

Indicators for good management of protected areas

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Keywords

Protected area, management, indicator, evaluation

Summary

Protected areas all need specific objectives, and managers need indicators to evaluate whether these objectives have been achieved. For scientists, good indicators should meet scientific standards. For managers of protected areas, rapid analysis of the management objectives is critical.

The Swiss conservation organisation Pro Natura was founded in 1909. Through ownership and contracts with other landowners, Pro Natura has secured 696 protected areas with a total surface area of 267 km². 130 of these areas, with a total surface area of 107 km², are part of regional nature parks or World Heritage Sites. In 474 protected areas, Pro Natura is involved in or responsible for the whole management. In these protected areas, the management objectives, and the indicators for monitoring their effectiveness are defined in a management plan. Every protected area has its own specific objectives. In some of them, the main objective is protecting the ecosystem by allowing natural processes to develop freely. In some of the sites, management interventions are used to favour specific habitat conditions. A third group of protected areas focuses on habitats with a high species richness which has developed as a result of traditional agriculture. The management activities promote the species richness by imitating these traditional activities (PRO NATURA 2005). Because of the differences in the objectives, each protected area needs specific indicators to evaluate the management.

In numerous protected areas, Pro Natura uses indicators based on methods for scientific monitoring of species populations, species groups and plant communities (BRUCKHAUS et al. 1997, HEYER et al. 1994, POLLARD 1982). For species which are difficult to detect, Pro Natura also uses genetic detection methods (HOLDEREGGER et al. 2016).

The following three examples show typical use of scientific methods: the protected site 'Latschgetweid' is a dry grassland formerly used as a cattle pasture. When farming ceased, the grassland became covered by shrubs and trees, and some of the species-rich grassland was lost. To favour the dry grassland Pro Natura cleared the growing shrubs and trees and the grassland was mowed regularly instead of having cattle grazing on it. In 1984 a monitoring program was initiated. At first, the development of the plant communities on fixed test squares was counted every year. In 1994 the method changed to monitoring a higher number of smaller test areas selected by chance (WEBER et al. 1995). After 2004 the plant community was assessed only every 5 years. Since 1994 the number of butterfly and grasshopper species have also been counted. The vegetation reacted to the removal of shrubs very quickly: there were more species and more typical dry grassland species. For the next 30 years, the vegetation didn't change significantly. The butterfly and grasshopper populations have been highly dynamic from year to year, with a slight increase over the 20 years of monitoring.

The 'Burgmoos' is a Swiss moor of national importance. Because of the expansion of tall plant species such as the common reed (*Phragmites australis*) the moor was mowed by hand every autumn. In 2004, a cattle pasture with Galloways was set up on one part of the mire to reduce the levels of common reed. The Swiss Federal Research Institute's moor vegetation monitoring program analysed the influence of the cattle on the vegetation (KÜCHLER et al. 2004, KÜCHLER et al. 2009). In the grazed areas, the number of bog species decreased, but the abundance of transitional moorland species stayed the same. Grazing had only a weak effect on common reed density.

The Aletsch forest is an alpine protected site. Since 1933 the forest has been left to develop freely. It is part of the World Heritage Site Swiss Alps Jungfrau Aletsch, a popular spot for summer tourists. Because of the possible influence of tourism on the management objectives, a scientific study of the effects of visitors was established in 2007 (FURRER 2009). The results showed that the number of visitors has remained constant during the last 13 years, but that their preferred routes have changed. At one picnic area the visitors often used to stop outside the designated area.

For scientists, good indicators for nature protection are those which use scientific methods and deliver results that can be analysed statistically (HOFER 2016). Because most Pro Natura site managers have a scientific background, they like indicators to be based on scientific monitoring methods. However, although scientific monitoring indicators need a significant investment of time and money, these indicators also have disadvantages. Managers of protected areas need quick analysis in relation to the objectives of the site so that they can improve their management. Unfortunately, some species and species groups react very slowly to changes in their habitat, and negative effects are therefore only detected after a long period. The observed number of species and population levels can also vary because of different weather conditions from day to day or from one year to the next, hiding the effects of the management.

In my own long-term monitoring of European tree frogs, the number of calling males can differ from one night to another by 197% despite selecting only those nights with good weather conditions during the mating season. Species with a high reproduction rate (r-strategy) can have a high natural fluctuation in the population from year to year so that the population trend is difficult to observe. Populations of species with a low reproduction rate (K-strategy) react only slowly to habitat change, so that there can be a long period before any effect of the management will be significant. Because of these disadvantages, Pro Natura also uses 'quick and dirty' empirical indicators for evaluating site management, for example photos or expert opinions.

The only two changes to the management of the 'Latschgetweid' are based on empirical indicators. Although the monitoring of the vegetation indicated a good development of the site, the comparison of aerial views from 1991 and 2000 showed that the area of dry grassland was reduced by new growth of bushes and trees. (see Fig. 1). The situation was improved by cutting down the shrubs and trees again. On the expert opinion of a butterfly specialist, Pro Natura reduced the number of cuttings of the dry grassland to improve the situation for butterflies and other insects. At 'Burgmoos', damage to bog vegetation due to cattle hooves had already been observed during a management tour two years before the scientific results were published. At 'Marais des Pontins', another Swiss moor of national importance, comparing photos from before and after the management measures showed that the intervention had been successful. In the Aletsch forest the rangers indicated that more visitors bring a dog. Most of the dogs are not under control and probably affect the wildlife in the reserve.



Figure 1: Aerial view of the protected site „Latschgetweid 1991 and 2000
The arrows on the aerial view 2000 are pointing on areas with increasing scrub surface

As with medical doctors, managers of protected sites rely not only on scientific indicators, but also on their experience and on empirical indicators, when coming to their decisions. If you as a scientist don't trust your eye when comparing aerial views, modern geoinformatic techniques transform optical information into scientific data sets (see Tab. 2).

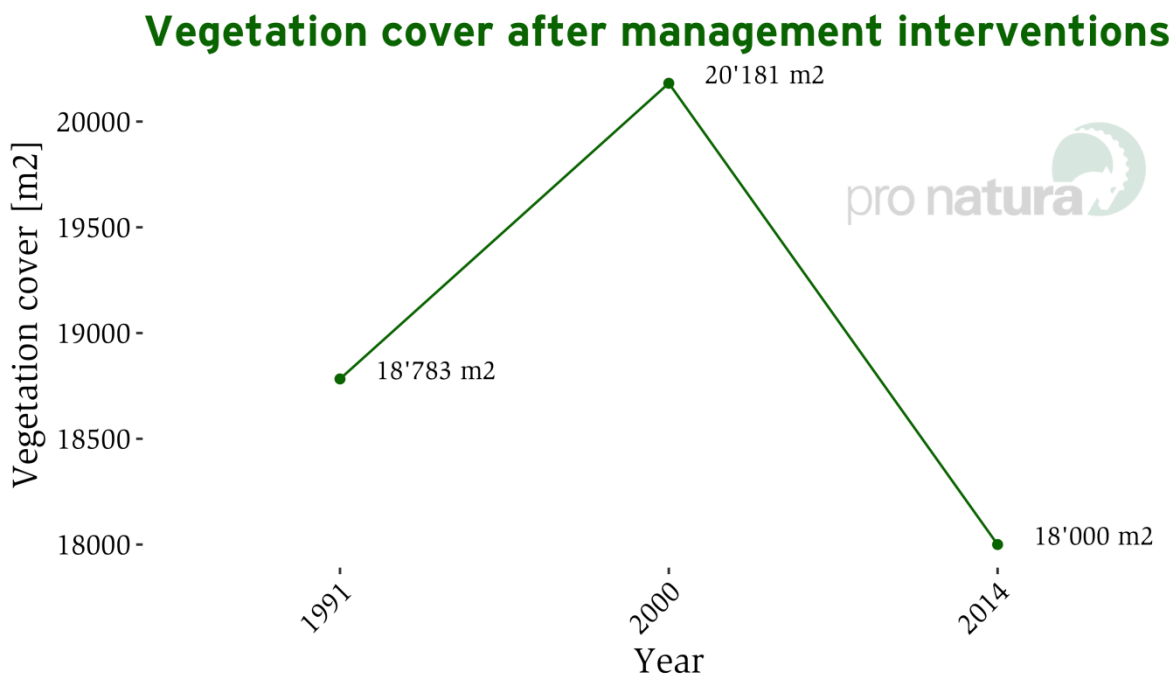


Table 2: Wood and scrub cover in the protected site „Latschgetweid“ 1990, 2000 and after management interventions 2014

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