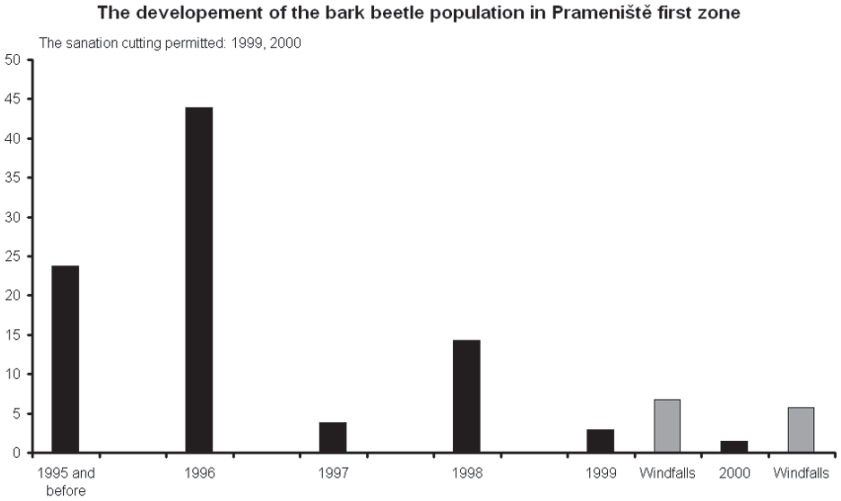
Figure 12: Trends in bark beetle quantity in some of the first zones of Šumava NP. First zones of four different forest districts with various relationship to the calamity centre, for more discussion on differencies between them see p. 18. **Železná Ruda forest district:** Slatinný potok (interventions both in 1999 and 2000), Novohůrecká slať (no interventions in 1999 and 2000), Plesná (1999, 2000). **Kvilda forest district:** Mezilesní slať (1999, 2000), Kvildský les (1999, 2000), Černohorský močál (1999, 2000), Jezerní slať (1999, 2000), Nad Vltavskou cestou (1999, 2000), Prameniště (1999, 2000), Prameny Vltavy (1999, 2000). **Modrava forest district:** Mezilesní slať (interventions both 1999 and 2000). **Strážný forest district:** Častá (1999, 2000), Silnice za celnicí (1999, 2000), Skalnatý hřbet (1999, 2000), Strážný-triangl (1999, 2000), Kynžvart (1999, 2000), Malá slať (2000). **Plešný forest district:** Vltavský luh (no interventions), Houska (no interventions), Smrčina (1999, 2000), Kaliště (1999, 2000), Jezerní luh (1999, 2000), Chornice (no interventions), Pod Hraničníkem (1999). Source: Šumava NPA.



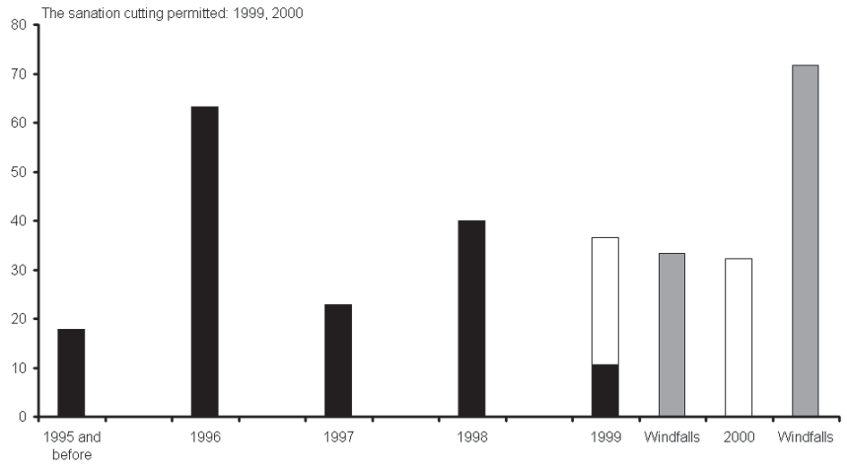

The developement of the bark beetle population in Černohorský močál first zone
The sanation cutting permitted: 1999, 2000
160
140
120
100
80
60
40
20
0
1995 and before
1996
1997
1998
1999
Windfalls
2000
Windfalls


The developement of the bark beetle population in Jezerní slať first zone
The sanation cutting permitted: 1999, 2000
120
100
80
60
40
20
0
1995 and before
1996
1997
1998
1999
Windfalls
2000
Windfalls

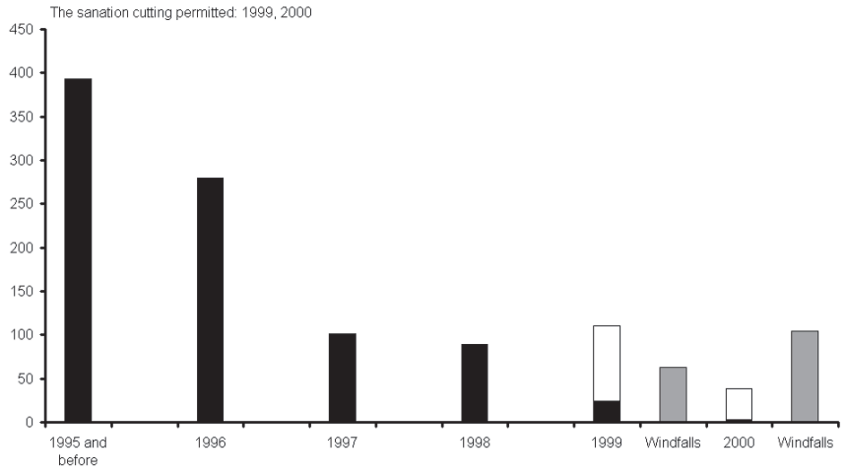

The developement of the bark beetle population in Nad Vltavskou cestou first zone
The sanation cutting permitted: 1999, 2000
160
140
120
100
80
60
40
20
0
1995 and before
1996
1997
1998
1999
Windfalls
2000
Windfalls


The developement of the bark beetle population in Prameniště first zone
The sanation cutting permitted: 1999, 2000
50
45
40
35
30
25
20
15
10
5
0
1995 and before
1996
1997
1998
1999
Windfalls
2000
Windfalls

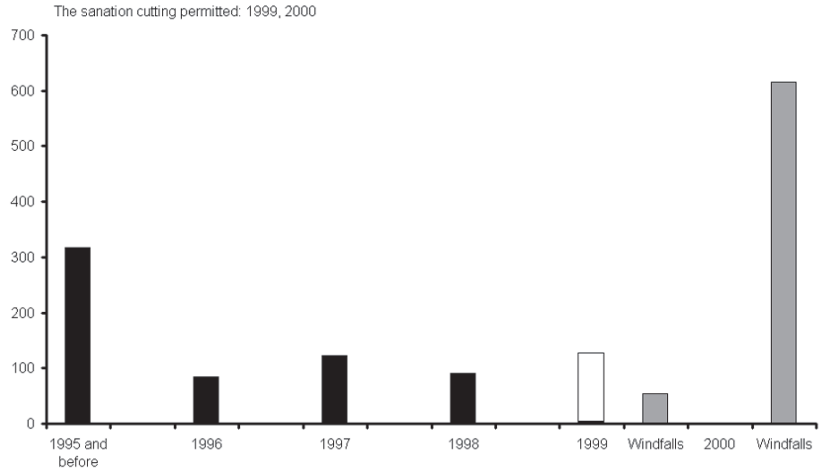
The developement of the bark beetle population in Kvildský les first zone



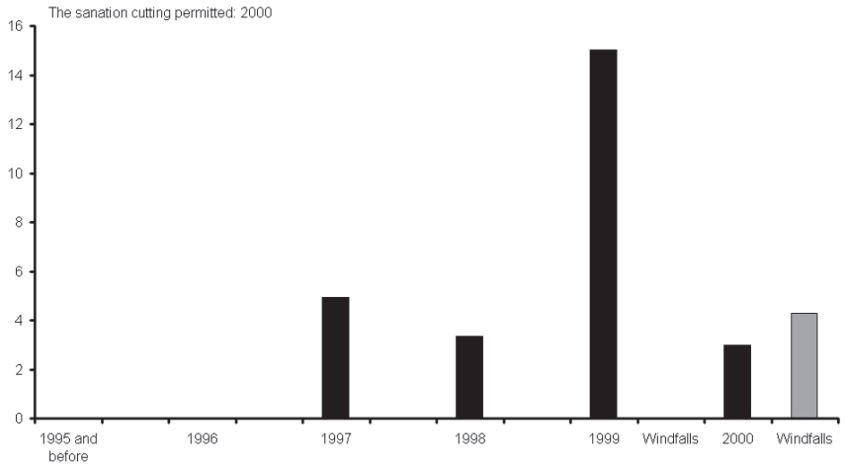
The developement of the bark beetle population in Mezilesní slať first zone



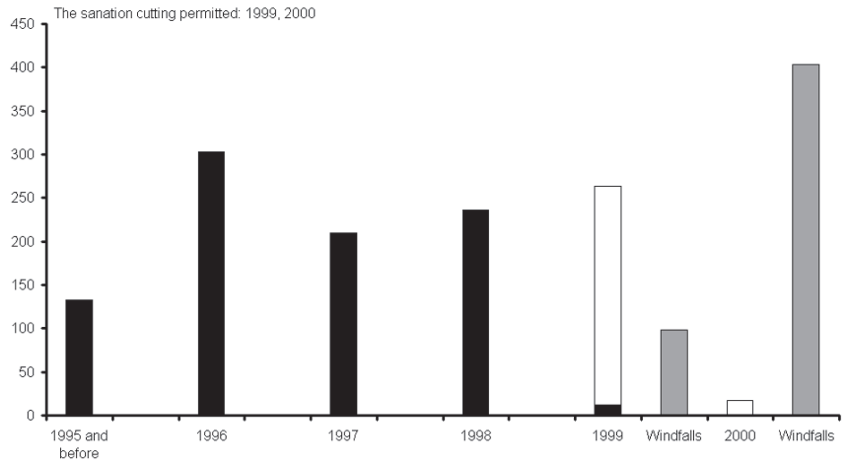
The developement of the bark beetle population in Častá first zone



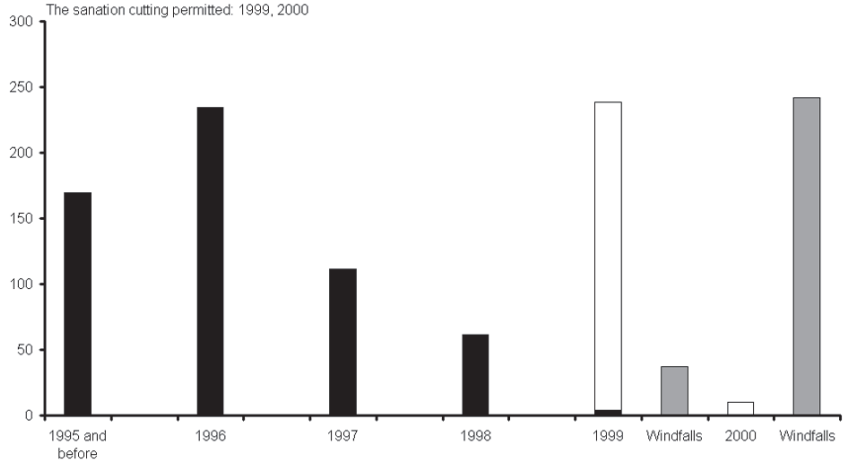
The developement of the bark beetle population in Malá slať first zone



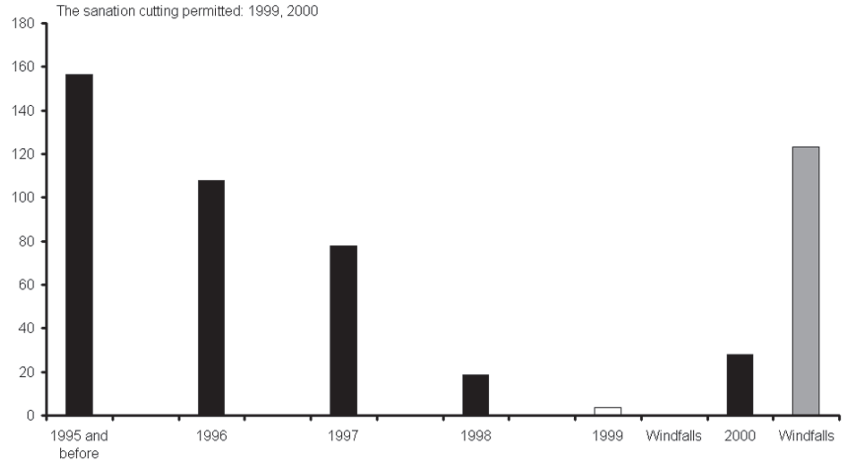
The developement of the bark beetle population in Kunžvart first zone



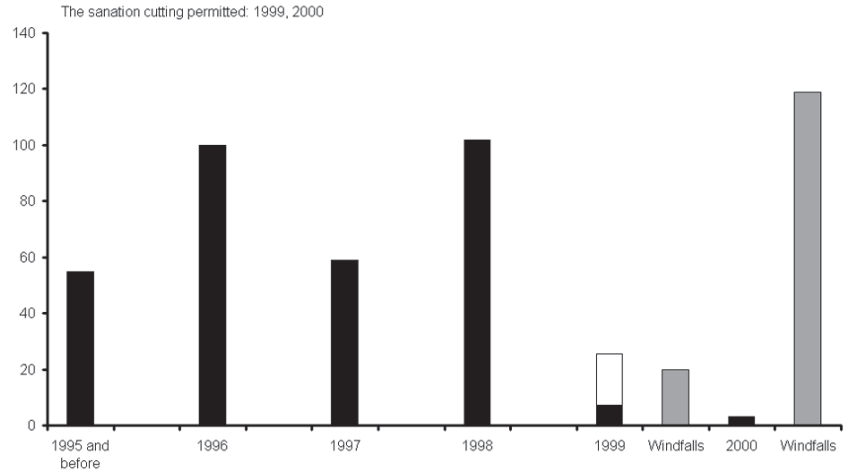
The developement of the bark beetle population in Strážný-triangl first zone



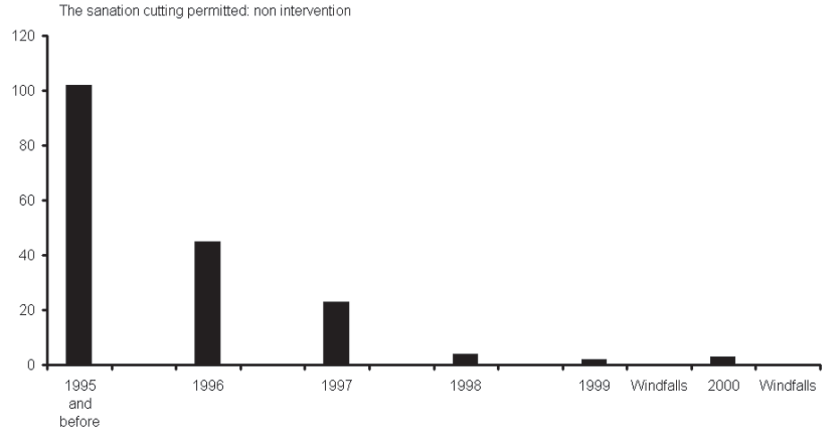
The developement of the bark beetle population in Skalnatý hřbet first zone



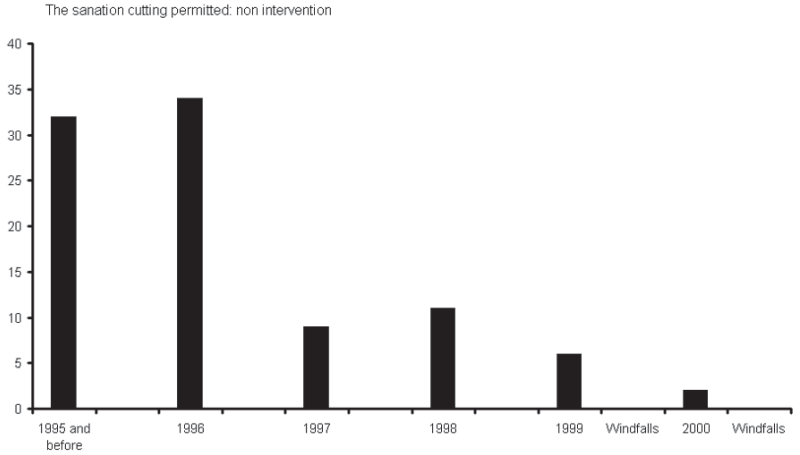
The developement of the bark beetle population in Silnice za celnicí first zone



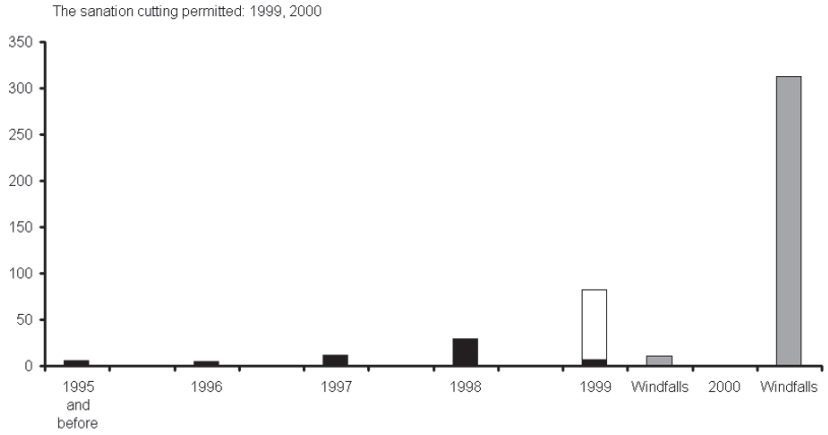
The developement of the bark beetle population in number 122 first zone



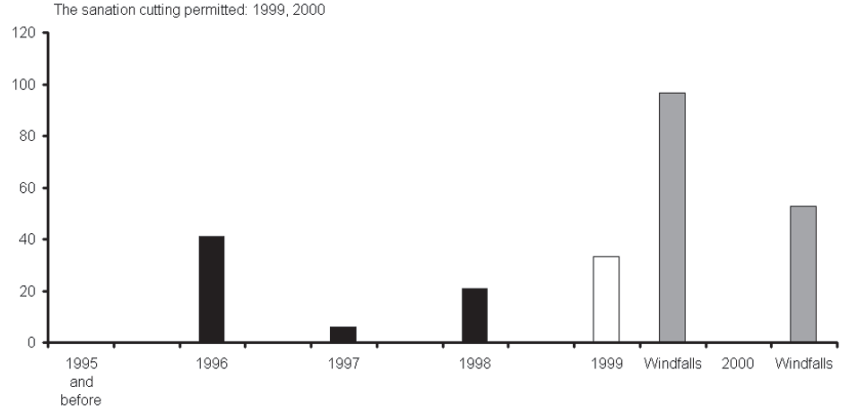
The developement of the bark beetle population in number 123 first zone



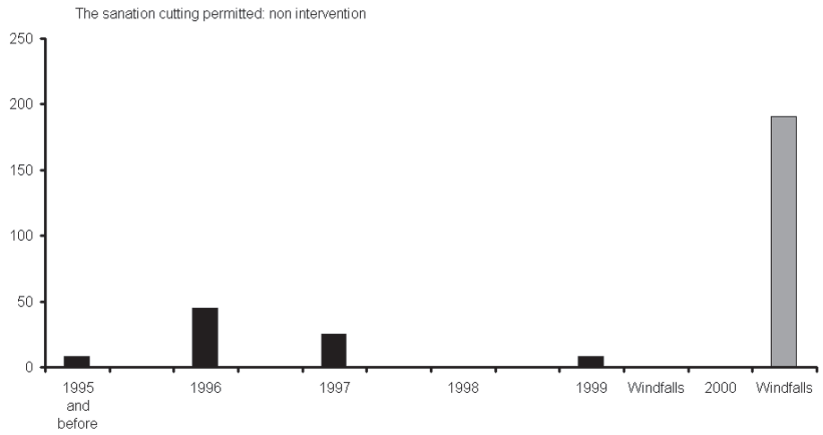
The developement of the bark beetle population in Jezerní luh first zone



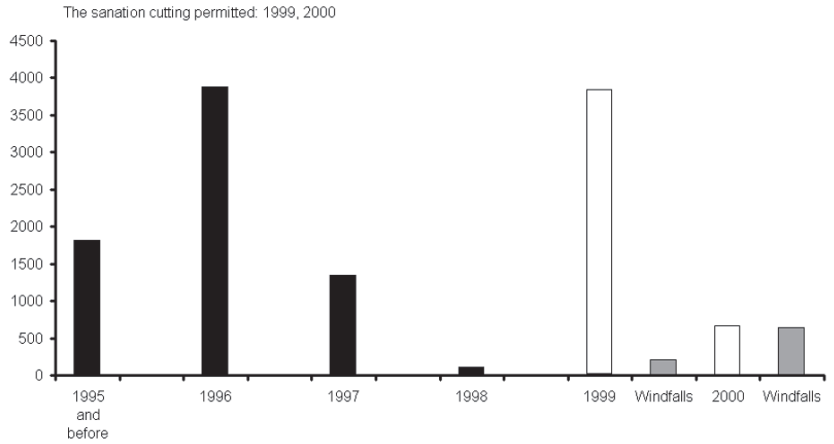
The developement of the bark beetle population in Kaliště first zone



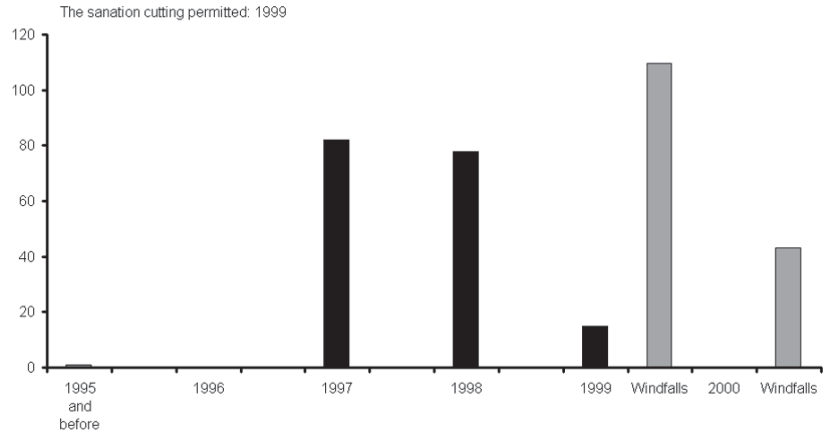
The developement of the bark beetle population in number 130 first zone



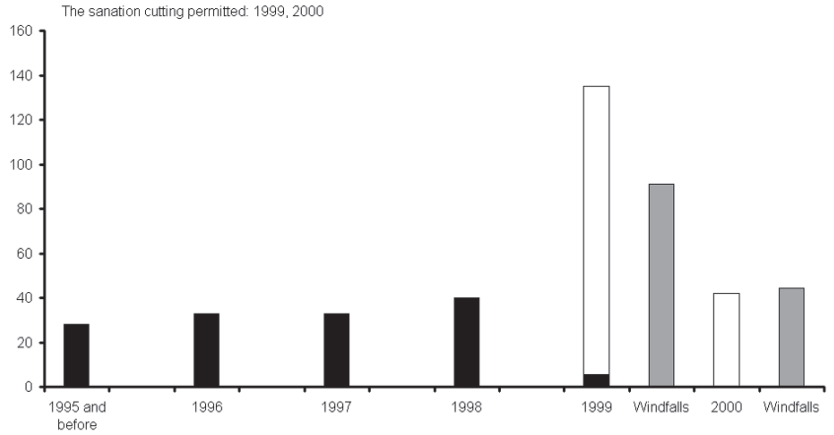
The developement of the bark beetle population in Smrčina first zone



The developement of the bark beetle population in Pod Hraničníkem first zone



The developement of the bark beetle population in Kaliště first zone



The key question, however, is why the Šumava NP Administration decided to go ahead with tree felling (or, better, with interventions) in the first zones at all.

The size of beetle population in the first zones close to the calamity centre is not an important criterion for the decision of whether to intervene here or not. Under local conditions of massive insect attack, the intervention approach means in reality a clear-cut of more or less all trees.

But in an overwhelming majority of the first zones distant from the calamity centre, the bark beetle population in 1998 was much smaller than in 1996 – when the non-intervention strategy in the first zones was generally accepted by the National Park Administration. Even the absolute number of trees attacked by the insect was rather low here in 1997 and 1998, with several exceptions. In most of these first zones, no spread of infestation into their neighbouring second zone was recorded – see Table 4 (however a detailed analysis is not finished yet).

The intervention approach in first zones of the national park has damaged their natural development and prevented these sites from serving as scientific 'benchmarks' for future research of bark beetle behavior in natural forest. A unique opportunity to study this issue was lost. Friends of the Earth believe that only because of this loss, the Šumava NP Administration's strategy raises some concerns.

Table 4: Cutting of standing trees affected by bark beetle in forest districts with selected first zones of Šumava National Park in 1996 – 2000

forest district	1996	1997	1998	1999	2000
Železná Ruda	no	yes	yes	yes	yes
Prášily	no	no	yes	yes	yes
Srní	no	no	no	yes	yes
Modrava	yes	yes	yes	yes	yes
Kvilda	no	no	no	no	yes
Borová Lada	no	no	no	no	yes
Strážný	no	no	no	yes	yes
České Žleby	no	yes	yes	yes	yes
Stožec	yes	yes	yes	yes	yes
Plešný	yes	yes	yes	yes	yes

Source: Hnutí DUHA/Friends of the Earth 2002 [8]

6. History of bark beetle outbreaks in Šumava National Park

The current bark beetle calamity in Šumava National Park has its roots deep in history. The population dynamics of the bark beetle is being influenced by the development and structure of local ecosystems.

The bark beetle calamity of 1870 – 1876

In the territory now comprising Šumava NP, wood exploitation started approximately in the middle of the 18th century. Local natural forests were gradually made more accessible. In the southern part and in the area encompassing Modrava, Srní and Prášily, the wood used to be cut by the Schwarzenbergs, the regional landlords, while in the area around Kvilda the situation was even worse due to activities of often changing owners of Zdíkov estate. Despite that, untouched primeval forest has been covering still almost half of the forested part of Southern Šumava in 1856-1874 [9].

An important milestone in the history of the Šumava forests was a wind-throw disaster over the night of 26 October 1870. The largest concentration of windfall-disaster areas occurred where, less than a hundred years before, extensive areas of primeval forests had been destroyed by clear-cuts. The wood from this harvesting was required for fulfilling a quota for river-transported timber. A consequence of this clear-cutting was the creation of homogeneous spruce forests [9].

In these areas, the bark beetle calamity began to spread extensively, which affected not only the remaining artificially planted spruce monocultures, but also part of the surviving Šumava primeval forests. Attempts to combat it caused extensive deforestation. The deforested areas were afforested with spruce trees again, partly artificially using the autochtonous and to a small extent an introduced gene pool, but to a large extent by natural renewal.

The origins of current calamity: 1983 – 1984 and first steps towards protection in 1989

The largest calamity of the last decades occurred in the Modrava area in 1983 – 1984 prior to the creation of the national park. The storm caused a number of blow-down areas overwhelmingly located behind the barbed-wire of the Iron Curtain where access was limited for both the public and forest workers, and steps to reduce the damage were not taken fast enough.

Intensive clearance of the area after the calamity took place in 1988 and 1989, massive logging caused a thinning of forest stands, creation of both large-scale clear-cuts and forest edges next to these clear-cuts, which are very unstable against the wind and attractive for bark beetle. Forest edges create favourable conditions for annual damage by wind and further spreading of the bark beetle. These edges accelerated the destruction of stands in the sites of Mokrůvka and Pytlácký roh.

In December 1989, after 20 years of effort, the Ministry of Culture declared Modravské slate State Nature Reserve (3,615 ha), which should protect a territory

> *"scientifically and hydrologically the most valuable landscape unit of the Šumava mountains, which … represents the best preserved segment of the middle mountains"* [10].

But a fundamental controversy about management in the forest of this reserve arose between the administration of Šumava Protected Landscape Area (PLA) on one hand and the management of the state forests and military properties on the other. The Minister of Agriculture and the Minister of Environment of the new democratic cabinet government became involved in the controversy, as well as other institutions, this continuing until the declaration of the national park in 1991.

After the national park was divided into three zones and after its administration was given the exclusive right to management in the forests in 1993, the feud subsided. Nevertheless, political and media attacks from other sources continued, especially from the Ministry of Agriculture, Forests of the Czech Republic (the government-controlled enterprise responsible for management of public forests outside national parks) and timber industry, the groups with vested interest in limitation of conservation measures: a significant part of the stands in the

Šumava Mountains, including the national park, were of cutting age and official data on timber reserves in the national park are even underestimated.

In August 1993, according to the opinion of the disaster committee, the bark beetle calamity was *"thanks to the responsible approach of all those concerned…successfully overcome"* [11], understandably with the exception of the non-intervention Modrava area.

New blow-downs 1993

A turning point in the development of the calamity came with more windstorms and consequent forest damage in 1993 (73,000 cubic metres). The political and media pressure of the forestry lobby led to the appointment of Mr. Ivan Žlábek as the national park director in 1994.

In 1995, the first zones were reduced and divided; at the same time the approach towards the bark beetle changed – wood-felling could be carried out everywhere except in the first zone areas and the non-intervention area in Modravské slatě (c. 1,300 ha, of which 820 ha were in the second zone). In the forest excluded from first zones, the nature conservation authority, a part of the National Park Administration, lost its right to ban salvage logging after individual assessment.

Despite the massive intervention involved in creating clear-cuts of many hectares in size in the second zone areas, paradoxically the numbers of bark beetles grew: while 63,000 m^3 of wood was extracted in 1995 as a result of intervention, a year later the amount was 192,500 cubic metres (including trees used as beetle traps), Fig. 13. This growth in the numbers of bark beetles despite the large-scale wood-felling, occurred partly because of the warm and dry weather and partly because the stability of older stand edges was disturbed through the removal of dry barren snags. Paradoxically the national park administration did not curb the extraction of dry barren snags until as late as April 1997 (see Chapter 11). The bark beetle calamity in the second zone of Šumava NP could not be overcome by human actions and sanitation had little effect – the workers were not able to process all the attacked trees in time.

After a rainy summer in 1997, there finally came a turning point – mainly thanks to climatic conditions – and a decline in the abundance of bark beetles in the second zone areas (115,000 m^3 of wood); a year later this trend continued (74,000 m^3). In 1999, in spite of all intensive anti-bark beetle measures the abundance of bark beetles increased again (90,000 m^3), mainly in areas neighbouring the Bayerischer Wald NP (Fig. 13).

Table 5. Forest districts in Šumava NP that were formally declared calamity areas in 1993 – 1998, with consequent intensive logging

1993	1994	1995	1996	1997	1998	1999	2000	2001
		Žel. Ruda	Žel. Ruda					
Prášily	Prášily		Prášily	Prášily				
Rejštejn	Rejštejn		Rejštejn	Rejštejn				
		Srní	Srní	Srní				
Modrava	Modrava	Modrava	Modrava	Modrava	Modrava	Modrava	Modrava	Modrava
		Kvilda	Kvilda	Kvilda				
Borová Lada	Borová Lada		Borová Lada	Borová Lada	Borová Lada			
Strážný		Strážný	Strážný	Strážný	Strážný			
České Žleby	České Žleby		České Žleby	České Žleby	České Žleby			
Stožec	Stožec	Stožec	Stožec	Stožec	Stožec			
Plešný					Plešný			

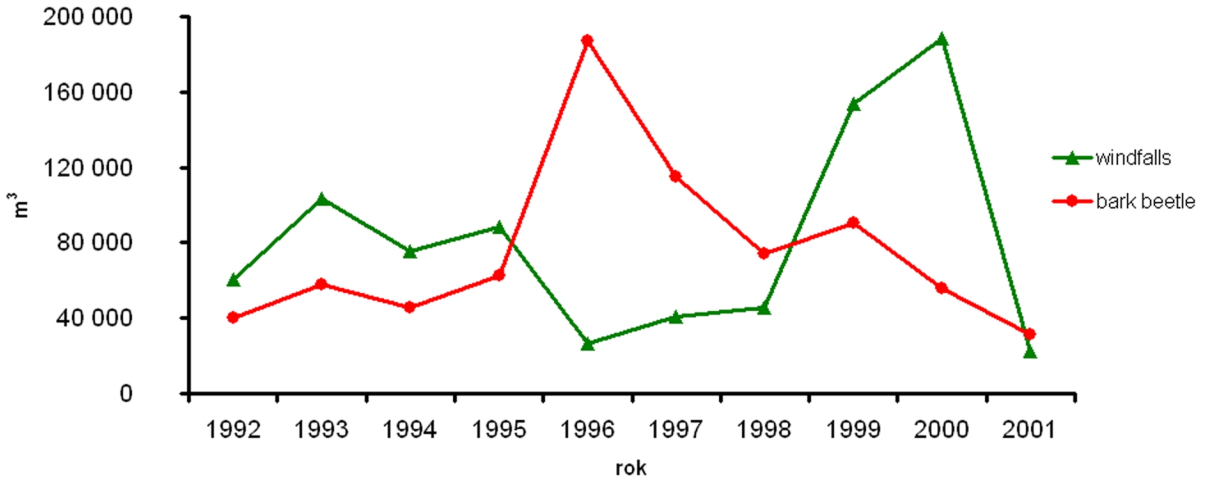
Large-scale sanitation felling of trees attacked by bark beetles goes hand in hand with the destruction of forest stands by wind. About 80-90 % of blow-downs were caused by the opening of forest stands. Therefore it is necessary to take into account the total extent of the calamity (bark beetle and wind) and consider the interaction between the two factors. Such evaluation, however, also calls into question the effectiveness of human intervention (sanitation treatment) in second zone areas, Fig. 13.

Table 6: Volume of logged timber after calamities – data from individual forest districts by year

Year		Železná Ruda	Křemelná	Prášily	Rejšten	Srní	Modrava	Kvilda	Borová Lada	Strážný	České Žleby	Stožec	Plešný	Celkem NP
1989	Wind+snow	7590	4604	6906	1411	10476	2474	10568	15776	3800	60788	8164	14732	147289
	Bark beetle	300	515	2486	137	3470	52494	4005	6326	1400	3927	622	736	76418
	Total	7890	5119	9392	1548	13946	54968	14573	22102	5200	64715	8786	15468	223707
1990	Wind+snow	17970	14482	16421	8262	11764	8851	8326	31590	14450	47576	26791	38709	245192
	Bark beetle	300	10	67	1048	231	3233	113	699	250	482	0	20	6453
	Total	18270	14492	16488	9310	11995	12084	8439	32289	14700	48058	26791	38729	251645
1991	Wind+snow	9336	6310	12332	9055	2904	4760	7087	15689	8132	21190	19004	10080	125879
	Bark beetle	300	399	72	1912	159	2706	270	2705	1568	1904	1054	128	13177
	Total	9636	6709	12404	10967	3063	7466	7357	18394	9700	23094	20058	10208	139056
1992	Wind+snow	4113	5318	3215	4867	2163	3207	4318	8778	3663	8765	4526	7526	60459
	Bark beetle	323	295	3343	2002	430	1200	150	3005	4251	2578	5889	5541	29007
	Total	4436	5613	6558	6869	2593	4407	4468	11783	7914	11343	10415	13067	89466
1993	Wind+snow	2713	5219	6830	5100	4599	3081	10399	18125	2280	14601	17727	12952	103626
	Bark beetle	655	511	4755	2248	2352	21501	0	607	4108	2967	9442	1850	50996
	Total	3368	5730	11585	7348	6951	24582	10399	18732	6388	17568	27169	14802	154622
1994	Wind+snow	0	4722	7160	4973	4243	6842	5042	9937	5141	10518	8768	7860	75206
	Bark beetle	0	360	2646	582	1991	9344	0	816	3167	2396	19797	4386	45485
	Total	0	5082	9806	5555	6234	16186	5042	10753	8308	12914	28565	12246	120691
1995	Wind+snow	1086	1206	2533	3198	2744	1729	2149	3341	2658	26781	18061	22739	88225
	Bark beetle	1374	524	2466	1443	2838	19585	2114	2246	1700	2884	17229	2649	57052
	Total	2460	1730	4999	4641	5582	21314	4263	5587	4358	29665	35290	25388	145277
1996	Wind+snow	391	207	1078	2310	2417	0	2967	2794	1292	3421	6073	3314	26264
	Bark beetle	7931	2024	4628	6964	10169	81440	20834	5562	4749	7320	29854	5876	187351
	Total	8322	2231	5706	9274	12586	81440	23801	8356	6041	10741	35927	9190	213615
1997	Wind+snow	2098	509	3179	2185	2929	195	1947	3249	2821	7228	7156	5158	38654
	Bark beetle	4364	1046	2987	4450	6912	44174	16726	3504	5872	5769	12867	6342	115013
	Total	6462	1555	6166	6635	9841	44369	18673	6753	8693	12997	20023	11500	153667
1998	Wind+snow	1934	564	1553	2294	1910	7886	3235	3454	1983	7293	7744	5955	45805
	Bark beetle	3315	1079	2801	3466	6650	29724	7998	1523	3203	3234	7870	3164	74027
	Total	5249	1643	4354	5760	8560	37610	11233	4977	5186	10527	15614	9119	119832
Total	Wind+snow	47231	43141	61207	43655	46149	39025	56038	112733	46220	208161	124014	129025	956599
	Bark beetle	18862	6763	26251	24252	35202	265401	52210	26993	30268	33461	104624	30692	654979
	Total	66093	49904	87458	67907	81351	304426	108248	139726	76488	241622	228638	159717	1611578

In areas in Modrava with the most intensive sanitation treatment, along with an increase in spruce bark beetle (*Ips typographus*), overpopulation of another bark beetle species also occurs, the small spruce bark beetle (*Polygraphus poligraphus*). This species lives predominantly in dead wood with drying bark and does not attack living trees. In the Modrava area, this species also started to attack living, mainly younger spruce trees (diameter 20 cm) and later also older, 60 – 80 year, spruce trees [12]. Forestry measures against this species is even less effective than that taken against the spruce bark beetle. In 1998 – 1999 it, together with another bark beetle species – *Crypturgus pusillus*, exceeded by many times the abundance of the spruce bark beetle [13].

Figure 13 and Table 7: The development of the bark beetle and wind calamity in the second zone of Šumava NP. Even resolute anti-bark beetle intervention in 1995 did not prevent an increase in bark beetles. On the contrary, in 1998 an extensive wind calamity occurred, in which mostly stands affected by previous logging were damaged. It is necessary to understand the effects of bark beetle and wind as interconnected factors.



year	windfalls	bark beetle	total
1992	60549	40328	100877
1993	103626	58000	161626
1994	75206	45484	120690
1995	88225	62518	150743
1996	26264	187001	213265
1997	40667	115003	155670
1998	45805	74021	119826
1999	153456	90377	243833
2000	188472	55774	244 246
2001	22645	31467	54112

Blow-downs 1998 – 2000: further calamity increase

In October and November 1998, further extensive blow-downs of about 100,000 m^3 were caused; the second destructive wave came during the following winter and a third in autumn 1999. The most affected areas were forests stands along the open edges next to clear-cuts. The wind calamity documented in 1999 destroyed a total of 153,000 m^3 of trees, a colossal amount.

Despite repeated warnings from Friends of the Earth of the serious danger of a further calamity in the second zone areas (should forest workers' efforts have been directed to cutting in the first zones, salvage-logging of the large amount of blow-down wood could not have been done in time), Šumava NP administration did a U-turn in the first zones non-intervention policy and extended the intervention territory by 53 first zone areas. Unfortunately, the warnings were ignored at great cost – in 1999 46,000 m^3 of damaged wood in the second zone areas were removed too late (after the 30 June deadline).

In the year 2000, there was a decrease in the bark beetle calamity, but the wind damaged an even larger tract of forest than in the preceding year, so the combined calamity (bark beetle and wind) grew.

2001: retreat of the calamity

The population of bark beetle decreased in 2001 in the second zone of Šumava NP down to a half of the quantity in 2000.

Although the calamity can be regarded as the largest in the last century, its extent is significantly overestimated. After 15 years of calamity, the affected territory still only covers about 5.5 % of the national park's area.

7. History of bark beetle outbreaks in Bayerischer Wald National Park

The history of bark beetle calamity in Bayerischer Wald National Park is similar to the Czech side of the mountains. Also here during the 19th century bark beetle outbreaks significantly affected spruce stands in the highest altitudes; on hillsides, mixed forests with a higher incidence of spruce have been preserved (see above Chapter 3).

After the German national park was declared, the first blow-downs of about 5,000 m^3 occurred in 1972; about 500 m^3 were left in the stands as single trees or small, so-called 'nests'. This was the first evidence of fulfilling the national park's goals. Under a 1974 order from the Ministry of Nutrition, Agriculture and Forestry, it was required that trees be left on site if they did not exceed 40 m^3. This ruling also applied to locations outside reserves where logging was no longer carried out. Until 1983, despite this radical restriction of logging, there were only small bark beetle outbreaks (up to 0.1 ha in area).

Bark beetle outbreak: 1986 – 1989

On August 1, 1983, a windstorm in the valleys and hillsides in the western part of the national park caused a large blow-down. There were 96 large-scale blow-down areas up to two ha in size. On the basis of a medium-term plan, expert panel decided to leave all blow-downs of the total area of 6,500 ha untouched, with the exception of a 500 metre wide strip at the outer national park borderline which borders with commercial forests.

The next blow-downs occurred, as occurred over all of Germany, on 24-25 November 1984, with small areas all over the national park being affected. Areas with larger damage (up to 1 ha) occurred on mountain plateaus with waterlogged land on both sides of the German-Czechoslovak border.

The Bavarian Forestry Research Institute (BFVFA) later evaluated aerial photographs and found 173 hectares of blow-downs and fallen trees (damaged areas larger than 0.1 ha were taken into consideration) resulting from both storms. Eighty-five hectares were left without intervention.

In 1985, the bark beetle attacked the lying wood left over from the 2-year-old blow-down areas. Unusually high temperatures (higher than 20° C) in May 1986 and May 1987 enabled as many as two generations of bark beetle to develop eachyear.

In 1986, the first mass attack on standing trees at the edge of blow-down areas occurred. These continued in 1987 into the adjacent spruce and mixed forests. After the evaluation of aerial photographs in 1988, it was demonstrated that 105 ha of spruce stands died in the course of these two years. In 1988 and 1989, a further 68 ha in the central and eastern parts of the national park were affected, but in the western part of the national park the bark beetle population disappeared completely as early as 1988. The mass overpopulation survived for the longest time in high altitudes of the central part of the national park, in the elevations between 1,100 and 1,250 metres. Non-native tree species and, hypothetically, also shifts in the forest borders as a result of climate change are suggested reasons explaining this phenomena.

In 1990 however no large-scale bark beetle attack could be found in the whole national park; in comparison to the previous year, only some 21 ha were affected. Thus, the mass overpopulation also disappeared from the central and eastern parts of the national park after some delay (caused by a storm in autumn 1984 in high altitudes of the national park).

In 1991, the bark beetle attacks were insignificant. According to aerial surveillance in the summer of 1992, fewer than 5 ha of new forest were attacked by the bark beetle (about one per-mille of the total park area). But a gradual spreading continued in high altitudes, which were significantly affected by industrial pollution [4].

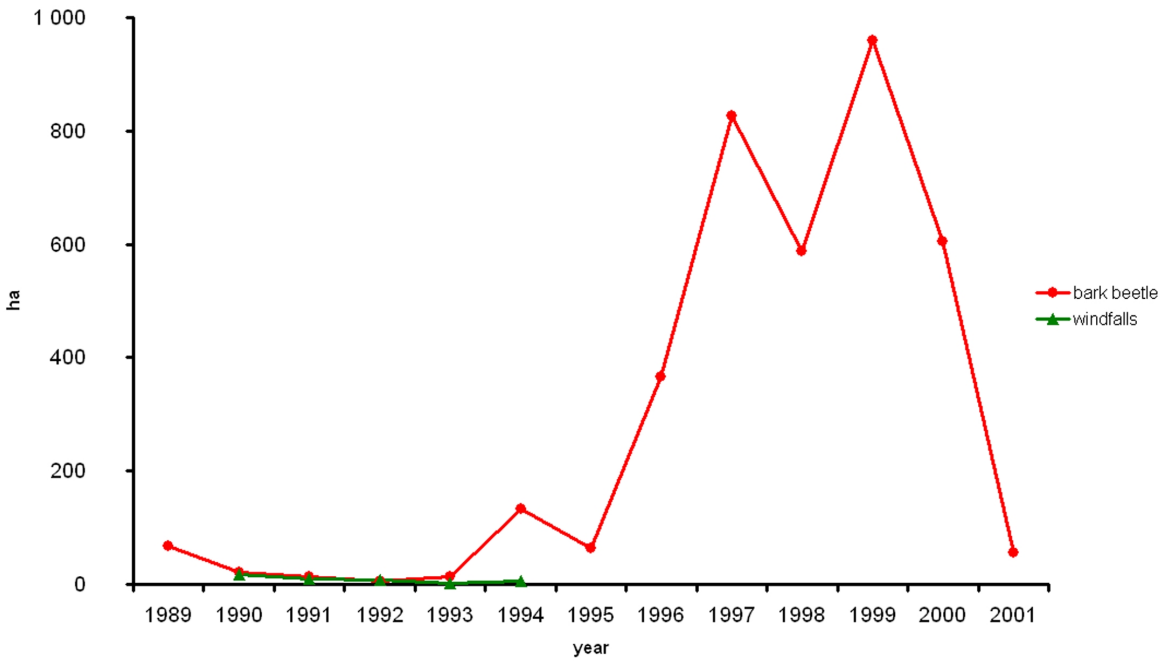
Bark beetle overpopulation: 1995 – 2000

The next wave of bark beetle overpopulation occurred in 1995 and 1996, at the same time as in the Šumava National Park. The reason for this was the warm and dry season. The spruce vegetation was also probably weakened by damage to the root systems of trees by storms in 1990 (storm "Wiebke") and 1991 [14].

This population outbreak was much more massive than the previous one, following the pattern seen on the Czech side. The development of the attack is shown in Fig. 14. The first and most affected areas were the high altitudes. The assumption that the bark beetle would stop in the mixed forests on the hill slopes was wrong. On the contrary, the bark beetle moved even faster there, because less food is available per area here [15].

Between 1995 and 2000 the bark beetle attacked forests with an aggregate size of 3,345 ha, 1,729 ha of which were in higher altitudes [16]. In 2000, the calamity decreased in the same way as in the Czech part of the mountains.

Figure 14 and Table 8. Development of the outbreak in Bayerischer Wald NP



year	bark beetle	windfalls
1989	68	
1990	21	16,95
1991	14	9,69
1992	5	8,47
1993	14	0,97
1994	132	5,57
1995	63	
1996	367	
1997	827	
1998	587	
1999	959	
2000	605	
2001	55	

Note: In the Bayerischer Wald NP, the increase of areas affected by the bark beetle is evaluated by aerial photos. Until 1999, photos were taken in July or August, meaning that observation could document areas attacked in the past year. In 1999, the pictures were taken in July and in October, therefore the areas affected in 1998 plus those affected in summer 1999, are included in the total number. From 1994 large-scale blow-downs were not recorded in the German national park [18].

2001: calamity decline

In 2001 the bark beetle calamity decreased to 55 hectares. Compared to 2000, the figure is ten times lower (a decline from 605 ha). Of the total affected area, 45 ha is in the core zone of old part of the national park and remaining 10 ha were logged in the buffer zone along the border of the park. The decline of bark beetle was faster in Germany than in Šumava National Park.

The reason for the fast bark beetle decline is not clear. Striking is that the decline of bark beetle in 2001 does not coincide with changes in weather. The quantity of active bark beetle swarming was higher compared with the quantity of previous years. The number of parasitoids increased sharply.

For the aerial suervelliance, a new method was applied, one that is more precise than the previous one. The advantage of the new procedure is based on the means of processing the aerial pictures, georeferencing. This includes the stereoscopic evaulation and interpretation of scanned aerial pictures via 3D-glasses on the computer monitor. The last step is delineation of distinguishable dead areas visible on the computer to photographs taken before hand. The total area of affected forest sites in the old part of the nationa park was refined to 3,610 ha. [17]

8. Case study: Trojmezná Forest

Trojmezná, one of Šumava NP's first zones with an area of nearly 600 ha, has not been a subject to anti-bark beetle intervention since the declaration of the national park. The lower boundary of this first zone is located at about1,000 m; the highest-lying point is the peak of Plechý Mountain, which is also the highest mountain in Czech Šumava (1,378 m). The glacial Plešné Lake and Trojmezí, the areawhere the borders of Germany, Austria and Czech Republic all meet, are also parts of this first zone.

The so-called Trojmezná Forest is the largest and best-preserved remnants of the natural montane spruce forest of primeval character in the Czech Republic. The oldest checked trees are some 300 years old. However, because of slow growth, some can be even much older. A 1170 old, healthy spruce tree was identified here in 1864 [9]. Trees of the spruce forest in the highest elevations of this first zone are only 5-10 metres high when 100 years old [9]. The forest was protected as a nature reserve since 1933.

There are however some indications of prior human activity here. At the turn of the 18th and 19th centuries, there was some logging in the highest ridge of the reserve, and cattle was probably grazed in the forest later. However, the current stands are still mostly a result of natural renewal, obviously in combination with unsuccessful artificial tree-planting. It can be described as the first post-primeval forest generation.

The lower part (about two thirds of the zone) can be labelled as a primeval forest: it has probably never been clear-cut in the past. Several individual tree cut marks can be noticed here, but it is evident that these isolated events did not damage the continued natural development of the forest. The special, age and space structure is well preserved. The only thing lacking perhaps is the quantity of dead wood [19]. The most valuable part of the forest are the stands on the slope above the lake, because of specific local conditions and unaccessibility which has prevented any logging.

From the forest typology perspective these are mainly natural stands of the montane spruce forest zone (c. 60 % of the area), beech-spruce zone and on some sites extra-zonal dwarf pine and waterlogged spruce forests. At different elevation intervals, natural spruce forests appear on steep slopes with a very well developed shift towards rowan-spruce forests in the higher altitude levels. The stands on the steep, stoney lake edges are untouched skeletal and rocky spruce forests comprised of the original ecotypes of spruce with narrow, slender crowns, including very old trees (more than 300 years).

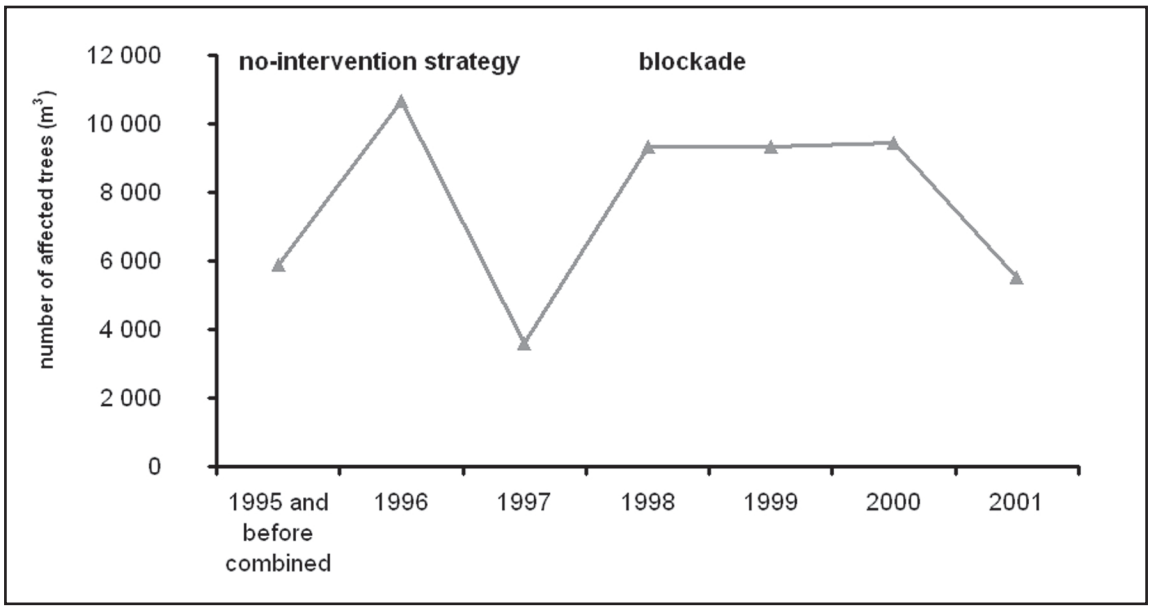
In a nearby stone field dwarf pine grows, which is rare on the Czech side of Šumava Mountains. The rowan (mountain ash)-spruce forests on the border mountain ridge are diffused and under-grown (stunted) locally with some solitary trees and an abundance of rowan trees. On the plateau, there is a mountain peat-bog with montane spruce forests. Down the hill, an acid spruce forest of medium height can be found [20].

Bark beetle in Trojmezná Forest

Until 1994, the condition in the entire non-intervention Trojmezná first zone was good, although there were already here the first signs of defoliation in the upper parts of the forest. In this forest stand were found many sterile snags destroyed by the bark beetle, some old fallen trees and broken tree crowns. The occurrence of trees actively attacked by the bark beetle was minimal.

Development of the number of snags attacked by the bark beetle in the reduced-size first zone Trojmezná in 1995-2001 is shown in Fig. 15. But 1996 saw an increase of bark beetle population, just like in the entire Šumava NP as well as Bayerischer Wald NP. However in 1997, without any human intervention, the population declined even more rapidly (natural factors efficiency of beetle population reduction: 66 %) than in the national park's second zones with intensive anti-insect measures (average efficiency of intervention, i.e. logging, measures in second zones: 39 %).

Figure 15. Development of the bark beetle population in Trojmezná first zone, Šumava



In 1999, Šumava NP Administration with the support of the Ministry of the Environment decided to abolish the non-intervention regime of the first zone areas. From May forest workers removed about 500 trees in this first zone, trees already abandoned by the bark beetle. In July, the Administration staff marked about 1,000 more trees for removal: should it be applied, felling would cause a serious damage to the natural development of primeval stands and would bring a risk of clear-cuts resulting from the consecutive disruption of the surrounding stands by wind.

Environmental activists, scientists and other nature lovers together with some local people stopped tree felling in the zone at the end of July 1999 by means of a non-violent blockade. During the blockade, forest workers were able to fell only about 100 trees. At the end of September, the blockade was closed after field inspection of the country's leading nature conservation experts, organised by Friends of the Earth. In their consensus statement, they stated that:

> *"Forest ecosystems, which became the subject of the blockade, have absolutely indisputable natural values and therefore must be preserved in their present dynamics as a unique reference area for observing undisturbed natural processes in comparison with other parts of the national park where there has been intervention [against bark beetle]."*[2]

Dendrochronological analysis of stubs of the trees felled in 1999 before the blockade showed that the trees had been dying already since 1994 through 1998 [21]. From these results we can assume that the bark beetle attacks only withered trees here and made sure that they died.

In 2000, a 200-250 metres wide strip along the Czech-German and Czech-Austrian borders was designated for the cutting of trees affected by bark beetle. The official reason given for this measure was that it was necessary to protect Austrian private and German state forests against the bark beetle. In 2000, over 500 m^3 of trees were felled in this strip, and then in 2001 another nearly 300 m^3. In the rest of the Trojmezná first zone, no interventions occurred.

However, this approach is unreasonable not only from a nature conservation point of view (this buffer zone is placed in one of the top biodiversity sites in the national park) but also from the view of the forest protection, which is the desired aim. The resulting felling of trees can cause the total deforestation of the 200 metre wide strip on the top of the Czech part of Šumava mountains within 5 or 10 years, and following destruction of the neighboring stands by wind. A similar process can be observed in the second zone at the border of Trojmezná first zone. Finally, felling will not protect the Austrian and German forests, because the bark beetle can migrate up to 500 metres.

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[2] Results of a field inspection in Trojmezná, 20 September 1999. Among the participants who signed the document were Dr. František Pelc, then director of the Protected Landscape Areas Administration (a body responsible for management of the country's protected landscape areas), Dr. Jan Hošek, then director of Nature and Lanscape Protection Agency (a government nature conservation research and advisory body), as well as Leo Košťál and the late Igor Míchal, members of the Minister of Environment's Advisory Expert Committee for National Parks

9. Bark beetle outbreak: comparison of Šumava NP second zones, Bayerischer Wald NP core zone and Trojmezná Forest.

Discussed here is the development of bark beetle calamity in:
- natural forest (Trojmezná Forest, Šumava NP first zone)
- transformed, previously exploited forests under non-intervention management (core zone of the older part of Bayerischer Wald NP)
- transformed, previously exploited forests under active anti-bark beetle management (second zone of Šumava NP in Modrava, Kvilda and Srní forest districts).

9. 1. Bark beetle expansion pattern and the extent of outbreak

When we compare the extent of the bark beetle infestation and the way it spreads in natural spruce forest (Trojmezná) and in commercially changed spruce stands (Modrava, Bayerischer Wald NP), we can find some significant differences.

In non-native, once commercially-used forests, under appropriate circumstances the character of bark beetle attack can change (instead of isolated ‚nests', a front develops) and the population can move by several hundred meters a year. In massive population outbreaks, the bark beetle does not attack only old or weakened spruce trees but also parts of original stands of the primeval character. A small number of bark beetles migrated and set up new ‚nests' which later connect. However, most of them attack the nearest trees. At the front, there can even be a relative lack of food and the bark beetle attacks young trees where it is unable to complete its development, and even the dwarf pine.

During this phase of the calamity, bark beetle population in affected older trees is so abundant that larvae compete with each other, larvae mortality significantly increases [22], and weaker individuals of lower quality complete their development. This creates conditions for a population collapse. At the same time, lack of fat reserves decreases number of migrating individuals [23]. Nevertheless, no collapse of the bark beetle population was registered in the surveyed area [24].

No widespread infestation occured in Trojmezná primeval forest, and no front has developed here. Trees are dying in small groups. Every year, several more snags usually appear in a group, and more groups emerge, while others are stabilised. The reason is the higher resistance capacity of natural spruce forest and the higher biological diversity of this vegetation – including predators, parasites and parasitoids.

It is unclear to what extent the different pattern of bark beetle attack development is caused by different local conditions of climax mountane spruce forest (Trojmezná Forest) and of waterlogged spruce stands, and non-native character of the vegetation (Modrava).

In both natural and non-native forest stands, bark beetle population changes. After blowdown damage, the wider availability of coarse woody debris trophic sources exceeds a certain limit, mainly during dry and warm periods, and the bark beetle population develops into an outbreak [25]. During an unfavourable combination of population and environmental factors, especially bad weather and limitedfood availability, the bark beetle population declines or even collapses. With abundant food, the population may again immediately reach outbreak proportions [26] [25].

The Bayerischer Wald NP example shows that it was wrong to assume that the bark beetle would reproduce geometrically until exhaustion of all available trophic sources. Access to food can be relative: it is not limited only by the existence or non-existence of nearby spruce. Even during an outbreak, the trees' health plays an important role, for example the number of trees with damaged root system (uprooted by wind), as well as the health of bark beetle population.

9. 2. Further development of the forest

Some people, mainly foresters, are concerned about the future of forests attacked by the bark beetle: *"The Bavarian way means to let bark beetles eat spruce forests, so that new forest, especially in the high altitudes of Šumava, might not even regenerate"* [27].

A number of research programmes have already begun in wind-throw areas. The results show that leaving the fallen trees on the site prevented a massive invasion of small-reed and other grass species as well as overpopulation of small rodents. Also in sites with standing dead trees, falling bark and small branches, later also entire crowns and logs, created good conditions for natural recovery after a certain period of time [4].

One remarkable aspect, extremely important for the further development of the attacked forests, is that despite the heavy bark beetle pressure, individual standing trees and small groups of spruce unevenly dispersed have been able to survive. Their number differs case by case but generally is between 1 and 10 per cent. Most probably they are resistant genotypes of spruce which can provide a good genetic pool for further generations [25] [19]. The clear-cut strategy of anti-beetle protection, however, leads to logging of them together with other trees, or they die due to the sudden direct sunlight.

An international seminar on bark beetle calamity and the subsequent forest regeneration in Bayerischer Wald National Park, held in St. Oswald, Germany in 1998, concluded that the regeneration of forests in areas damaged by the insect is sufficient, with minor problems in the highest elevations (complete results of the seminar and the participants list is avaliable from Friends of the Earth site, www.hnutiduha.cz/lesy/nps/czech/npbw).

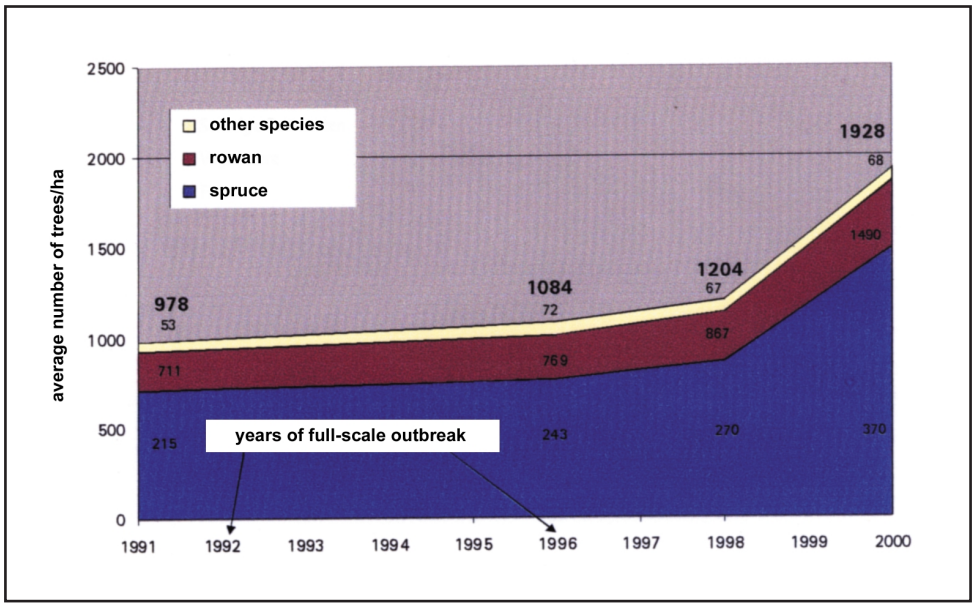
Today, even these concerns have been dispersed. The 1998 forest inventory revealed a further increase in natural regeneration, with 1,204 single trees higher than 20 cm per hectare and 630 trees that were 10 – 20 cm high per hectare counted at higher altitudes. The density of new growth decreases, of course, with increasing altitude (see Fig. 16, 17, 18). But there are only very few places where concerns about forest regeneration are still justified. In 94 % of the total number of 1,639 experimental plots (with a size of 500 m^2), natural regeneration cover above 20 cm could be found, although at some sites the number of trees found was lower than 500 per hectare [28]. It is possible to expect that the regeneration in the remaining 6 % will accelerate when the decay degree of lying logs is higher. This positive trend has been confirmed by the inventory carried out in 2000 [29] (see Fig. 19)

Figure 16: New forest in an area damaged by bark beetle outbreak, c. 1,300 metres (NE slope of Lusen Mt., Bayerischer Wald NP). Photo by Jaromír Bláha/Hnutí DUHA

Figure 17: New forest in an area damaged by bark beetle outbreak, c. 1,150 metres (NE slope of Lusen Mt., Bayerischer Wald NP). Photo by Jaromír Bláha/ Hnutí DUHA

Figure 18: New forest in a wind-blow damaged area, Bayerischer Wald National Park. Photo by Reiner Poehlmann

Figure 19: Young trees in Bayerischer Wald NP Source: Bayerischer Wald NP Administration



At sites which are located higher than 1,250 metres, regeneration density is lower than 1,000 trees per hectare [18]. At some sites, especially in the Roklan Mt. area, where undergrowth was lacking at the time of the calamity (and therefore the grass cover rapidly developed), young trees will grow on fallen logs after a certain period of time aftertheir decay, as is otherwise usual in such a high-elevation natural montane forest.

The monitoring results in the Czech Modrava non-intervention area are similar. The regeneration here was observed first by Straka and his colleagues at Lesoprojekt consultancy [30] [31]. A more detailed investigation, but in a smaller area, was carried out by the Šumava National Park Administration. The Šumava National Park deputy director also admitted that concerns about the threat to the existence of the forest affected by the bark beetle are not relevant anymore [32] [33]. Research carried out by the Forestry Department of the Czech Agricultural University has brought similar results: natural regeneration under the dry stands is sufficient, under-planting is not necessary [34].

Also the national park staff was wrong in assuming that under the dried-up tree layer an even-aged, unstructured stand would grow [32] [33]. Thorough observation of the renewal process in various parts of Bayerischer Wald NP, some stands of which are already 15 years post-calamity, we see several phases.

The first phase is made up of various old spruce trees which already made up the under-storey at the time of the calamity. The second phase is made up of spruce saplings from the masting year which usually succeeds a calamity; in the years after such a setback, the saplings often grow in large numbers, though the selection process which follows reduces the numbers severely. The third phase of renewal begins after the snags fall down. This limits access of red deer to the area, thanks to which the renewal starts with significant growth of rowan under the protection of the fallen snags. In wet ground vegetation and forests with low quality genetic structure, the snags break approximately 6 to 12 years after the bark beetle attack but much later in the case of climax mountane spruce habitat.

The fourth phase is represented by the emergence of saplings which saprophytically grow from the rotting trunks. The source of seeds are individual spruce trees loosely scattered as well as the small clusters of spruces and individual trees which have survived the calamity.

These monitoring results and personal observations are also confirmed by research in the Modrava non-intervention area:

> *"We analysed in detail certain data about natural renewal. I am more and more convinced that trees destroyed by bark beetles in these zones could be seen also as a positive phenomenon. It has provided the base for age- and spatially-diversified stands and spontaneous succession will enable the achievement of a very acceptable and 'permanently sustainable' state. Any kind of mechanical intervention only disrupts this natural development"*, writes Prach [35].

There is a quite different situation in the nearby Šumava NP area where intensive clear-cutting of bark beetle infested forest has been conducted (see Chapter 6). The level of rejuvenation is many times lower than in the stands left to the bark beetle and it is much more unevenly distributed. The age structure of the trees is more homogeneous; an almost total absence of trees from the 1990s can be attributed to the damaging effect of felling. After the felling, no seedlings have taken root.

Along with spruce, willows have appeared in the clearings, later also birch trees and aspen in smaller density. Unlike in the areas of untouched, drying-up stands, there is no rowan in this region. Their seeds are spread by birds which have nowhere to sit in the clearcuts and just fly over [36].

Intensive reforestation however is on-going here. Its success, however, depends on the conditions of the micro-location and decreases with altitude.

From the point of view of ensuring the existence of the forest, it can be stated that forest stand regeneration is taking place both in clear-cut areas as well as in non-intervention areas: artificial in the former case, natural in the latter. Exceptions to this can be found in the highest areas as well as in those habitats with the most extreme climate. Here, young trees are restricted to rotting wood which is absent from the clearcut areas of Šumava NP.

The key issue is that of the further development and future of the new forest. The results of observations carried out to date indicate that under dead trees, new forests with diverse age structure are developing and will lead to so-called 'small' succession cycle. In the clear-cut areas however, the development is again more that of even-aged stands, i.e. similar to the so-called 'large succession cycle'.

The seedlings selection under the protection of snags in the earliest period plays the crucial role. Under dry growth, climax (long-living) spruce genotypes are selected more frequently than in the clear-felled areas. Surviving there however are pioneering genotypes which are able to withstand the extreme conditions of the clearing (fluctuations of temperature, wind) but are short-living (80 – 120 years) [37] [19].

If large clear-cuts are created and later completely reforested at the same time, after 80 to 120 years, there will again be the widespread forest dieback. This is exactly what happened in the 19th century (see Chapter 6) – and now history is repeating itself.

According to Krahulec,

> *"Plantation leads to the creation of an even-aged stand of poorgenetic composition. In my opinion, this is the preparation for a bark beetle calamity to occur in 100 years similar to the one prepared for us by our predecessors"* [38].

Trojmezná Forest has managed to avoid the problem of forest renewal and future growth, because the development of the majority of this site has not been interrupted in the past by clear-cutting. Gaps are being created by the death of individual trees and groups of trees and natural regrowth occurs to an adequate extent. The number of young trees here is also negatively correlated with altitude.

9. 3. Biodiversity

In the Bayerischer Wald NP stands which have been affected by the bark beetle, the majority of trees has died. In contrast to the clear-cuts however, the diversity of animal species and to a greater extent plant and soil biodiversity have been preserved. Transition to the new generation of forest has been smooth with all forest types preserved along with successional habitats.

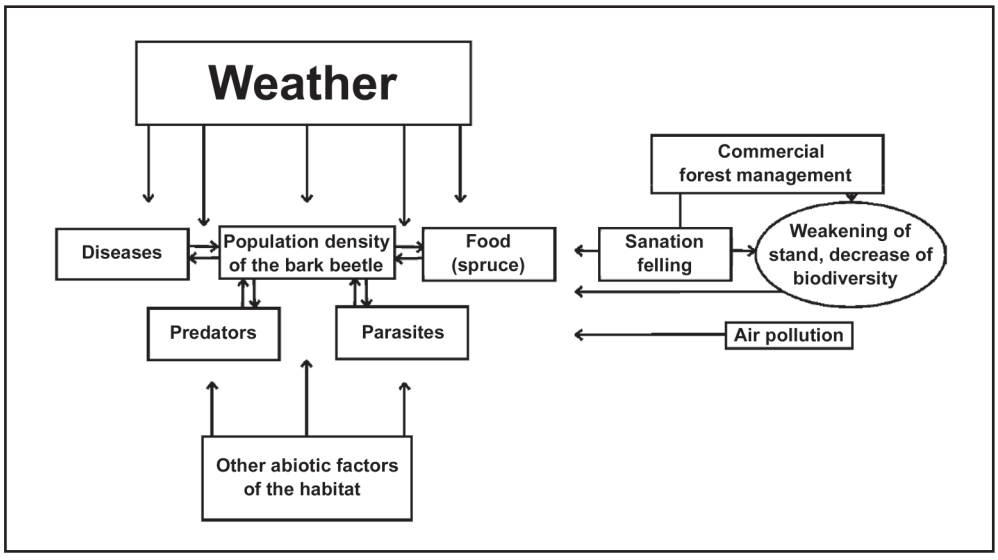
The temporary thinned-out structures of the forest have seen the growth of species which occur less commonly in closed forest [4]. Species diversity has been increased by decomposition organisms, from insects to fungi to micro-organisms. Decomposing stands are, therefore, even more diverse than green spruce monocultures.

Research on the Czech side of Šumava Mountains has shown that diversity in dead stands remarkably increases compared to healthy spruce forest for birds [39] and *Carabidae* beetles, an important bio-indicator group [40], though remaining more or less the same for plants [41] [42]. Some researchers did expect such results, however [43].

9. 4. Effectiveness of sanitation measures and influence of other factors

Surely the most debated question is, and will be, the extent of the effect of the various factors on the abundance of the bark beetle population and the choice of the most suitable measures. Forest management usually considers the oversimplified equation in which the population of the bark beetle is given by the degree of sanitation measures and how properly they are provided. In reality, however, additional factors of different importance have a role [44]. Fig. 20 gives a brief overview.

Figure 20: Factors influencing the bark beetle population



No detailed research giving clear and unquestionable answers has been carried out. Nevertheless, the results of the comparison give us at least a basic idea of the issue.

Observing the amount of salvage logging in the second zone areas of the Šumava NP we can see that the sanitation treatments are not able to stop the invasion of the bark beetle calamity when a bad combination of external factors (especially weather) occurs. The hypothesis that preventive measures would confidently prevent a calamity is wrong. Under certain circumstances the removal of every single infested tree is technically impossible and therefore this approach is not effective. Some authors compare it to an avalanche which also cannot be stopped in the middle of a hill.

Šumava NP Administration top staff often claim how many trees they had saved by a particular intervention measures. Stenseth makes a comment on this kind of arguments:

> *„Some people argue that if eg. 5,000 beetles are cought in traps, one tree is saved. This may be fallacious argument"* [45].

Without proper knowledge of at least theoretical or supposed effects of a measure, no interventions to the bark population should be taken [45].

In 1996, the number of trees attacked by the bark beetle tripled in the all second zones of Šumava National Park (Fig. 24) – not only in the areas neighboring the non-intervention part of Bayerischer Wald NP (Tables 5 and 6). Sanitation treatment, paradoxically, rather caused than prevented the catastrophe: extensive salvage logging in 1996-1997 opened further forest edges which, in connection with logging of sterile snags in old forest edges, led to unusually strong wind damage. During the last few years, the wind has destroyed an area of Šumava NP larger than that destroyed by the bark beetle (Fig. 24). It has become clear that it impossible to assess the bark beetle calamity separately from the wind damage as these are interconnected phenomena.

The worst damage was caused by a storm at the end of October 1998. Although the German side of the mountains was exposed to a stronger storm, the damage on the Czech side was several times higher than that in Bavaria. In Bayerischer Wald NP, there have been no large-scale blow-downs since 1994 [46].

Even storms before 1991 caused no major damage in Bayerischer Wald National Park: the storm on the 1 March 1990, called "Wiebke", destroyed hardly any trees despite wind speeds of 137 km/hour. January and February storms of the same year (called Daria, Herta and Vivian) were much weaker (81 km/h). One of the few episodes in the past decade with some large-scale wind damage was the storm on 25 March 1991, with about 4,000 m^3 of fallen trees. It was proven that standing snags at forest borders or even within the forest have a significant protection function and serve as excellent wind breakers (an experience with Wiebke) and they protect the stands behind them [4].

In 1997-2001, some 450 000 m^3 of blowdown were registered in Šumava NP.

Also in Trojmezná Forest, the bark beetle population peaked in 1996. But in 1997, without any human intervention, the population decreased even more significantly (the effectiveness of the natural factors being 66 % here) than in the second zones where attacked trees were felled and removed (combined effect of sanitation and natural factors leading to average 39 % decrease for the whole second zone) as shown in Fig. 15. At Trojmezná, there was no large-scale blow-down.

Another interesting result is the comparison of the development in the Černé and Čertovo Lakes National Nature Reserve, which protect two popular glacial lakes and montane nature forest. Here, in Šumava Protected Landscape Area, close to the national park boundary and at comparable altitude, the effectiveness of intervention measures was researched in detail. Part of the nature reserve was left alone without any intervention while in the second part infested trees were removed systematically.

The results of this research show that even the systematic removal of every single infested tree in the intervention area did not prevent the bark beetle calamity in 1996. The effectiveness of logging was only one percent higher than the effectiveness of the natural regulation in the following years on the non-intervention territory. The decrease of the bark beetle abundance in the non-intervention part of the reserve is almost similar to the intervention areas. But the number of spruce trees victim to sanitation measures was much higher: in 1998, a storm uprooted and broke many trees of which over 88 % were located in areas with massive intervention and less than 12 % in non-intervention part of the nature reserve.

When we add the salvage logging and the blow-downs which occurred as a result, around 40% more spruce trees fell victim to sanitation than were destroyed by the bark beetle in the non-intervention site. Implementation of sanitation measures clearly speeded up the destruction of the forest stand [47].

Another important but unpredictable factor is the extent to which the beetle population is influenced by weather.

Temperature is an important factor for the speed of bark beetle population development. It is the key factor determining how many bark beetle generations will develop during one year. But comparison of Fig. 24, 25 and 21, 22 shows that the relationship between temperature and occurrence/failure of a calamity is speculative: a calamity was preceded by three years of above average temperatures between April and September. Significant

decrease of bark beetle population in 2000 followed after years with lower temperatures (1996, 1997 and 1999) with less very warm days (temperature 25 °C or higher) so that the relationship is not as apparent here.

Furthermore, LWF (Bayerische Landesaustatt für Wald und Forstwirtschaft) monitoring pointed to the fact that the number of hour flight period was higher in all Bayerischer Wald NP locations than in previous years. Though the flight started at the beginning of May in 2001, i.e. 1.5 week later than in 2000, the weather in 2001 was in general good for development of bark beetles, especially in May, July and August [48]. Number of so-called flight periods, respectively flight days, is very important for the success of the bark beetle, and there would be many more such periods if temperatures reached 25° C [49]. It therefore does not seem that the decline of bark beetle population was closely related to temperature in our case.

Figure 21: Average temperatures in April-September in 1983-2001: data from Březník (Šumava NP, 1,130 m) and Waldhauser (Bayerischer Wald NP, 940 m) research stations

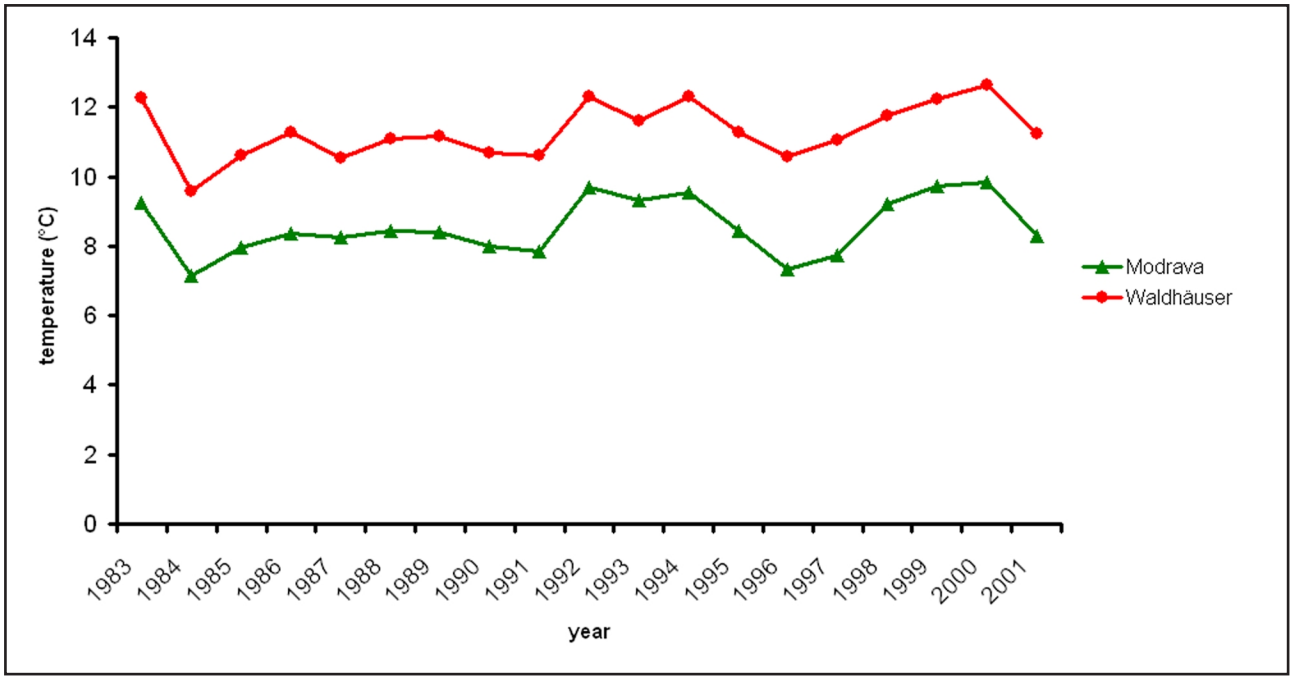
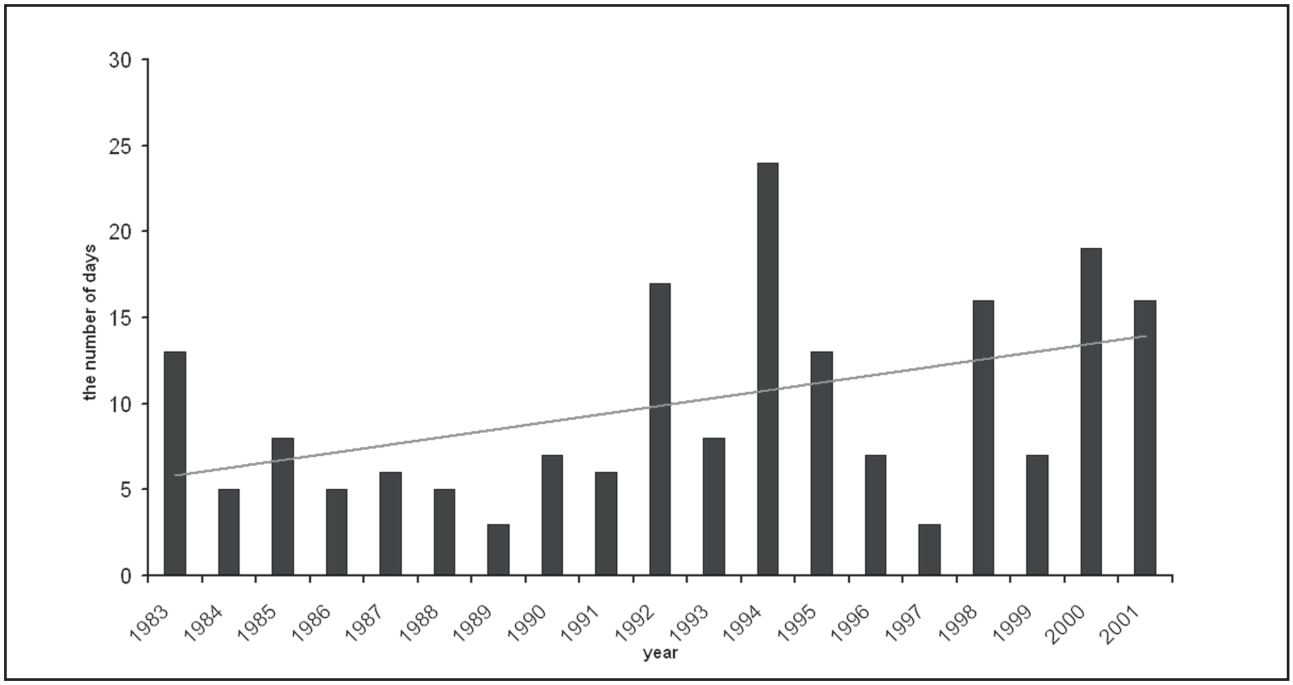


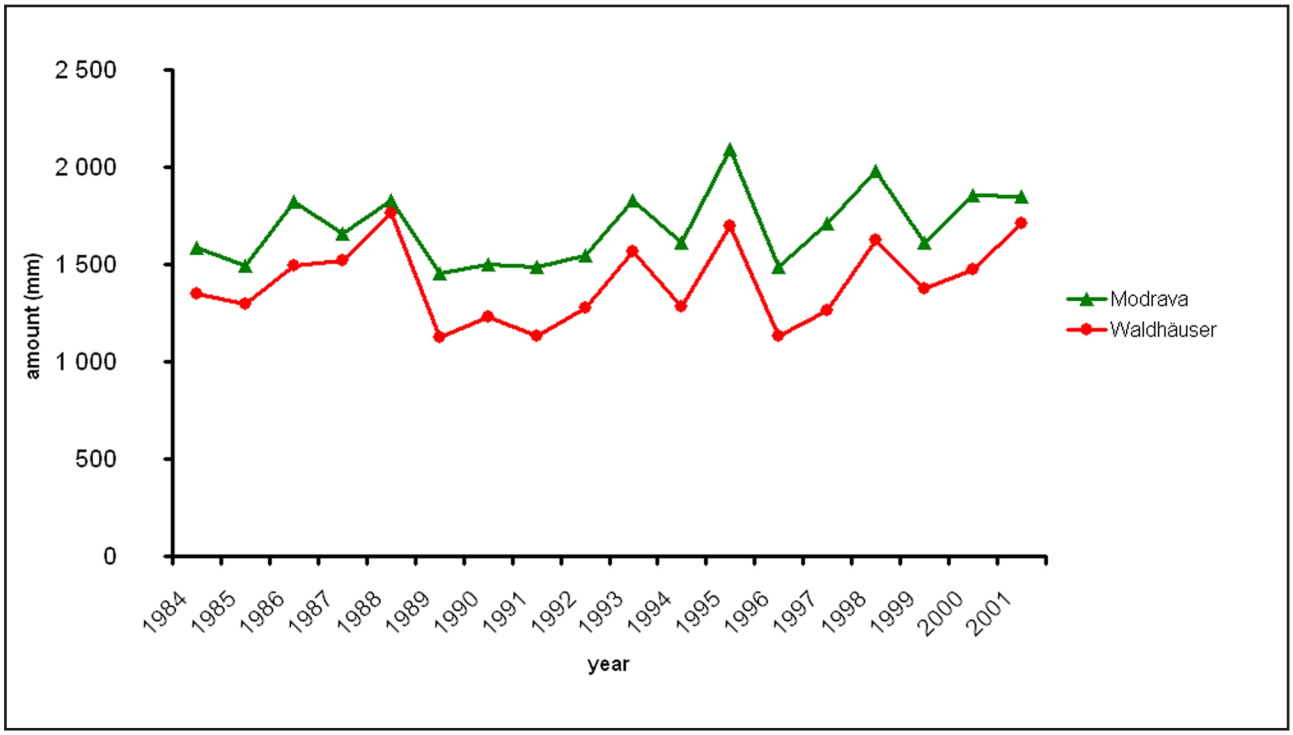
Figure 22: Number of days with the maximum daily temperature 25 °C and higher in 1983-2001 (Waldhauser, 940 m)



Also rainfall size influences bark beetle population. Dry periods decrease trees' defensive capabilities. Warm, humid weather increases mortality of the bark beeetle due to and fungi diseases, sometimes even by 100 % [50]. Rainy summer weather jeopardizes the development of the bark beetle by reducing of the number of flight periods.

Fig. 23 shows a large dry period in 1989-1992 and there is also an apparent difference in quantity rainfall on both sides of the national border.

Figure 23: Rainfall in 1983-2001



A totally insufficiently researched aspect is the acitivity and influence of bark beetle's natural enemies.

Birds in general do not have any major influence on the development of the beetle population but they can reduce its size to some extent [51]. Their influence is much more intensive in the remains of natural forests and in dying vegetation. Their presence can be seen very well in Trojmezná Forest and in the Bayerischer Wald NP core zone. In Trojmezná it is not unique to see three woodpecker species – black woodpecker *(Dryoscopos martius)*, white-backed woodpecker *(Dendroscopos leucotus)* and three-toed woodpecker *(Picoides tridactylus)* – together at a single tree.

Predatory insects, especially parazitoides, are much more important. Because many parazitoides reproduce faster than the bark beetle (especially chalcidoid wasps, *Chalcidoidea*), they are able to influence the bark beetle population quite significantly under favourable circumstancies [50]. Unfortunately, only limited data on the influence of predatory insects and parasitoides both in the Šumava NP and Bayerischer Wald NP is available, so that it is impossible to make a conslusion or prognosis. Attacks of the clerid beetle (*Thanasimus formicarius)* multiplied by several times during 2001 in two research sites in valleys on the German side of the border, compared to 2000. Activity of rove beetles *(Staphylinidae)* in Šumava NP is low [52].

Anyway, mortality of the bark beetle in non-intervention territory is increasing, especially thanks to the influence of parasitoides [53]. A significant increase of parazitoides was also discovered in the core zone of Bayerischer Wald NP in 2001 [48].

To find out the total impact of all factors, we can compare the entire area affected by the calamity in the Bayerischer Wald NP and in the adjacent areas of Šumava NP (Modrava, Kvilda and Srní forest disctricts). This comparison shows to what extent the intervention measures contribute to control or uncontrolled development of beetle outbreaks. It is however necessary to take into account the relationship between individual factors, as well as the effect of sanitation activities.

When we compare the strip of montane spruce forests along both sides of the international border between Mokrůvka and Bučina, an area 2.5 km wide and 5.6 km long, with very similar habitat and forest conditions (plain plateau, successive forest after the 1870 large-scale calamity), the evaluation of the aerial survelliance from the summer 1991 (to evaluate the first calamity from 1984 – 1990) shows the following picture:

- on the Bavarian side of the border, fallen trees destroyed by wind, attacked by the bark beetle and dead stands were left on the site and make up 10.2 % of the evaluated territory
- clear-cuts on the Czech side, the result of felling and removal of blow-downs and anti-bark beetle measures, make up 21.1 % of the evaluated territory [4], i.e. 1,400 ha.

Suitable aerial pictures for the Czech side are not available for a similar comparison of the second calamity of 1995 – 2000. The size of the affected area on the Czech territory can be estimated from the amount of salvage logging in the relevant forest districts and the available figure for average amount of wood per hectare, which is 412 m^3/ha. But it is impossible to determine the increase of the attacked areas in the Modrava non-intervention area for individual times.

Comparison of the results of both calamities shows that in the Bayerischer Wald NP part of this belt, without any human intervention, the bark beetle damaged 3,712 ha of forest between 1984 and 2000 [4]. In Šumava NP part, the size of destroyed area is 1,300 ha in the non-intervention areas plus 2,700 ha of clear-cuts [54] – 4,000 hectares altogether.

This is very rough comparison only, especially because of calculation which uses average data on timber reserves per hectare though they differ significantly in different forest types. But at the same time the expected error will be at most only 100-200 hectares rather than thousands of hectares. Exact calculation of infested areas would be possible using GIS air survelliance photographs, which are not available to Friends of the Earth. But the data used here are sufficient for a rough comparison.

Development of the calamity in Šumava NP and Bayerischer Wald NP over time follows almost the same pattern. The outbreak occurred and ended atthe same time, without regard to the respective national park policy. This is due to the impact of the non-intervention area of the Bayerischer Wald NP on the adjacent clear-cut areas in Šumava NP (the beetle migrates over the border), and it also confirms that human intervention has little impact on the large bark beetle calamities.

Similar example had been described in Norway during a large calamity in 1971-1982. It also had two phases. Despite widespread intervention measures (5 million m^3) it lasted 10 years. It ended at the same time in all affected areas although integrated protection measures (mainly clearance and beetle traps) were used with different intensity in various sites [55].

Figure 24: Bark beetle calamity in the second zones of Šumava NP

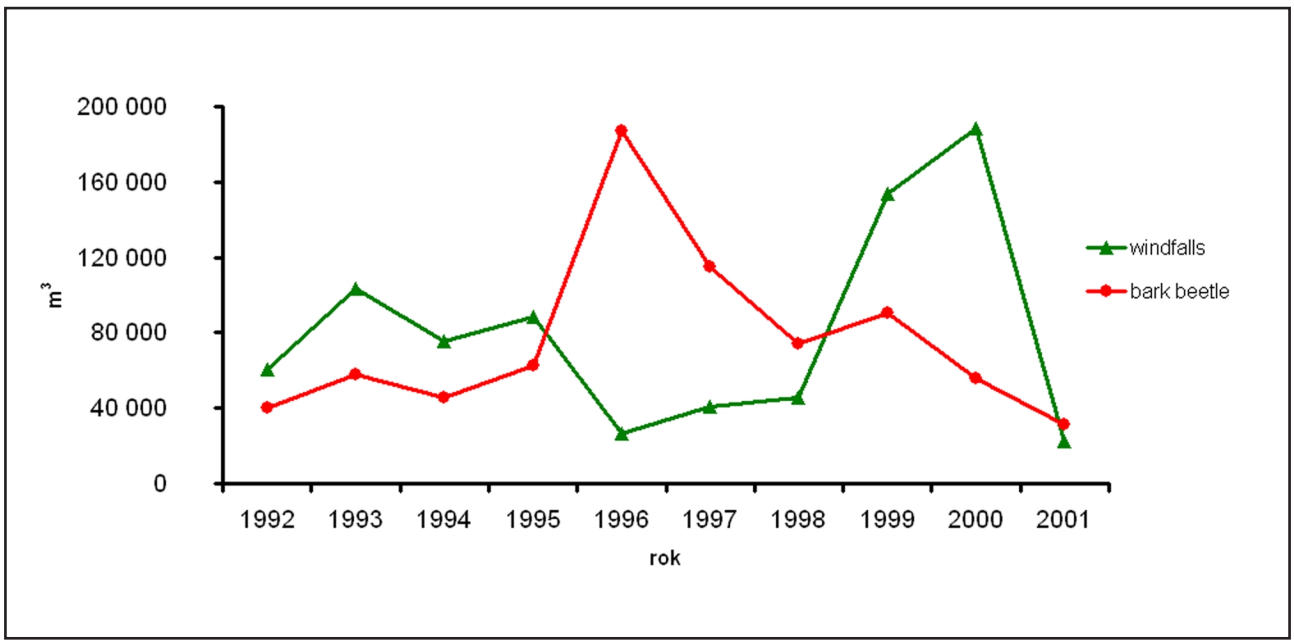
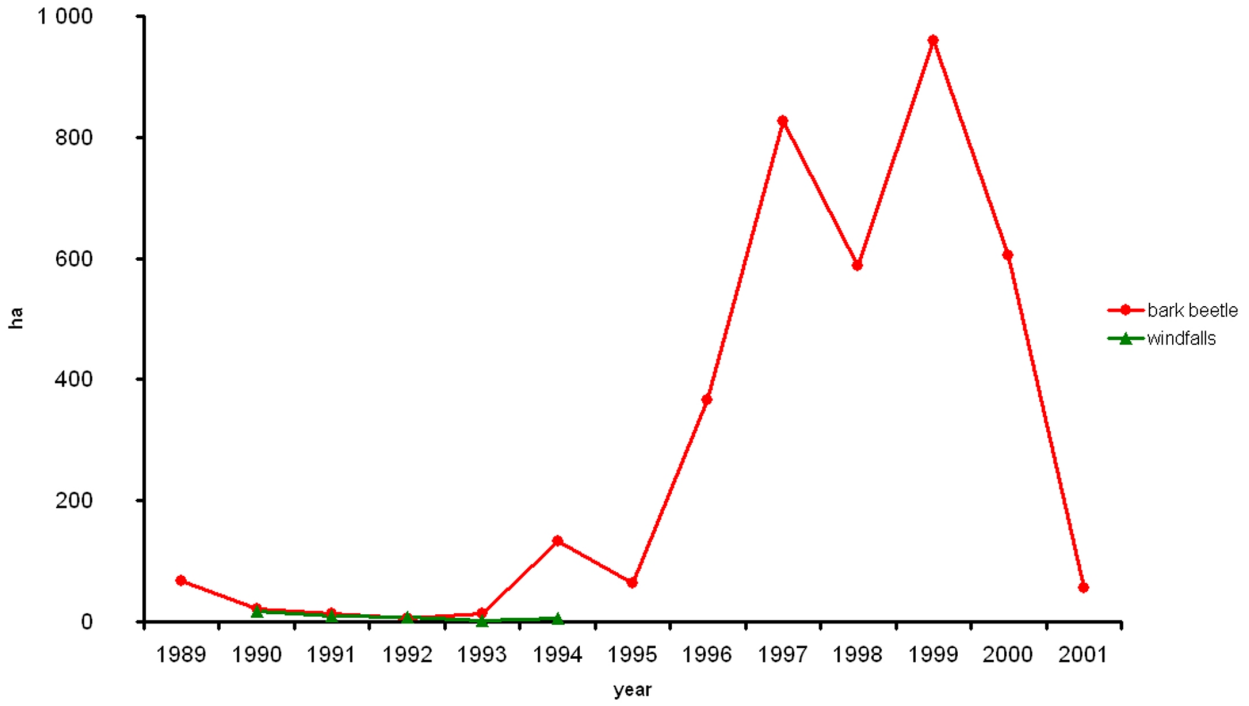


Figure 25: Bark beetle calamity in the older part of Bayerischer Wald NP



Note: In Šumava NP, bark beetle population were measured by the volume of salvage-logged timber (m^3), while in Bayerischer Wald NP by of airial photos. By 1999, these photos were taken in July or August so that they also include areas affected by the bark beetle from the previous year (so that when comparing the figures there is a shift towards Šumava NP). In 1999, photos were taken in July and October so that the areas affected in both 1998 and in summer 1999 are included. In the graph it is visible as an out-of-scale increase of the population in 1999.

9.5. Conclusions

Even several years ago, many foresters believed that after a large-scale attack of the bark beetle, forest would die completely, leading to soil erosion and then a regeneration of the site by large succession cycle lasting hundreds of years. Mr. Ivan Žlábek, the Šumava National Park director, warned against future large stone fields and mat-grass steppes:

> *„only stone will remain on the clearings, with some soil here and there, which will be carried away after some time and possible subsequent vegetation will have no ground to catch on to"* [56].

It is clear that they were wrong today. At the same time, however, there are other authors with an ecological background who have underestimated the bark beetle threat and overestimated the power of natural self-regulation. It is obvious today that a period of bark beetle outbreaks in weakened, ‚borealized' forests can last longer than in natural forest [57] and with a sufficient amount of appropriate food available, a new outbreak follows shortly after coming to an end in previous one [25]. The belief that the bark beetle would spread to the entire NP territory, or to most of it, if the non-intervention policy is strongly enforced, may be realistic.

The most important findings are that, first, sanitation measures do not necessarily prevent the calamity under circumstances favourable for the insect. Secondly, they are not the key factor for suppression of larger calamities: they can only weaken or, on the contrary, strengthen them.

Third, from the point of view of damage to the ecosystems and the future the forest, the choice of development under the snags is clearly better than in a clear-cut.

There is no answer available to one of the key questions: whether the large-scale destruction of spruce forests can at least be slowed down when it is not possible to be avoided. The experience from both national parks in the Šumava Mountains does not support this hypothesis very strongly. We can assume rather the opposite, especially taking into consideration the global climate change trends and their impact on the forest vegetation. The forecasts show clearly that the spruce vegetation zone is in decline and will decrease to practically zero in the Šumava Mountains during the following 30 years [58]. The development in Trojmezná Forest so far confirms this hypothesis.

Clearly the worst option of the management of the entire forest complex (Šumava and Bayerischer Wald National Parks) is the one which has caused the present situation, i.e. when a non-intervention approach is applied on one side of the mountain range and human intervention measures are chosen on the other. The result is an almost unbroken clearcut area along the ridge at an altitude of about 1,300 metres, one which is at least 500 metres wide (this mostly increases to one kilometre because of further impact of wind) and 25 km long – in an area declared as national parks on both sides of the border.

10. Management Plan: disputes between declarations and reality

The Šumava National Park Management Plan is a pitfall for inattentive readers. There is no doubt that general goals of conservation management are correct:

> *„Nature conservation [in Šumava NP] 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…Ecosystem management is to be directed at the conservation of ecosystems in their integrity, in all their components and relationships."* (p. 33) [59]

The suggested measures however do not lead to the named targets, and in many cases they are in contradiction to them.

Failure to ensure enlargement of the first zone

The Plan maintains the fragmentation of the first zones practically until 2030. The enlargement of the first zone is planned for as late as after 2020 (pp. 40-41) [59]. By 2010 the enlargement will consist of only 3,000 – 8,000 hectares (i.e. 4 to 11 % of the national park's area), which basically means a return to its extent before the reduction and fragmentation of the first zones in 1995.

The conservation strategy has not been adjusted to this target in zones II.A and II.B which are to be incorporated into the first zones. For instance, tree felling is not limited in these two zones, nor clear-cutting areas in the event of another bark beetle calamity (and in case of unnatural disturbances). If the bark beetle calamity is repeated, the Management Plan permits for additional large clear-cuts. It is intended that such areas would then gradually become part of the first zone, though the return to a natural forest would be delayed in these areas at least by 100 years.

On the other hand it is likely that the bark beetle calamity can be continued or repeated in the nearest future. This will depend on a number of factors such as the neighboring Bayerischer Wald National Park, climate change and interventions on unrestricted areas.

The exact geographic location of the areas that are to be incorporated to the first zone remains unclear so that no one knows when and which areas will be included in the first zone.

Also, the NP Administration's investment policy contravenes the declarations about expansion of the first zones and gradual reduction of forestry activities in II.A and II.B zones. The Administration invests substantial sums of money into the construction and re-construction of roads in these parts of the second zone. Roads are being repaired and re-constructed even in the first zone.

Tree cutting in first zones

As the main goal of the first zones' protection, the management plan declares it is an area for the *„conservation or restoration of natural development of ecosystems that will be gradually left to self-regulatory development"* (p. 38) [59].

However, it absolutely unsystematically excludes the influence of bark beetle from the natural development. The management plan proposes cutting trees affected by the bark beetle in all first zones with more than 40 % representation of spruce [60]. Nevertheless, the bark beetle is a part of life cycle of ecosystem of mountain spruce forests, especially in a phase of so called decomposition and renewal. The cutting causes a divergence of the natural processes from their trajectory and harms the established first zones.

Dead wood removal

The management plan generally declares that:

> *"[f]ollowing both intentional and incidental sanitation measures, a substantial amount of wood, including*

some thick trunks, should be left to natural decomposition; larger volumes of wood should be left in the vegetation forest belt 8 (i.e. on waterlogged and peaty biotopes) and in areas with a higher conservation level" (p. 47) [59].

However, it does not specify the quantity of timber to be left there. It passes the decision on this quantity to the National Park Administration which will define a volume of timber case by case. However, the Administration has so far not respected even its own plan and was either removing all timber from clear-cut areas or leaving there only thin stems and the tops of the trees – see Chapter 11.

Lack of harmonisation with Bayerischer Wald National Park

The Šumava National Park management plan is not harmonized with that of neighboring Bayerischer Wald National Park. There is an important difference in the time schedule of the first zone expansion. In the new part of the German national park, the process of enlargement is to be finished as of 2017 when the first zone will cover 75 % of the total area of the park. In the Czech park, significant enlargement is planned after 2020. If the bark beetle infestations are repeated in the new part of the Bayerischer Wald NP, and in the case of the Czech national park management having the same policy as now, the cutting along the international border will continue in the same way as it has along that with the older part of the German national park.

Due to the current management policy of the national park, it is practically impossible to fulfill the targets described in the management plan for forested areas.

11. Timber trade: consequence or cause of bark-beetle salvage logging?

Forest management and the trade with timber logged in the Šumava National Park are business activities that, by their significance, reach beyond the region. They bring profit to all – local small traders, forest management companies and big timber industry in the Czech Republic as well as in the neighboring countries of Germany and Austria.

Between 1994 and 2001 more than 1.3 million cubic meters of wood were casually logged in the second zone. The income from the sale of wood during this period totaled 1.96 billion Czech Crowns (about 65 milion euro). This results in strong political pressure against efforts to limit the logging of bark-beetle trees in Šumava NP. It is not easy to decide whether managers at current National Park Administration are either victims or agents of this pressure; and whether bark-beetle is really a cause or an excuse for vast logging in the national park: the facts that follow should help to consider some aspects of this problem.

11.1. Hauling and selling of the wood from the national park

Hauling and illegal removal of the wood from second zones

Friends of the Earth believe that wood should not be carried away from those parts of the national park primarily dedicated to the protection of natural processes. In the Šumava NP these are especially the first zones and also the parts of second zones which should be incorporated into the first zones during the next few decades – i.e. zones II.A and II.B. The reality is different, though.

Until 1998 no limitations were set for removing the felled trees from the national park. After the decline of bark-beetle (the largest bark-beetle logging took place in 1996 and 1997) and under pressure of strong criticism by media and NGOs, the National Park Administration decided to limit the hauling of wood [61]. According to this decision, hauling of wood from wetland areas and upland areas poor in nutrients was banned completely:

> *"The sanitation will be realized only by excoriation with all decontaminated wood mass left on site afterwards"* [61]

While in other areas at least 20 per cent of logged woody material should be left to decay on site (except for areas with only a sporadic bark beetle incidence):

> *"in case of sparse incidence of bark beetle – up to 5 m^3/ha/year – to decontaminate infested trees by excoriation and leave the decontaminated wood mass on site…in case of bark beetle incidence higher than 5 m^3/ha/year… at least 20 per cent of wood mass should be left on the site of sanitation"* [61].

The decision nevertheless concerned only the wood logged during bark beetle sanitation, but not the wood from wind-fallen trees. Wood from wind-fallen trees in the second zone continued to be hauled away and sold by the NP administration without any constraints. It should be noted that in 1999 and 2000 the logging of windfalls was much more intensive than bark beetle logging – see Figure 24 and 26.

In 2000, urged by information from a member of the public, the Czech Environmental Inspection (ČIŽP, a national environmental enforcement body) documented that the National Park Administration does not comply even with the wood-hauling limits set up by its own decision [62] [63] [64]. The Administration did not keep the minimum limit of 20 per cent of wood mass left on site for decay and wood was also illegally carried away from both wetland and nutrient-poor areas where its hauling was forbidden completely:

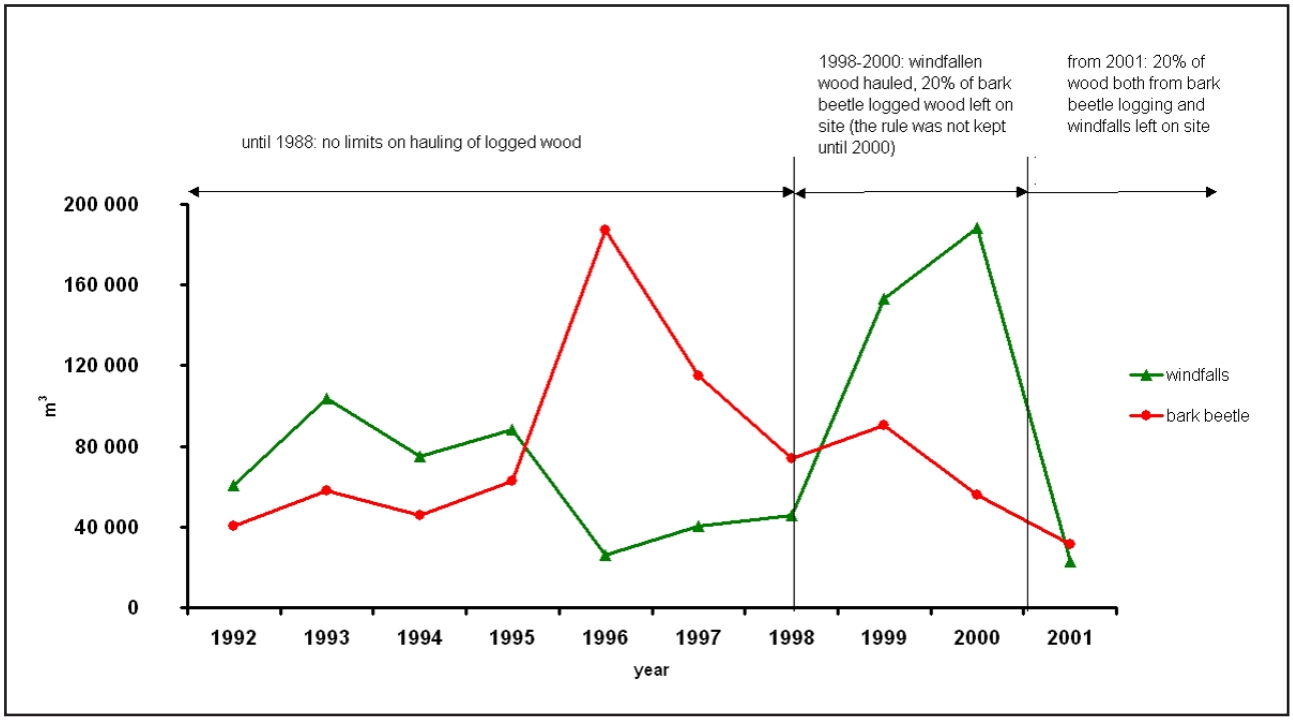
> *"the worst situation is in LS [Lesní správa – Forest District] Modrava where nearly all wood mass from sanitations should be left on site according to SLT [Soubor lesních typů – Forest Site Type] but in reality only 30 per cent were left there"* [63].

Helicopters were often used to remove the wood from wetland areas.

The National Park Administration began to comply with its own decision to limit the hauling of wood only after public criticism by Friends of the Earth and media following the release of findings by the ČIŽP control. The wood

that can now be seen left in clear-cuts mostly originates therefore from logging done in 2001 and 2002. Yet sometimes only thin stocks and upper parts of logged trees (and not large trunks) are to be found – a discrepancy with the National Park Management Plan (see Chapter 10). In 2001 administration revised the decision about hauling of wood from forests so that now the limits of wood that should be left on site apply also to logging in windfalls.

Figure 26: Decisions of NP Administration concerning the second zone and their relation to the course of bark beetle calamity



Hauling of wood by helicopters

Between 1995-2000 the NP Administration used helicopters to remove logs even in areas where all wood should have been left to decay. NP Administration had to pay for the costs of helicopter service and these costs were higher than the price for which the wood was sold (see below). At the same time it is not difficult for the NP Administration to find a workforce that would debark the trees and leave them on site, a much cheaper solution indeed.

The costs for helicopter were partly paid by subsidy from the State Environmental Fund (SFŽP, a government agency for funding of usually community or private environmental and conservation projects), which the NP administration had requested always one year in advance. Again only after a strong public criticism in 2000, the Fund did not approve the subsidy to NP Administration for helicopter operations in 2001.

Illegal hauling of wood from first zones

In 1999 the Šumava National Park Administration allowed for the felling of bark beetle infested trees even in the first zones of the park, including the remaining bits of natural (close to primeval) forests, on the condition that all felled trees would be excoriated and then left on site for decay. Later Friends of the Earth, other NGOs and park visitors found out that in some first zones, NP Administration does not keep this condition. Wood hauling was discovered and later also confirmed by ČIŽP control mission in six first zones: Jezerní slať [65], Ztracená slať [66] [67], Ptačí slať, Trampusův křížek [68], Modravské slatě [69] a Trojmezná [70]. Felling and hauling were even discovered and proved in areas where bark-beetle sanitation was not permitted at all (first zone of Novohuťský močál) [68].

A dendrochronologic analysis of stumps (carried out by the Institute of Botany of the Czech Academy of Sciences, and finished only in August 2002) demonstrated that wood was logged and hauled from the first zones

already in 1996-98, i.e. before the non-interference regime was officially cancelled there in 1999 (the Pod Ptačím potokem first zone) [71]. In other words, wood was logged here illegally already during the time when all logging was prohibited in these parts of the national park.

Hauling of wood from first zones does not reach the same massive dimensions as in second zones – in the opinion of Friends of the Earth this is also thanks to intensive surveillance by environmental groups. Several cases of wood disappeared from the first zones are being investigated by the police.

11.2. Shrinking the first zone: a means to wood

The reduction of the total area of first zones from 22 % to 13 % (see Chapter 4) in 1995 also cleared the way for the continuation of logging and hauling of wood. By that time it was already clear that the hauling of wood from the first zone of national park could not be vindicated – neither by scientific evidence nor against public scrutiny. The administrative change in zoning brought an end to logging in the first zones, but at the same time it opened new areas (ex-first zones) to logging. The bogs and surrounding wetland spruce-growths around Modrava, Kvilda and Srní, and also Stožec are renowned sources of high-quality wood and even resonant wood (most suitable for the manufacturing of musical instruments) can be found here in indispensable amounts. It is the resonant wood from just these parts of Šumava that have become celebrated worldwide.

When the reduction of the first zone took place in 1995 it had already been clear that, in this area adjacent to the core zone of the neighboring Bayerischer Wald National Park, the combination of a bark beetle calamity and non-interference regime on the Bavarian side would either necessarily require massive anti-bark beetle interventions or the whole area would also have to be proclaimed an area of non-interference (the latter being the plan of the previous national park management). A study carried out by Research Institute of Forestry and Hunting had already in 1993 warned the NP Administration managers that in the areas adjacent to the German national park it was necessary to decide either on large tree-cutting or for a non-interference regime. The study concludes:

> *"It can be assumed that in case the forests in the area are claimed non-interference, most trees will gradually die, chiefly from the bark-beetle infestation, and the process of 'inducing' the dynamics of the natural forest will take place right in this form of calamity. Otherwise, with regard to the fact that neighboring forests in Bavaria are treated as non-interference, we cannot imagine any other way to prevent the above mentioned mass dying of trees caused by bark-beetle infestation than de-forestation of large areas. It is highly probable that contingent anti-bark beetle measures would gradually result here in the cutting of most areas, which definitely is not the intention and does not comply with the function of these parts of forest that are indeed part of natural reservation within the strictly protected first zone of Šumava National Park."* [72]

Having these facts in mind, the new director of the Šumava NP, Mr. Ivan Žlábek, who became thedirector of NP Administration in 1994, decided to intervene against bark beetle in the areas neighboring Bayerischer Wald National Park. He solved the problem of the non-interference regime in the first zones by simply reducing its area in 1995 (originally he banned any interventions against bark beetle in the first zone). But he never openly explained to public that a consequence of this decision would be de-forestation of the range along the border with Bayerischer Wald.

By the end of each of the following years the NP Administration announced a victory over the bark beetle calamity only to re-start the cutting again the next year:

> *„The outbreak of the bark beetles has been stabilized…a declining trend of bark beetle calamities is to be expected in the next two or three years*",

explained Mr. Radim Košíček, the deputy national park director, to Mr. František Benda (then Minister of Environment) in February 1996 [73]. In November 1997, director Mr. Ivan Žlábek was convincing the journalists that

> *"the radical intervention around Modrava were effective, the bark beetle population has, thanks to these measures, been on substantial decline and in Březník area felling can already be essentially ceased"* [74].

Figure 27: The area along the border with Bayerischer Wald National Park in 2000 – Malá Mokrůvka, Studená hora. Photo by J. Soukup

11.3. Logging of sterile dead trees

The NP Administration publicly defends the logging in the national park as a necessity to intervene against bark beetle. But in fact the new NP Administration of Mr. Ivan Žlábek has soon after coming to office in 1995 cancelled the ban on felling the snag trees – i.e. the trees once infested but now abandoned by bark beetle – and issued a directive concerning the processing of *"dead standing trees technically suitable for production of marketable products..."* [75].

By cutting-off the dead, bark beetle-abandoned trees, some of the already stabilized forest stand walls were re-opened. Again only after public criticism of such methods, the cutting of the dead standing trees was stopped in 1997 [76]. Yet, in spite of its ban, some critics claim that it continues today [6].

11.4. The real price of wood from Šumava

Resonant wood requires special saw processing. The first sawmill was builtin Modrava by František Bienert in 1827. It was not only the first sawmill in Šumava but in all the Austrian-Hungarian empire. Bienert's son-in-law founded two more sawmills in Stozec and Kvilda. Resonant wood is manufactured by chopping spruce logs into planks (for string instruments) or by sawing along the fibres (for piano desks). The next step in the processing was dipping and drying so that resin is washed out. Some individuals were also engaged in the production of resonant wood. They usually searched for strong trunks in the moors because it was believed that the best resonant desks could be obtained from the trees that had fallen by themselves. Under the rotten upper coat a white wood of outstanding resonant qualities was preserved in the moors.

(Vaneš, S. (1988): Klostermannova Šumava, Západočeské nakladatelství, Plzeň)

The interest of companies that buy wood from national park to sustain this source is understandable. The NP Administration sells the logged wood of high quality as a low-class, third-rate wood. Even the wood removed from wetland spruce stands by helicopters is not sold for higher prices (see above). Figures 28, 29 and Table 9, 10 show how the increased total amount of logged wood lowers the proportion of wood sold as first- or second-rate quality. The bark beetle, of course, does not influence the quality of wood. Indeed, the production of a high grade wood from salvage-logging was commonplace during previous decades [77]. The NP Administration, on the contrary, does not even make high grade wood from trees fallen by wind outside the vegetation season – when there is no risk of its rotting out because of both cold weather and absence of sap in logs. In Modrava, the area which traditionally supplied the most high grade and resonant wood, the NP Administration suddenly found almost none – see Table 10. For comparison, in Table 11 we quote the evaluation rates of wood produced in the neighboring Kašperské Hory Municipal Forests, which in reality possess stands of much lower quality of wood material.

Table 9: Total output of logging and the deliveries of wood of different qualities from Šumava NP

Year	1995	1996	1997	1998	1999	2000	Total
Total logged [m³]	167142	241094	179636	169523	281908		1039303
Type of wood product [m³]							
1st grade+resonant	813	251	66	109	150		1389
2nd grade	2648	1813	1312	1009	1015		7797
3rd grade	93450	130122	134549	82394	152450		592965
industrial wood*	10024	14273	23213	11646	22142		81298
quality wood total	3461	2064	1378	1118	1165		9186
Other wood [m³]	60207	94635	20496	74365	106151		355854

*Notes: * roundwood for industrial processing*
Source: NPA

Table 10: Logging and wood supplies in Modrava Forest District

Year	1995	1996	1997	1998	1999	Total
Wood logged [m³]	21314	81440	44369	38888	78516	264527
Product supplies [m³]						
1st grade + resonant						0
2nd grade					16	16
3rd grade	11133	55486	42656	28359	47907	185541
industrial wood*	839	2559	4714	828	1389	10329
Other [m³]	9342	23395		9701	29204	68641

*Notes: * roundwood for industrial processing*
Supplies from 1996 on „ES“
Source: NPA

Figure 28: Total logging and quality wood supplies from Šumava NP

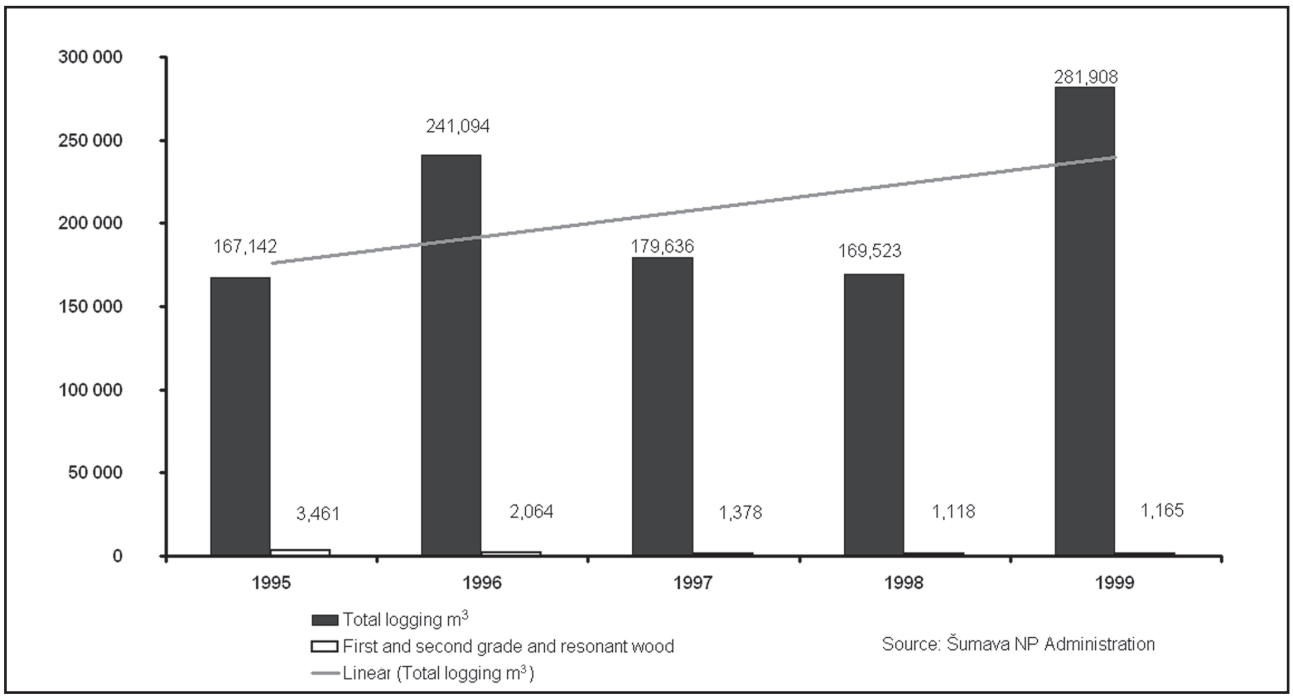


Figure 29: Development of total supplies of resonant, first- and second-grade wood from Šumava NP

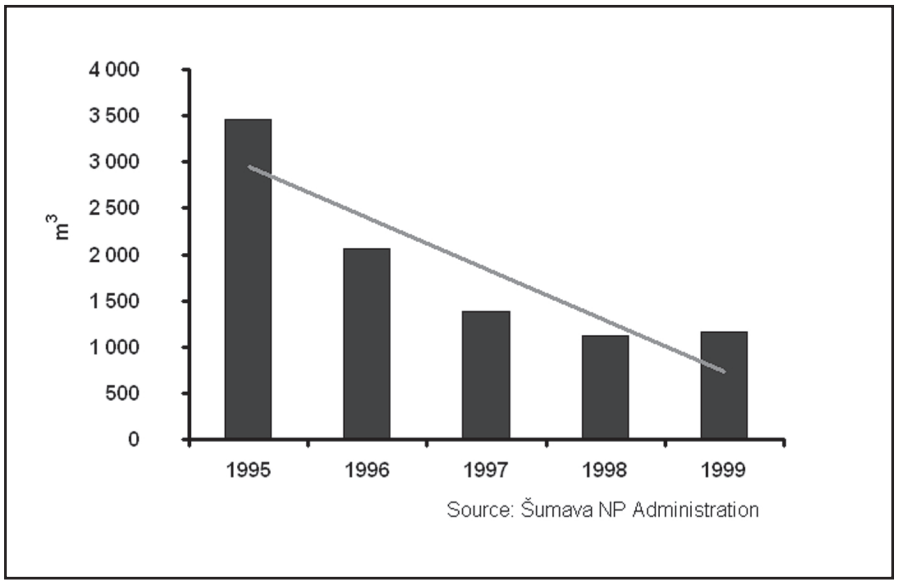


Table 11: Comparison of total supplies of resonant, first- and second-grade wood from Šumava NP and neighboring Kašperské Hory Municipal Forests

	Municipal Forests of Kašperské Hory	Šumava NP, Modrava forest district
Size [hectares]	1 200	6 000
Years	1994-99	1995-99
Amount of wood logged [m^3]	38 700	264 527
of that: first and second grade wood including resonant wood [m^3]	1247	16

Source: Šumava NP Administration, Municipal Forests of Kašperské Hory

11.5. The national park management: a question of priorities

The economic management of the park shows very little effectiveness. Expenses on controversial hauling of wood exceed profits from its sale and the losses uselessly reduce financial sources necessary for nature conservation and the education of the park's visitors.

Comparison of selected costs and revenues of NP Administration is shown in Table 12 and Figures 30-32. Table 13 is an overview of government subsidies.

Table 12: Costs and revenues of Šumava NPA by activity

	Costs 1994-2001	Revenues 1994-2001
Forest regeneration	132 438 876 CZK	33 221 180 CZK
Forestry protection	227 271 897 CZK	13 169 480 CZK
Other sylviculture	26 652 498 CZK	6 290 355 CZK
Thinning	14 070 820 CZK	0 CZK
Sylviculture	400 434 091 CZK	52 681 015 CZK
Amelioration, fertilization	241 737 CZK	0 CZK
Logging	142 264 948 CZK	2 312 CZK
Skidding	513 593 183 CZK	82 014 224 CZK
Post-logging restorations	49 612 444 CZK	5 530 450 CZK
Transport and manipulation	101 151 740 CZK	861 269 CZK
Logging (total)	806 622 315 CZK	88 408 255 CZK
Manufacturing overhead and wood sales	1 084 084 848 CZK	1 867 660 230 CZK
Purchasing and operation of forestry machinery	96 406 987 CZK	15 794 480 CZK
Roads	214 312 912 CZK	7 205 557 CZK
Buildings	107 615 535 CZK	5 127 140 CZK
Hunting	22 977 050 CZK	13 866 831 CZK
Information, education, tourism	59 658 777 CZK	8 556 779 CZK
Nature conservation without rangers	1 331 426 CZK	501 647 CZK

Figure 30: Costs and revenues of Šumava NPA in selected activities – detailed overview

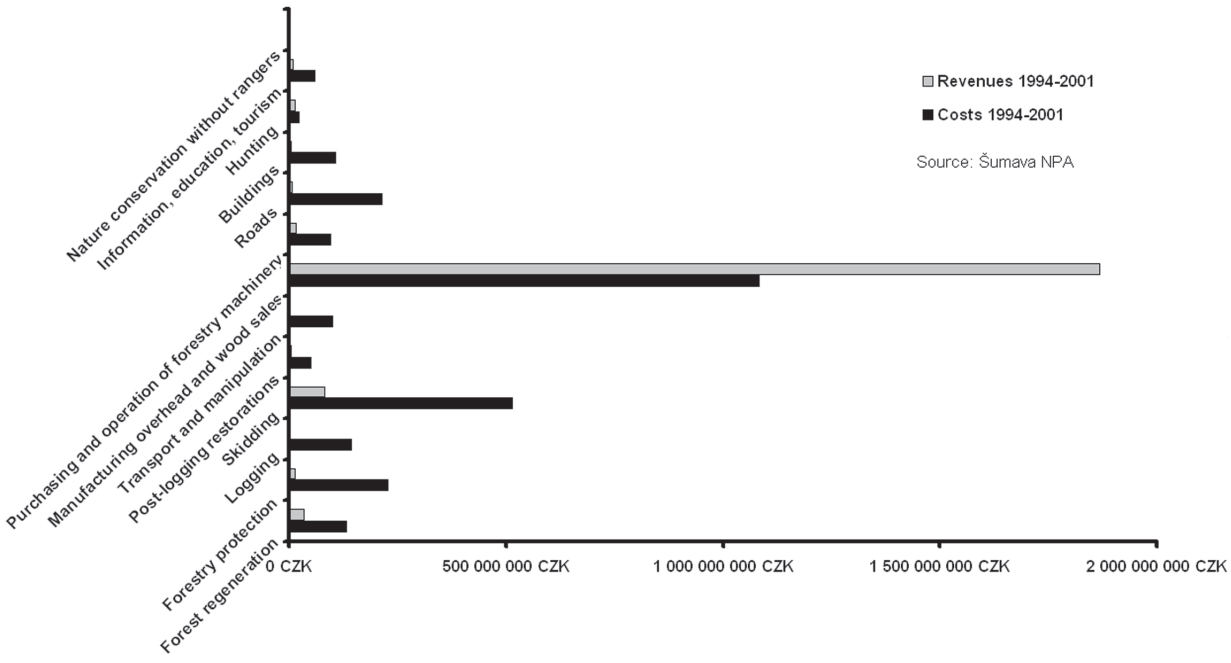


Figure 31: Costs and revenues in selected activities Šumava NP Administration – more general overview

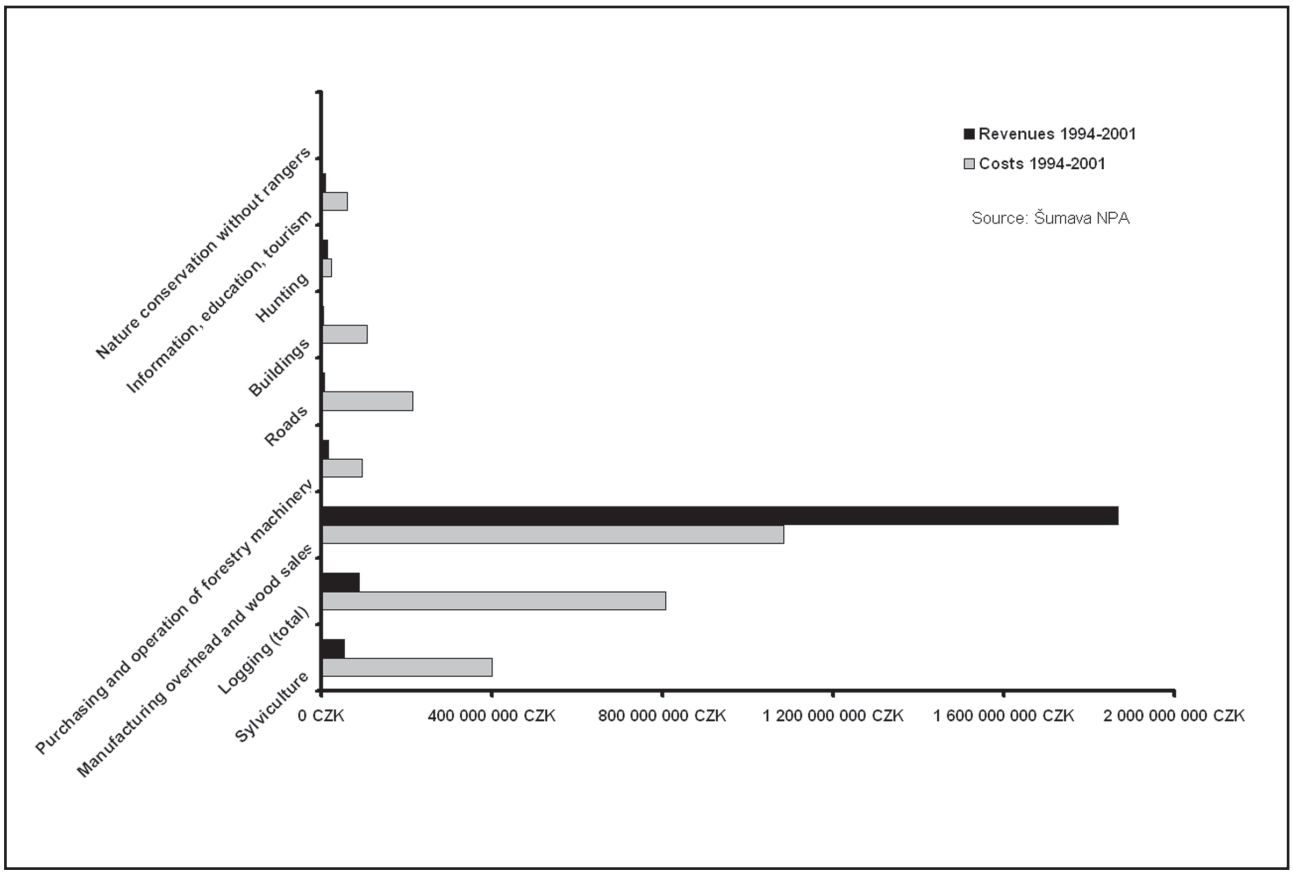


Figure 32: Costs and revenues of Šumava NPA in selected activities – general overview

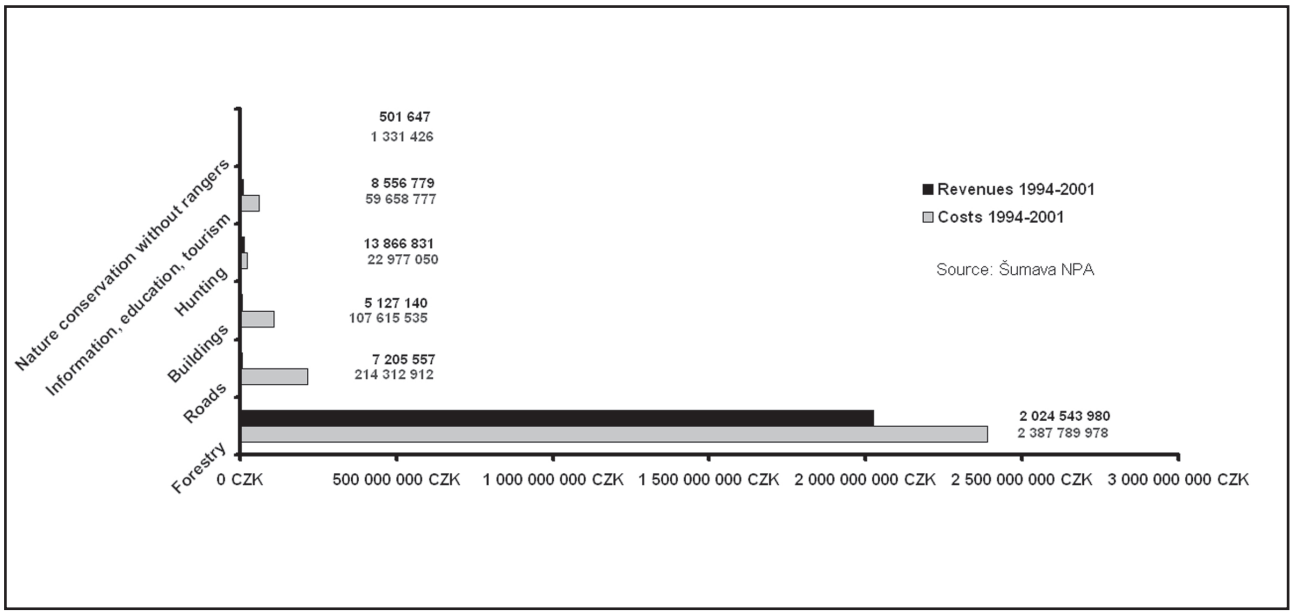


Table 13: Overview of contributions and subsidies to Šumava NP (1991-2000) (in thousands of Czech Crowns)

Year	Subsidy by MŽP	Grant from SFŽP	Contribution for investments by MoE			MoE and SEF total	PHARE	FACE foundation
			construction	machinery	total			
1991	6 192	0	0	8 180	8 180	14 372	0	
1992	8 320	0	0	0	0	8 320	0	
1993	18 145	0	0	2 500	2 500	20 645	0	
1994	15 749	0	9 629	4 058	13 687	29 436	0	
1995	15 950	0	25 500	0	25 500	41 450	0	27 980,8
1996	28 720	19 152	43 139	4 537	47 676	95 548	0	25 223,1
1997	28 503	11 757	49 920	6 030	55 950	96 210	0	22 287,2
1998	37 997	35 265	31 822	5 444	37 266	110 528	260,7	20 184,4
1999	128 259	21 618	29 141	5 400	34 541	184 418	497,2	16 729,9
2000	128 666	29 722	10 250	2 150	12 400	170 788	77,3	13 879,9

Note: MZP – Ministry of Environment, SFŽP – State Environmental Fund
Sources: MŽP, NPA

In Šumava NP forest management is a predominant activity and a vast majority of the NP Administration's budget is spent in this field. This is understandable given the extent and the state of the forests in the national park. Nevertheless the disproportion between expenditures on the forest management on one side and expenditures on nature conservation and educational activities on the other is simply too large.

Even though between 1994 and 2001 over 1.3 million cubic meters of wood was logged, the revenues from its sales did not cover the costs paid by NP Administration for logging-related activities (plus overhead costs). This is a remarkable fact by itself.

The response of the Ministry of Environment to such management by the NP Administration was not a demand for better control and measures to make it more effective, but rather an increase in subsidies. These subsidies were used to pay for the NP Administration's economic activities or, more precisely, for the profit of companies buying wood from the NP Administration, companies hired by NP Administration to carry out some forest management activities and also for the over-equipped forestry staff of NP Administration.

The Ministry of Environment has also covered up the scandal concerning the illegal use of subsidies for (the tens of millions of Czech Crowns-worth of) helicopter operations to remove wood from wetland spruce stands [63]. The then environmental minister claimed in response to parliamentary question in November 2000 that the case would be examined:

> *"With regard to the discovered failures, the Ministry will adopt corresponding action towards the director of the Šumava National Park. In connection to these facts, the Ministry of Environment's Control Department will further look into correctness and effectiveness of spending the financial means granted by The State Environmental Fund for a clearance of wood mass, especially with a use of helicopter…I will sum it up. The corresponding action according to the findings of the Czech Environmental Inspection will of course be taken…I also want to promise to the questioning M.P. that the respective numbers he is asking for, i.e. the volume of illegally hauled wood mass will, of course, be provided to him. Next Monday the Control Department will carry out the respective examination at the National Park Administration."* [78].

But the Ministry of Environment's Control Department has never carried out the investigation in the national park announced for "the next Monday". The questioning M.P., Mr. Libor Ambrozek (now the new Minister of Environment), has never obtained the promised data.

All in all, ceasing logging in the national park would, in the current situation, free a fairly large, additional financial resource for nature protection and educational activities without any change in the level of the state subsidies.

High investments of NP Administration into the park forestry infrastructure, especially the construction and repairs to forest roads in II.A and II.B sub-zones (while these two sub-zones should, in contrast to such activities, be gradually changed into first zones), new buildings and forestry machines, are in clear contradiction with the National Park Management Plan which proclaims a need to enlarge the first zones and to limit forestry activities there.

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13. Annex

Statement by local communities[1)] and non-governmental organisations[2)] on the situation in Šumava National Park:

Reasons behind the crisis and suggestions for its solution

In most European countries ‚national park' implies the conservation of key natural values, along with important regional economic contribution. It benefits not only the communities within the park, but the entire region surrounding it. It is for these benefits that local people accept high conservation standards, which assure that development will not damage natural values – the key to local prosperity. The situation in Šumava National Park (NP), however, is different: some communities question the benefits of the national park.

Reasons:

The reasons behind the failure of some local communities to support strict conservation standards in the park stem from unresolved issues of common existence of the national park and local communities. Neglected for a long time, these issues include, in particular:

I.

There are no clear rules for development stated in the management plan. Nearly every case is handled individually, which often gives rise to conflict. Decisions made by the park management are neither transparent nor consistent.

1) There does exist a vision for the final state of the region, but it was left undecided at to which areas should be granted what level of protection (i.e. which areas would constitute the 1st, core zones). It remains unclear as to how to achieve the vision. This should be included in the management plan and approved after thorough discussion not only with the experts and community representatives but also in the form of public hearings for the local population. The management plan does not answer fundamental questions; some it answers only superficially, and some not at all.

2) Because there was no concrete final stage determined for the park (what, where and how it will be protected), there was no definite opportunity to study limitations of tourism specifically and general use of the area as a whole – so that neither maximum limits to tourism industry and other activities' burden, where a damage to the protected area is still avoided, nor strategy of the tourism development were never set.

3) Because of the complete lack of a strategy for and limitations to development of the tourist business and other profit-based activities, the current management cannot even set limits to community development, a fundamental criterion for transparent and reliable decisions about particular projects.

II.

The tax structure prevents local communities from profiting from tourism in the national park.

III.

Until now, local communities were not compensated for their loss of property tax funds. (Owners of a specific category of forest – all those included in national parks – do not pay property tax, so that communities within Šumava National Park lost a significant part of their budget.) This year saw the first exception to this tax structure, when local communities were compensated for lost tax monies.

IV.

National parks directly and indirectly give rise to new jobs. The economy of Šumava National Park is currently based most heavily on forestry, but in the future it will become more dependent on tourism. The park management gives preference to forestry companies and bigger suppliers, which employ low-paid workers from abroad or poorer regions of the Czech Republic to the detriment of local small businesses and employees. This problem is not specific to Šumava, forest companies in other parts of the Czech Republic have behaved similarly, inciting local people to feel animosity toward the park management and consequently toward the park itself.

V.

Local people have minimal involvement in the nature protection activities (work and services) organized by the park management. There are many unused opportunities – guide businesses, jobs in research assistance and so on.

VI.

Unreliable management and missing concept. The lack of a clear plan and rules for management of the national park gives the park management and the Ministry of Environment the freedom to consistently change their decisions as well as alter their general strategy. At one point in time, the park management is taking measures against the bark beetle, then they are not, and then again they are. The 1st zones grow, then shrink, then grow again, and so on.

The rules are not the same for everyone. Tourists and local people are forbidden from entering the special regime areas and the 1st zones, so as not to disturb the protected animals and the natural processes by crossing the grass or picking blueberries. On the other hand, helicopters are flying into those areas to extract wood.

VII.

The collapse of communication among the park management, the Ministry and local communities (i.e. the process for creating and approving the management plan, etc.).

VIII.

Bad personal relationship between some representatives of park management and some regional figures.

T**he establishment of Šumava National Park was a great act to save unique natural treasures in the area after the end of the communist era. Consensus on the fundamental rules for care of the national park, community development and the exact jurisdiction of state management, however, has been missing since the park's inception in 1991. From the very beginning, the communities wanted to show the need to set clear rules, but those people responsible for the preparation of the park's establishment did not take these points seriously.**

Neither the Ministry of Environment nor the park management has strived for solutions to this problem in the 10 years the park has existed. Mistrust to the park managers and the Ministry has increased and naturally resulted to mistrust to the park itself. The attempt to solve the situation with a hastily enacted law might prove worse than the improvised establishment of Šumava National Park ten years ago. That is why it is necessary to thorough discusse potential solutions with all interested parties, to take the advice and recommendations from the grassroots before enacting a law.

The new national park act would solve only a part of the problem.

We suggest a different solution:

A round table with representatives of local municipalities, independent experts, park management, the Ministry of Environment and non-governmental organisations. Definition of the fundamental problems. Definition of the working group, which will create a proposal with concrete solutions, taking the following steps:

1. Šumava National Park Act

Community representatives have no guaranties that the Ministry of Environment and the government will start to resolve the accumulated problems. They insist that the fundamental rules in the park are defined by law. Some community representatives would like to remove buildings and zones designated for construction from the national park, so that an institution other than the park management will reside over their management. Non-governmental environmental organisations do not think this recommendation is wise, but they understand the communities' concerns and accept them.

The communities and non-governmental organisations, in co-operation with all interested parties, want to settle on a version of the law that would benefit the local population and the region as a whole.

Other steps:

2. Updated management plan

2.1. Contents and concepts of the plan

Peer-review process by independent experts, consultation with WWF and IUCN, discussion with local communities, public hearings, agreement at the round table.

2.2. Management plan

Peer-review process by independent experts, consultation with WWF and IUCN, discussion with local communities, public hearings, agreement at the round table.

2.3. Study of the limits to use of the area and a strategy for tourism development.

Peer-review process by independent experts, discussion with community representatives, agreement at the round table.

2.4. Drafting the rules for community development

Peer-review process by independent experts, discussion with local community representatives, agreement at the round table, implementation in the management plan.

3. Approval of the plan by the Ministry of Environment

4. New Sumava National Park Act

5. Change of zonation documents and forest management plans so that they will respect the management plan

6. Changing the organisational structure and the expert management of the park in accordance with the agreed strategy

7. Incorporating the needs of the local population in the management plan in accordance with the agreed strategy.

Temporary steps:

- Stop the privatisation of state land in the 3rd zones of the park until a development strategy has been agreed upon – with the exception of the present buildings, construction zones within communities and the surround-

ing areas for agricultural use. The communities will become the owners of these properties after the new Act 95/99 becomes implemented.
- Amend the Nature and Landscape Conservation Act (114/92) so that management plans are legally binding and the communities are compensated for lost property tax monies from the forests with special designation.
- Revise the forest categories in Sumava National Park, so that those groups of trees that do not fulfill the conditions of the para. 7 of the Forest Act 289/95 will be reclassified from the ‚protective forests' to the category of ‚specially designated forests'.

Throughout this procedure, the communities do not request a reduction in the area of the national park by means of any significant change of its outside border. What they do ask for is space for a full life in the national park and the opportunity to benefit from its many advantages. It is not possible to make the park smaller without removing invaluable natural areas (with the exception of those plots designated for community buildings and the intensive agricultural meadows and fields at the edge of the park or in direct connection with the communities). **The quality of nature protection depends not only on the size of the park, but also on the park management.**

17 July 2001

1 Modrava community – Antonín Schubert, mayor
Kvilda community – Jiří Frydlewicz, mayor
Prášily community – Libor Pospíšil, mayor
Stožec community – Zdeňka Lelková, mayor
Nová Pec community – Jan Jelen, mayor
Borová Lada community – Stanislava Barantálová, mayor
Strážný community – Jaroslav Pubal, mayor
Rejštejn community – Jaroslav Petáň, mayor
Horní Vltavice community – Jiří Fastner, mayor
Lenora community – Richard Němec, mayor
Čachrov community – Karel Randák, mayor
Železná Ruda town – Věra Drahorádová, mayor

2 Hnutí DUHA/Friends of the Earth Czech Republic – Jan Beránek
Environmental Law Service – Vítězslav Dohnal
Horní Otava civic association – František Krejčí
Calla Association – Edvard Sequens
Hnutí DUHA/FoE CR Sušice local group – Jiří Koreš
Hnutí DUHA/FoE CR Volary local goup – Martin Bláha
Ekocentrum Volary – Ivo Stehlík