

Naturalness and conservation status of forest habitats in the National Park Hohe Tauern Salzburg (Austria)

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Abstract

National Park Hohe Tauern is a protected area under the European Framework for nature conservation Natura 2000 and is internationally acknowledged by the IUCN. The protected area comprises the border region of the countries Carinthia, Tyrol and Salzburg along the Central Alpine crest covering 1.200 km² altogether. The proportion in Salzburg is 805 km², 16% of it covered by forests.

Knowledge about the natural tree species composition, the naturalness and the conservation status of the forest habitat types was scarce. For this reason the National Park Administration set up a project to address these issues in 2014 and to derive information about nature conservation tasks for the upcoming planning period. The project was conducted by WLM Office for Vegetation Ecology and Environmental Planning (Innsbruck) and the Institute of Silviculture / University of Natural Resources and Life Sciences, Vienna

Keywords

Natura 2000 forest habitats, naturalness, indicators for conservation status

Introduction

The Natura 2000 site National Park Hohe Tauern in Salzburg comprises 13.800 hectares of forests. Based on a terrestrial sampling survey on forest vegetation, ecological site conditions, tree species composition and land use influences (i.e. forest management, grazing, game, tourism) the state of the respective habitat types could be investigated. 160 sample plots were examined, 30 among them were established as permanent monitoring plots for future assessments.

The project outputs are maps of the potential natural forest types derived from an empirical site model as a reference data basis for naturalness assessment. In comparison with the actual tree species composition based on a false color image interpretation the actual forest habitat types could be assigned. By intersection of both maps the degree of naturalness of the forest stands could be derived. The latter is key indicator for the naturalness assessment and the conservation status respectively.

This data basis allows conservation object oriented management activities as well as setting up research activities in the context of ecosystem development in relation to climate change, ecosystem services and biodiversity.

The research questions to answer:

- Mapping the potential natural forest types
- Mapping the actual forest habitat types based on a FCIR image interpretation
- Inference of the area-wide naturalness of tree species composition
- Forest habitat type description in a kind of ecological portfolio as a reference for National Park and forest management
- Assessment of the conservation status of forest habitat types based on a plot survey of 160 samples, 30 of them established as monitoring plots
- Assessment of the degree of forest function fulfillment according to the National Forest legislation
- Analysis of the degree of exploitation through forestry and pasturing
- Definition of nature conservation issues
- Proposal of management activities for the protection and development of the forest habitat types in the park area

Methods

The potential natural forest communities (e.g. potential forest types) was inferred by applying an empirical ecological site model based on terrain forms, geology, altitudinal belts and hygric positions in a GIS environment: The forest types are defined according to soil-specifics and vegetation characteristics. Forest types on acid soils, base-rich soils and calcareous soils were distinguished and correlated with the forest communities of Austria (MUCINA et al.1993).

The actual forest habitat types were inferred from actual tree species compositions derived from an FCIR image interpretation overlaid by the specific potential forest types. By defining thresholds for obligatory tree species in a respective habitat type the naturalness of the stands could be derived.

The conservation status of the habitat types was determined by applying the national guideline for assessing the conservation status of Natura 2000 habitat types (ELLMAUER 2005) concerning habitat specific indicators for tree species composition, structure, influences through pasturing, forest management, tourism and game (Table 2) on the basis of 160 sampling plots which were randomly distributed over a 200 m Grid net for the survey around the Park area.

The degree of exploitation by forest management was assessed via a GIS based model taking into account the distance to forest roads and terrain suitability for specific cutting and transportation techniques. Pasturing of the forest stands was derived from terrestrial mapping of pastures in the park area courtesy of Umweltbuero GmbH.

Results

The naturalness of the tree species composition of the forest habitats and the conservation status was assessed on the forest groups level for practical reasons. The natural forest groups are physiognomic and ecological units specified by principal tree species (Table 1) and are regarded to be a suitable level for conservation and forest management issues.

The naturalness of tree species composition could be mapped area-wide (Fig. 1), the conservation status was inferred statistically on the basis of 160 sampling plots (Fig. 3).

Forest group	%	Forest group	%	Forest group	%
Dwarf Pine shrubs	15,1	Subalpine Spruce forests	25,6	Beech forests	0,0
Green Elder shrubs	19,2	Montane Spruce forests	0,1	Sycamore forests	0,5
Stone Pine forests	9,6	Fir forests	19,0	Grey Alder forests	2,8
Larch forests	7,4	Spruce-Fir-Beech forests	0,3	Birch forests	0,2

Table 1: Natural forest groups and relative area (%) in the National Park Hohe Tauern Salzburg

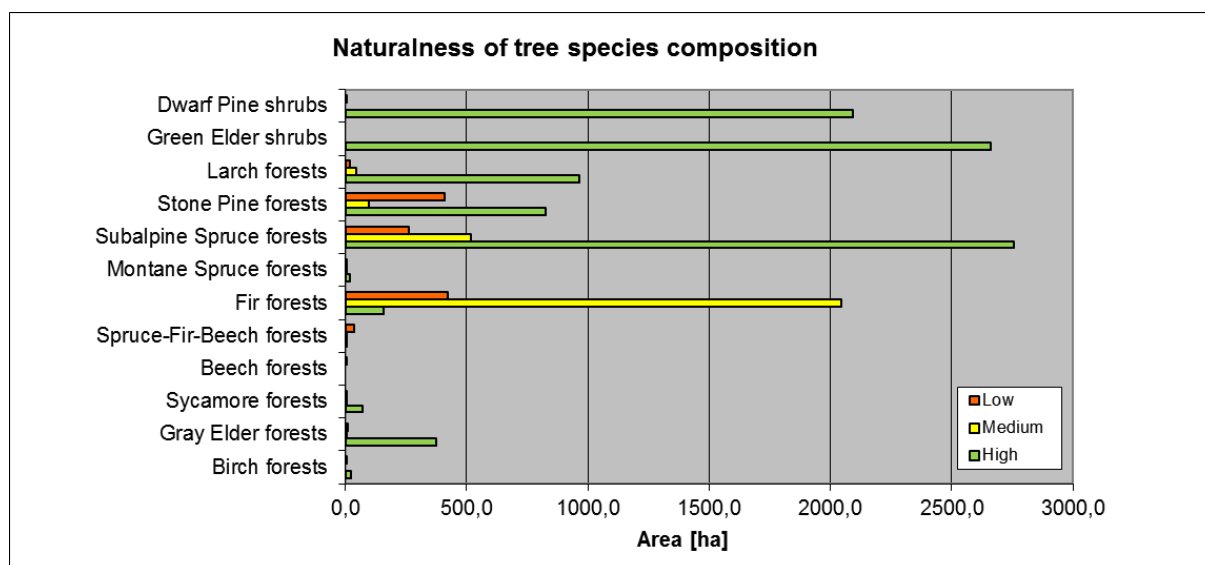


Figure 1: Absolute Area of Naturalness of tree species composition in the forest groups for the National Pak area

The naturalness of tree species composition was assigned in 3 levels: High – full correspondence of potential tree species composition and the actual abundance in the stand (ELLMAUER 2005). Medium – one obligatory tree species is missing or shift in proportions by 1 degree. Low – potentially dominant or subdominant species missing or not abundant.

The following indicators (Table 2) are considered for the conservation status of the habitat types in the levels A (excellent), B (good), C (intermediate/limited) for the Natura 2000 site.

Reflecting the indicators tree species composition and dead wood together with game influence determine the largest threats to the conservation status. About 25 to 31% are in limited state (see Fig. 2) On the other hand appropriate tree species composition can be found on 2/3 of the plots – mostly (94%) among Subalpine Spruce forests. The latter also show the most negative influence by game (36%) which does not impact the conservation status as much as in the Fir forests. The reason is that there are always enough Spruces for regeneration whereas Firs are affected considerably and extinguished for ages if there are no seed trees in the neighborhood.

Indicator	Description	Indicator	Description
Cover (FG)	Area of the stand covered by the habitat type	Structure (St)	Occurrence of stems of a least diameter per area
Tree species composition (BA)	Occurrence of natural tree species of the habitat type in the actual stand	Forestry exploitation (Nu)	Degree of lumbering
Dead wood (TH)	Volume of dead wood over a certain diameter per area	Disturbance (SZ)	Disturbance due to grazing indicated by specific plants
Influence of game (WE)	Damage on branches, stems caused by game	Hydrological impacts (HY)	Artificial alteration of water flow along rivers

Table 2: Indicators for the conservation status

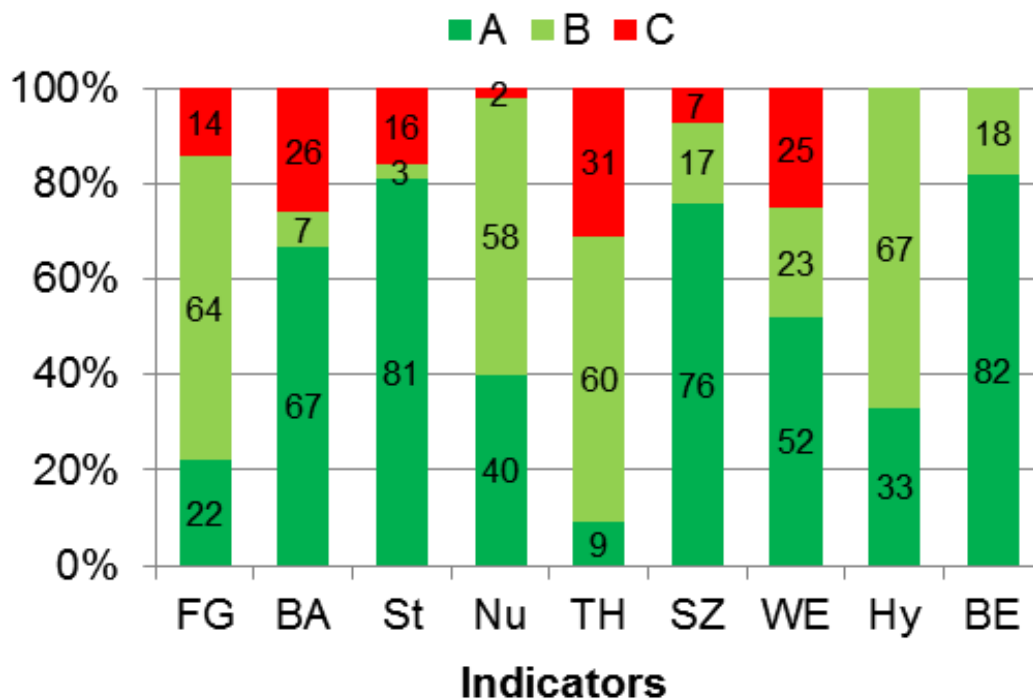


Figure 2: Overall assessment of the indicators for the conservation status suggested by Ellmauer (2005)

Reflecting the forest groups the conservation status is rather different. Stone Pine forests comprise most of the plots with excellent status, Subalpine Spruce forests show the fewest samples with limited conservation status. The deficits are strikingly significant among the Fir forests due to the missing Fir as the essential tree species. 84% are in limited status. The reason can be identified through the vast exploitation of the forests in former times for mining and salt production. Recently high game stocks prevent the sensitive young Firs from establishing in the stands. Despite the K tschach valley near Gastein European Fir is missing or restricted to relicts. To re-establish Fir in the National Park will be the challenge for future forest and Park management. Globally there are about the same proportions of the respective 3 conservation states. (Fig. 3)

Discussion

The statistical results of the conservation status gives insight into the influences and threats on the forest habitat types derived by the indicators examined on 160 plots. The indicators allow to identify the impacts on the habitats and consequently the measures to be taken in order to improve this status or conserve it as demanded by the Natura 2000 legislation of the European Union. The samples are not sufficient to derive impacts on the forests for a single valley, specific zones or even on stand level but they give an overall insight in what is favorable for naturalness of the habitats and what is not.

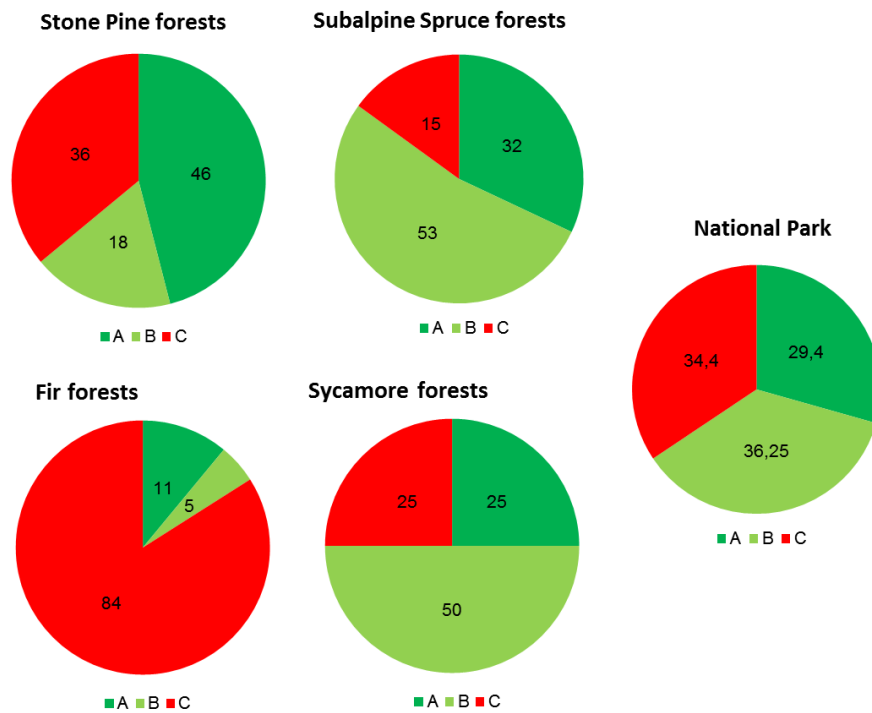


Figure 3: Percentages of conservation status (A, B or C) for specific forest groups and for the National Park out of a sample of 160 plots

Conclusion

The analysis of the conservation status is a kind of traffic light to watch and to consider action to be taken for an appropriate management of the respective habitats. The monitoring plots were designed to repeat the terrestrial survey in 15-20 years time in order to monitor the change of impacts reflected by the investigated indicators.

In addition it is recommended to set up activities in the most affected forest habitat types – so to say to put an eye on the remaining Fir forests in Kötschachtal, and on the seed trees and stands in Untersulzbachtal, Habachtal, Hollersbachtal and Seidlwinkltal.

A second priority is the conservation of rare and priority forest habitat types (EUROPEAN COMMISSION 1992) such as the Sycamore forests (habitat type 9180 Tilio-Acerion forests) on screes and in ravines and the Gray Elder forests along rivers and on erosive slopes (habitat type 91E0) which nevertheless show a significant occurrence in the National Park Hohe Tauern Salzburg. Consequently Salzburg and the Park administration have the responsibility to keep or restore them in an excellent conservation status.

The maps and GIS data on the conservation issues provide the geographical information for management activities. The portfolios for the forest type groups convey the essential information on how to treat the respective habitats appropriately according to conservation and forest management objectives.

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