Assessment of forest wilderness in the Kalkalpen National Park

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Keywords

Forest wilderness, protected area, national park, Austria

Introduction

Europe has lost most of its untouched wilderness areas. Protected areas according to IUCN categories I and II can significantly help to preserve the last remnants of natural ecosystems or to enable a succession from managed to unmanaged nature. But is this task done effectively?

After 20 years of research and without silvicultural management in the Kalkalpen National Park the authors try the attempt of an assessment of the state of wilderness. As some research results are not available as quantitative data, a descriptive approach to the assessment of forest wilderness was chosen.

Evaluating the effectiveness of protected areas for the conservation and development of wilderness requires assessing the four qualities of wilderness: a) naturalness, b) undisturbedness, c) undevelopedness, and d) scale (EU COMMISSION 2013).

Methods

The quality <u>naturalness</u> includes naturalness of vegetation, of the occurring species and of the natural processes (EU COMMISSION 2013).

First one is described by forest hemeroby (methodology GRABHERR et al. 1998), an inverse value. The ecosystem monitoring inventory data (300 x 300 metre grid, 1.900 recorded and 400 re-recorded plots) therefore was used. As zoological data are not considered in forest hemeroby, an analysis of the occurrence of indicator species for primeval forest ecosystems completes the picture of naturalness in the Kalkalpen National Park. The volume of dead wood and its developement are used to make dynamic processes, that cause a high diversity of forest structure, visible.

The degree of <u>undisturbedness</u> – the freedom from natural control or manipulation – can be measured e.g. by administrative, statutory or legislative agreements and stand age, that has a higher explanatory power than the protection time (20 years) and therefore indicates a degree of undisturbedness from a historical point of view. The development of forest hemeroby reflects an actual change of naturalness since the establishment of the national park. 383 re-recorded plots of the ecosystem monitoring were used to show this development.

<u>Undevelopedness</u> is described by length and density of roads. All fragmenting elements are recorded and categorised in road type and use, allowing detailed analysis.

Appropriate <u>scale</u> is an inevitable issue that arises within protected areas and is given by an effective functioning of natural processes (DUDLEY 2008). Aerial photo analysis seems most appropriate for the evaluation of the size of forest ecosystems.

Results

<u>Naturalness</u>

The analysis of the ecosystem monitoring data shows that more than ¾ of the sites are ranked as semi-natural or natural. While in Austria in general only 3 % of the forest areas show no visible human impact (ahemerob or natural), this class makes up for more than 25 % in the national park (GRABHERR et al. 1998).

110 to 130 breeding pairs of the white-backed woodpecker live in the Kalkalpen National Park (WEIßMAIR 2011). 21 of 115 relic beetle species of primeval forests (MÜLLER et al. 2005) were recorded (ECKELT & KAHLEN 2012, ECKELT 2014). Comparing dead wood volumes of the first and second data collection indicates an increase of dead wood by 60 % (ECKMÜLLNER 2013).
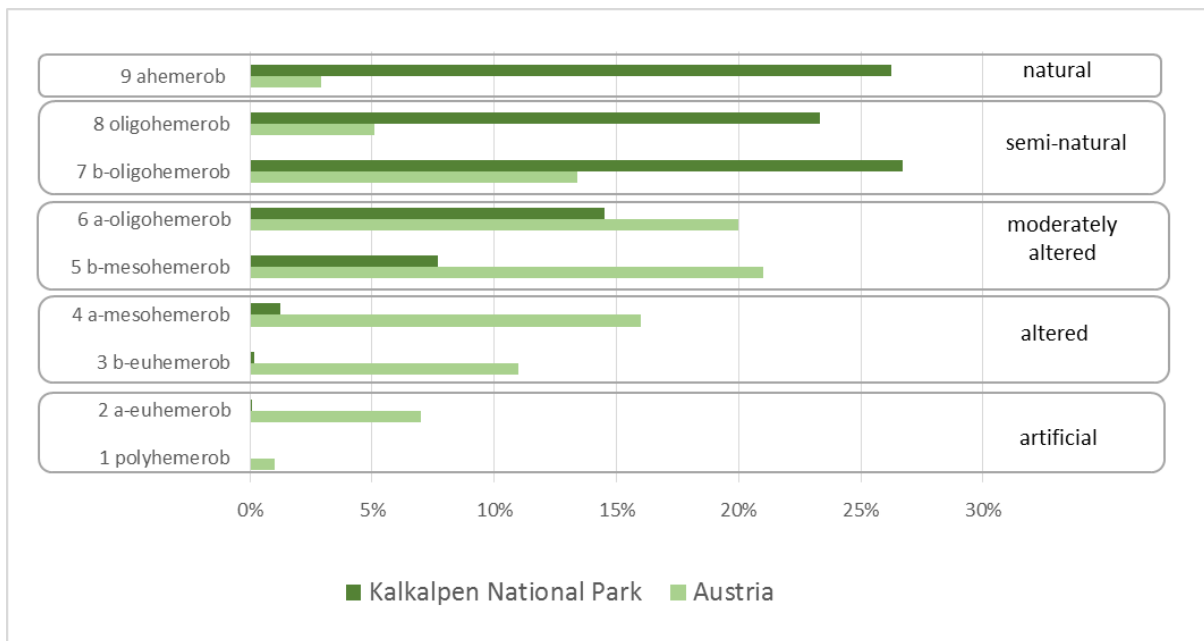
Figure 1: Comparison of forest hemeroby values in Austria (n=4892) (Grabherr et al. 1998) and Kalkalpen National Park (n=1595)

Undisturbedness

The national park consists of a 'core zone' (89 %) and a 'buffer zone' (11 %). The core zone only allows actions for implementing the management plan and for ensuring human security. The buffer zone also allows near-natural mountain pasture, sustainable forestry and maintenance of buildings and forest roads. Bark beetle management has to be done only in 25 % of the NP area due to an exception of the forest law.

Due to a high stock of game and its effects on forest regeneration, game stock regulation is mandatory, but only conducted in a designated area. 54 % of the national park area is currently called 'game-reserve-zone' without any game management.

An analysis of hemeroby development over the last 3 to 17 years (with a 10.8 years average time gap between the assessment of the first and second data collection) shows that naturalness is increasing within the national park (Tab. 1) and can therefore be interpreted as evidence for the absence of any actions disturbing the forest ecosystem – at least in forest wilderness zone.

Zone	First assessment	Second assessment	Development
Management zone (n=74)	6,45	6,50	0,05
Forest wilderness area (n=309)	7,19	7,43	0,23
National park total (n=383)	7,04	7,23	0,19

Table 1: Average hemeroby value of samples of the first and second assessment in the different management zones of the Kalkalpen National Park. 1= artificial – 9 = natural

51 % of the forests are older than 160 years. 16 % are between 121 and 160 years old; the remaining stands are between 81 and 120 years (12 %) and between 20 and 80 years (21 %) old. Forest age in combination with information about forest history shows the existence of forests that were used only once.

Undevelopedness

For assessing the developedness, all maintained public and forest roads in the national park and its surrounding have been taken into account. The average Euclidian distance of a site within the national park to the closest forest road is 598 m (Austrian average 55,6 m (ÖWI, results 1992-1996). About 22 % of the area is more than 1.000 m away from a road. As the use of roads is extremely restricted, impacts of fragmentation and disturbance stemming from forests roads are low.

Scale

Remote sensing data shows 81 % of forest coverage. Deciduous tree coverage makes up 41 % (about 8.500 ha) of the area and mainly consists of beech trees. In the face of the intensive silvicultural management, the proportion of spruce-dominated areas seems too high at 32 % and consists of primary and secondary spruce forests (about 6.600 ha). Larch (*L. deciduous*), pine (*P. sylvestris*) and fir (*A. alba*) trees (in this order) cover the remaining 1.700 ha of forest area. (PRÜLLER 2009). The forested areas are connected and are not separated by zones of high human interference such as farmland or settlements. This adds up to approximately 17.000 ha of forest ecosystems forming a mosaic of different development stages caused by age-driven tree deaths as well as by natural hazards.

Conclusion

When adding all the results of these different viewpoints of naturalness, undisturbedness, undevelopedness and scale, a picture of the high state of wilderness and its development can be drawn.

The method for assessing wilderness shows strengths and weaknesses. The assessment of the naturalness of dynamic processes in forest ecosystems requires a wider approach such as the checking of the coexistence of all natural forest development phases. The same applies to the assessing of scale. Diverse quality of data (quantitative, qualitative, age of data) deserves mentioning, too. The method's greatest strength is definitely the availability of quantitative data of the ecosystem monitoring as a basis for the hemeroby analysis which implicates the greatest significance in this article for assessing forest wilderness.

The methodological approach gives an assessment of the wilderness in a given protected area. By applying this to other areas, a benchmark system might be developed which helps to compare different results and to establish break values for various indicators.

Even though this benchmark data is not available yet, the results emphasise that the Kalkalpen National Park is an example of national parks (according to IUCN Category II) being eligible for conserving forest wilderness.

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