Conference Volume	6th Symposium for Research in Protected Areas 2 to 3 November 2017, Salzburg	pages 79 - 81

Challenges for future wildlife management in and around protected areas

Peter Brang

Abstract

Wild ungulates are an important part of the fauna in protected areas such as national parks. They often shape their habitat and influence species richness, e.g. by preventing forest expansion into grassland or by influencing the tree species composition of forests. Ungulates are often managed in different ways in and around protected areas. Examples from Europe will showcase the long-term challenges for wildlife management in and around protected areas, including rising impacts of ungulates related to their increased abundance, a higher need for strongly browsed tree species in forestry in order to ensure adaptation to changing climates, the potential spread of diseases from wild ungulates to domestic livestock, and the arrival of large predators. Addressing these challenges requires a good understanding of the ecosystems managed and decision makers which are flexible, willing to develop new solutions, patient and able to communicate.

Keywords

protected areas; wildlife management; climate change; large predators

Wildlife in protected areas: a success story

Wildlife is an important component of many protected areas (PA) such as hunting reserves, biosphere reserves and national parks, and its protection has often been an important motivation for their creation which mainly took place in the 20th century. In Switzerland and in other countries networks of hunting refuges were created to restore viable populations of wild ungulates such as red deer (*Cervus elaphus*), chamois (*Rupicapra rupicapra*) and ibex (*Capra ibex*). In cases were these species were extinct, reintroduction efforts were undertaken, e.g. for ibex in the Swiss National Park. Managing wildlife in PA therefore meant first increasing wildlife abundance. These efforts were very successful in that wildlife populations markedly increased (e.g., Swiss National Park, SCHLOETH 1972). A similar long-term increase of wildlife populations occurred in many PA, and populations developing within PA served often as source populations which spilled over to surrounding areas.

However, in many PA large predators lack behind in developing viable populations. In Slovenia, for instance, half of the hunting reserves contain viable populations of predators such as lynx (*Lynx lynx*) and wolves (*Canis lupus*) and brown bear (*Ursus arctos*) . An overview of 16 national parks in Central Europe showed presence of large predators only in 50% (GÜNTHER & HEURICH 2013). In the Swiss National Park, individuals of these predators are only temporarily present, and it is unclear if they will be able to increase in abundance in the near future. The habitat of their potential prey therefore lacks an important component: ungulate populations live in a 'landscape of trust' instead of a 'landscape of fear' (LAUNDRÉ et al. 2010), in particular so since the animals get also accustomed to the large number of visitors, e.g., in national parks. The consequence of this 'predator gap' is that the density of ungulates, which is otherwise limited by predators in northern ecosystems (RIPPLE & BESCHTA 2012), continuously increases, although the strength of predator impact is not well known (KUPFERSCHMID & BOLLMANN 2016). In cases with no hunting, I do not see that the increase of ungulates in PA has reached a plateau.

Wildlife in protected areas increasingly shapes habitats

Large populations of ungulates can shape their habitat. Effects such as promotion of species richness on mountain grasslands (SCHÜTZ et al. 2003) and prevention of natural reforestation in heavily grazed areas (SCHÜTZ et al. 2003) have been demonstrated, while effects on tree seedlings (<10 cm) and saplings (≥10 cm) on the landscape level seem to be small (BRÜLLHARDT et al. 2015). In a study in a Swiss hunting reserve (Aletschwald) with high ungulate densities, long-term undesirable impacts on tree recruitment were considerable (BALLMER et al. 2014). Given variability in seasonal habitat use by ungulates, in forage availability and in anthropogenic disturbance, and given highly lagged and spatially heterogeneous patterns, it is plausible that effects on tree regeneration are not well understood.

In addition, it is not clear how any changes, e.g. by a decelerated tree regeneration, should be valued, in particular in PA where natural processes have priority. Traditional indicators of overuse of the habitat by ungulates seem inapplicable since no particular expectation on how it should develop is valid. However, several reasons may justify a deviation from a pure laissez-faire management:

1. an unnatural ecosystem development, and
2. inacceptable impacts on adjacent ecosystems.

Which wildlife populations are 'natural'?

An argumentation based on naturalness is often routed in unstable ground since, for many landscapes, the natural state of an ecosystem is unknown. The long debate about whether large ungulate populations were, before the arrival of men, able to shape their habitat by keeping it open, has not lead to conclusive results. While it seems plausible that deer and mega-herbivores were able to keep floodplain forests open, other arguments make it unlikely that the example of floodplain forests is a generally valid pattern: Silver fir (*Abies alba*), a highly palatable species, was largely dominant before the arrival of man in central Europe, even in the lowlands (TINNER et al. 2013), large predators are able to control populations of their prey species (RIPPLE & BESCHTA 2012), there was little non-tree pollen before the arrival of man (ZOLLER & HAAS 1995) and the forests north of the Alps were described by the Romans as dense (ZOLLER & HAAS 1995).

I therefore believe that we face, in many PA, an unnatural overpopulation by ungulates and at the same time an unnatural underpopulation of their predators. This situation persists for about 60 years, in some cases even longer, and will reshape forest structure in the long term (BRANG 2017). However, it has to be admitted that we are probably unable to describe which states (and which variability) of ungulate populations would be 'natural'. The idea of any long-term steady state seems erroneous, which means that any management meant to mimic the impact of predators should be variable in time and space. Current hunting practices in PA (GÜNTHER & HEURICH 2013) seem so far unsuitable to achieve this, and to promote more natural ecosystem dynamics. In some countries, the motivation to hunt in PA is even to generate income from hunting guests, which is in contradiction to mimicking predation.

It seems also undesirable that most of the few remnants of old-growth forests in central Europe are, at the same time, hotspots of ungulate abundance. This means that these precious relicts will evolve, in the long term, from old-growth to senile forests, because their tree recruitment is largely absent or reduced to unpalatable species, which also limits their value to preserve genetic diversity. This even raises the question of whether some wildlife refuges would need to be protected from wildlife.

Impacts of wildlife populations on adjacent non-protected areas

Management goals in and outside of PA are often different. Around the Swiss National Park, for instance, forests protecting humans and assets against natural hazards such as snow avalanches (protection forests) predominate. Current best practices in these forests are to create mixed forests in which a small-scale disturbance regime is mimicked, which is likely to prevent any large scale breakdown of the protective effect (BRANG et al. 2008). However, this requires constant recruitment of several tree species, and is partly unfeasible or unreasonably costly (fencing) if ungulates are abundant in wintertime and browse on tree seedlings. Hunting has limited effect since it is restricted to short time periods in fall when the animals can hide in areas with a hunting ban, such as the National Park. This example shows the need to work on solutions which integrate conflicting goals at the landscape scale.

Similar conflicts may arise in the future with large predators which are not hunted in PA, but cause damage to livestock in adjacent areas with agricultural use. In addition, arriving large predators will not only feed on previously unchallenged prey populations within PA, but may also lead to a more even distribution of their prey species in the landscape, including non-protected areas where higher ungulate populations can be in conflict with other land uses. All these phenomena will require careful communication to the public and, possibly, adjusted wildlife management.

Climate change will cause a marked, although delayed change of the vegetation. In forests, this means that tree species which are currently found in warmer and drier climates will be able to occupy new habitats (BRANG et al. 2016). Most of these locally new species are highly palatable species such as silver fir or oak (*Quercus spec.*). If they are unable to establish due to abundant ungulate populations, which is currently often the case (KUPFERSCHMID et al. 2015), the future forests will be less resistant and resilient to disturbance, which is highly undesirable.

Finally, new diseases may spread from wildlife to domestic livestock and vice-versa. Conservation, farming and health interests will need to be weighed, and difficult decisions made.

Perspectives for wildlife management in and around protected areas

Given the challenges associated with undesirable impacts, which originate in PA and affect their surroundings, the management of PA is facing significant challenges. One challenge is to revise current hunting schemes to ensure the natural process of predation, as long as there are not enough natural predators present (DACHS 2013). I do not advocate the simple adoption of hunting practices from adjacent areas, and do also not see a great urgency for immediate large-scale action, given the long time scales involved in ecosystem dynamics. However, I am in favor of starting tests of new practices with proper scientific consultation and monitoring. This would also increase the acceptance of PA among the local population.

In the case of forests, the long-standing conflicts around PA that arise from large ungulate populations are exacerbated by climate change and should be addressed soon. Currently, the interest groups (including the administrations of PA) seem either to ignore the conflicts or only to agree that they disagree.

With the ongoing climate change and the global spread of diseases, we face high uncertainty in natural resource management. This calls for leaving behind simple command and control approaches, for efforts to get prepared and to anticipate what could happen (scenario techniques), for openness for unusual solutions, for courage to test them and monitor the outcome, and for accepting the results and adjusting practices.

References

BALLMER, I., HEIRI, C.; BRÜCKER, R., TINNER, R., WUNDER, J. & P. BRANG. 2014. Auswertung der Vollkluppierung 2012 im Naturwaldreservat Aletschwald. Aktueller Zustand und Bestandesdynamik seit 1962. WSL Berichte 15: 71 S.

BRANG, P., SCHÖNENBERGER, W., OTT, E. & B. GARDINER. 2008. Forests as protection from natural hazards. In: EVANS, J. (Ed.), The Forests Handbook, Volume 2: Applying Forest Science for Sustainable Management, pp. 53-81.

BRANG, P., KÜCHLI, C., SCHWITTER, R., BUGMANN, H. & P. AMMANN. 2016. Waldbauliche Strategien im Klimawandel. In: PLUESS, A.R., AUGUSTIN, S. & P. BRANG (Red.), Wald im Klimawandel. Grundlagen für Adaptationsstrategien. Bern, Bundesamt für Umwelt BAFU; Birmensdorf, Eidg. Forschungsanstalt WSL. Bern, Stuttgart, Wien, Haupt. 341-365.

BRANG, P. 2017. Einfluss von Wildhuftieren auf den Wald seit Langem zu hoch - was tun? (Essay). Schweizerische Zeitschrift für Forstwesen 168: 195-199.

BRÜLLHARDT, M., RISCH, A. C., FILLI, F., HALLER, R. M. & M. SCHÜTZ. 2015. Spatiotemporal dynamics of natural tree regeneration in unmanaged subalpine conifer forests with high wild ungulate densities. Canadian Journal of Forest Research 45: 607-614

DACHS, D. 2013. Effects of wildlife management in national parks on its populations - Where to go? 5th Symposium for Research in Protected Areas, 10 to 12 June 2013, Mittersill, 119-120.

GÜNTHER, S. & M. HEURICH. 2013. Bewertung der Naturnähe des Rothirschmanagements in mitteleuropäischen Nationalparken. Allgemeine Forst- und Jagdzeitung 184: 1-16.

KUPFERSCHMID, A. D. & K. BOLLMANN. 2016. Direkte, indirekte und kombinierte Effekte von Wölfen auf die Waldverjüngung. Schweizerische Zeitschrift für Forstwesen 167: 3-12.

KUPFERSCHMID, A.D., HEIRI, C., HUBER, M., FEHR, M., FREI, M., GMÜR, M., IMESCH, N., ZINGGELER, J., BRANG, P., CLIVAZ, J.-C. & O. ODERMATT. 2015. Einfluss wildlebender Huftiere auf die Waldverjüngung: ein Überblick für die Schweiz. Schweizerische Zeitschrift für Forstwesen 166: 420-431.

LAUNDRÉ, J. W., HERNÁNDEZ, L. & W. J. RIPPLE. 2010. The Landscape of Fear: Ecological Implications of Being Afraid. The Open Ecology Journal 3: 1–7.

RIPPLE, W. J. & R. L. BESCHTA. 2012. Large predators limit herbivore densities in northern forest ecosystems. European Journal of Wildlife Research 58: 733–742.

SCHLOETH, R.F. 1972. Die Entwicklung des Schalenwildbestandes im Schweizerischen Nationalpark von 1918 bis 1971Schweizerische Zeitschrift für Forstwesen 123: 565–571

SCHÜTZ, M., RISCH, A. C., LEUZINGER, E., KRÜSI, B. O. & G. ACHERMANN. 2013. Impact of herbivory by red deer (*Cervus elaphus* L.) on patterns and processes in subalpine grasslands in the Swiss National Park. Forest Ecology and Management 181: 177-188.

TINNER, W., COLOMBAROLI, D., HEIRI, O., HENNE, P. D., STEINACHER, M., UNTENECKER, J., VESCOVI, E., ALLEN, J. R. M., CARRARO, G., CONEDERA, M., JOOS, F., LOTTER, A. F., LUTERBACHER, J., SAMARIN, S. & V. VALSECCHI. 2013. The past ecology of Abies alba provides new perspectives on future responses of silver fir forests to global warming. Ecological Monographs 83: 419-439.

ZOLLER, H. & J. N. HAAS. 1995. War Mitteleuropa ursprünglich eine halboffene Weidelandschaft oder von geschlossenen Wäldern bedeckt? Schweizerische Zeitschrift für Forstwesen 146: 321-354.

Contact

Peter Brang
brang@wsl.ch
Swiss Federal Institute for Forest, Snow and Landscape Research WSL
Zürcherstrasse 111
8903 Birmensdorf
Switzerland
Phone +41 44 739 24 86