MINISTERIUM
FÜR EIN
LEBENSWERTES
ÖSTERREICH

HBLFA RAUMBERG - GUMPENSTEIN
LANDWIRTSCHAFT

AGRI-ENVIRONMENT

SUSTAINABLE AGRICULTURE IN THE LIGHT OF EUROPEAN ENVIRONMENTAL TARGETS

AUSTRIA – CROATIA – KOSOVO

HIGHER-KOS PROJECT

2013-2015

raumberg-gumpenstein.at

LAND ABANDONMENT – IMPACTS ON BIODIVERSITY IN THE NATIONAL PARK GESÄUSE

D. Kreiner, T. Frieß, C. Komposch, A. Bohner

Introduction

The survey undertaken by Gesäuse National Park and AREC Raumberg-Gumpenstein, within the framework of the LTSER platform Eisenwurzen, was part of the international ALTER-Net project „Land abandonment and vegetation change in open landscapes: assessing biodiversity impacts and options for mitigation". It is comparing the change in biodiversity between highly cultivated and abandoned mountain meadows. Besides a vegetation survey the abundance of zoological indicator groups was examined. Additionally to the surveys, interviews with keepers and former alpine farmers were conducted. Results are showing a decrease in biodiversity with afforestation of former extensively farmed mountain meadows. Results from the surveyed areas in the National Park Gesäuse are valid for many central European regions undergoing comparable developments. Other involved research institutes from Europe: FERC/UNIGOE (Germany), Alterra (Netherlands), CEH (United Kingdom), Cemagref (France), SLU (Sweden), UFZ (Germany), IN (Belgium), UBA (Austria). The results were published in Prevosto et al. (2011).

Three master studies focused on:

- Vegetation in relation to alpine pasture management (high input or low input management): Miller-Aichholz 2007,
- Former pastures on which livestock had to be tendered: Werschonig 2008 and
- Former wood pasture: Diethart 2007

Other research activities focused on:

- „Influencing factors to floristic diversity at alpine pastures" from Gubert 2006
- Zoological surveys from ÖKOTEAM (Komposch et al. 2010) and
- a research documentation about historical sources and interviews with the land users and former alpine pasture managers (Hasitschka 2005a-c).

The results are best practice examples. The large-scale land abandonment on the one hand and the intensification in favorable areas on the other hand are trends that can be observed in Central Europe.

Project period was 2006-2008. A second survey for the evaluation and long-term monitoring of plant species biodiversity will start in spring 2015.

Starting situation:

Without human use (mowing, pasturing, removal of shrubs) successional developments start in open habitats below the treeline. Thus, they approach the successional climax (natural, long term stable and species rich habitats).

Results:

- The abandonment of high pastures leads to encroachment of shrubs and dwarf pines, later to forestation
- Forestation means at least on a short-term basis a loss of some species and a reduction of diversity of habitats
- But the loss of species affects mostly animals and plants with low demands and widely distributed species, as well as synanthropic species, which were originally missing at this altitude. Exceptions are special high value sites and species-rich, low nutrient meadows, being hot-spots for endangered species.
- In the long term, forestation fosters autochthonic, demanding species like endangered xylobiont and species endemic in the Alps.

Recommendations for conservation:

- Conservation of selected used areas, which are characterized by endangered animal and/or plant species
- Reduction of land use on intensive pastures
- Very low intensity, short pasturing with suitable breeds and specific management of the most valuable high-pasture habitats, from a conservational point of view, like calcareous low-nutrient meadows, wetlands or fens
- Research and monitoring for an improvement of conservation guidelines
- Partial protection of susceptible communities against human impact and livestock
- No artificial reforestation of high pasture areas were successions are already in progress
- Conservation of special habitats and structural elements (single trees, dead wood, spring communities, (ice-)caves, stone walls and heaps…)

Consequences on vegetation and structural richness of a landscape

This study documented successional processes on the high pastures „Ebersangeralm", „Wolfbauernhochalm" and „Eggeralm" (Werschonig 2007), located in the Austrian National Park Gesäuse (Ennstaler Alpen, Styria). Those high pastures were abandoned between 50 and 100 years ago.

As site parameters and influences change with modifications in land use or abandonment, the habitat also changes. On most areas of the former high pastures dwarf pines, larches and spruces invade and establish themselves in the herb and bush layer. Starting from the forest, the encroachment continues to the edge of the pastures. The area of pasture decreased significantly during the monitoring period (1954-2007). In the dwarf pine stands of the study area, a remarkable increase of mountain ash, Swiss pine, larch, spruce and sycamore maple within a slowly growing tree layer can be seen. Following an analysis of aerial imagery, those communities developed only in the last 50 years.

The development of these forests differs quite a lot from each other: The spruce and larch forests at the „Eggeralm" and the north eastern part of the „Wolfbauernhochalm" did not change much in the last 50 years. On the other hand, on both high pastures developed different successional stages of thin stands of Swiss pines and larches from bush/shrub dominated communities, where the development has not stopped yet.

All three high pastures change significantly, the change is similar, but happens with different

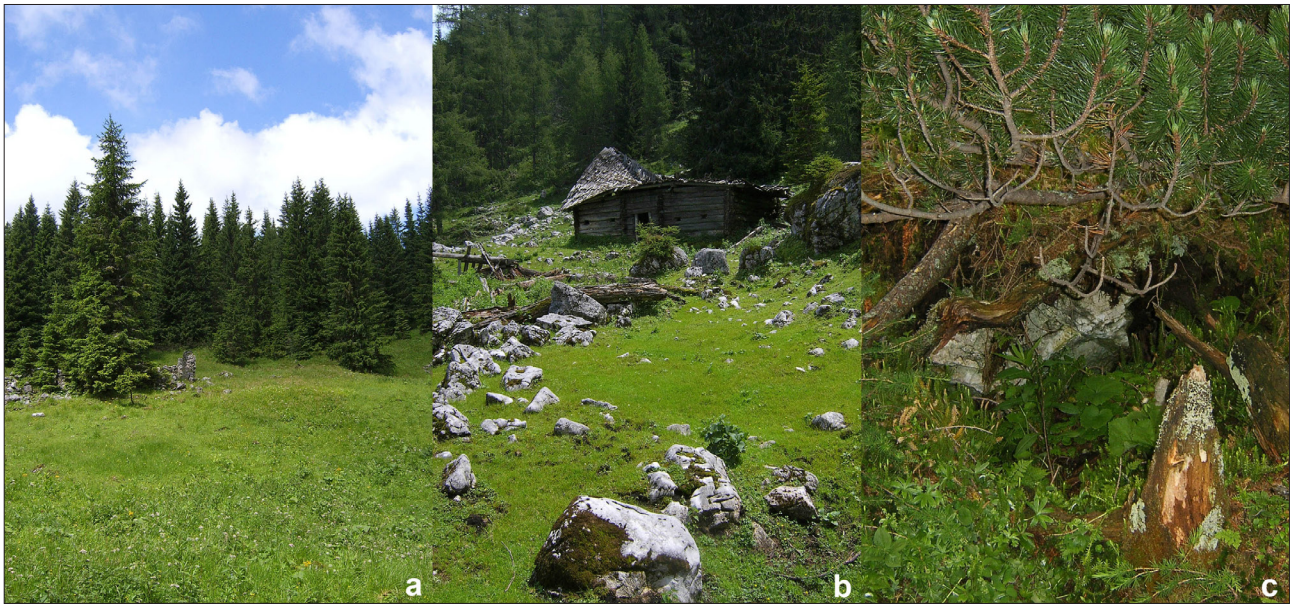

Figure 1: In focus were three differently advanced succesional stages of high pasture areas, from a zoological point of view: a) Eggeralm, b) Wolfbauernhochalm, c) Ebersangeralm (Pictures: C. Komposch/ÖKOTEAM, July 2005)**.**

speed. Without human impact or herbivory of game, recent open landscapes or thin forests are closing more and more. The still observable mosaic of habitats within the forest belt gets more uniform and more natural. Populations of species from open spaces decrease and high demanding native forest species find more habitats again.

Zoological studies: Insects and spiders

Aim of the zoological study was the ecological description of different successional stages of high pastures after abandonment. Especially species groups, which are constrained in the movements because of close connection to their habitat, are suited for detailed evidence. The different groups studied (spiders, ground beetles, leaf- and planthoppers and true bugs) offer a wide range of different types of ecological adaptions. Semi-quantitative samples with traps, catches by hand and nets from a representative section of the local fauna make detailed statements on diversity and conservational value of these habitats and their animal communities possible (Komposch et al. 2010).

Diversity of true bugs on high pastures:

On the three high pastures studied, on overall nine plots 37 species of true bugs could be found. Species and individual counts decrease significantly with increasing encroachment and forestation. The spectrum of different ecological guilds found changes characteristically from open to more closed habitats. The proportion of soil-living individuals decrease drastically with shadow, those of plant living species are reduced for those living on woody species. Characteristic for semi-open areas is the high abundance of bugs living on dwarf shrubs.

An analysis from a conservation point of view on Red List and endemic species shows semi-open areas being with nine valuable species richer and lying ahead of open areas with seven and forest stands with only three of those species. Habitats in an transitional phase, mostly rich in structural elements are therefore of high importance for the survival of rare and endangered true bug species, as well as for other species of the alpine fauna.

Figure 2: *Calocoris alpestris*, a true bug, prefers humid, partly shady microclimates, dominated by herbs (Picture: T. Friess/ÖKOTEAM).

Comparisons with a study on the still operating high pasture „Sulzkaralm" (Friess 2006) show that still open, but not anymore used pastures have an overall lower diversity of true bugs, in opposite to still extensively pastured areas.

The importance of special sites:

In agriculture, areas with erosion are seen as „wounds in the landscape". Structural elements, like lying and standing dead wood, stone heaps, dolines and bare rock, as well as a strong relief are obstacles for human land use. Those elements break the homogeneity of a pasture area. The research on arachnids give in an impressive way evidence that these special sites are hot spots for species diversity and/or harbour a high number of endangered species, like an island within a heavily disturbed, anthropogenic formed matrix. Good examples for these kind of specialists within the Araneae are *Troglohyphantes noricus* (figure 3) and *Troglohyphantes thaleri*. Both spider species are sub-endemic in Austria, meaning, they are only found in the Eastern Alps and endangered (Komposch 2009).

The reference habitat and special site called „Gass", a just above the forest line lying alpine grassland, interspersed with rocks and scree, shows concerning the diversity and abundance of spiders lower figures than the mean of the three abandoned high pastures. Nevertheless, from a zoo-geographical, faunistic and conservational point of view, the „Gass" shows the most remarkable species inventory.

Figure 3: *Troglohyphantes noricus* is sub-endemic in Austria and one of the demanding inhabitants of crevices and undisturbed habitats, which declined because of the use as high pastures (Picture: Ch. Komposch/ÖKOTEAM, Styria, Gesäuse).

Conservation of species rich animal communities by use as extensive high pasture:

Following measures are of high importance for the conservation of typical, endangered spider and insect species, as well as the faunistic diversity on high pastures in the National Park Gesäuse:

1. Conservation of species rich, structured rough, moist and wet areas under use, meaning no reduction in area.
2. Extensification of intensively used high pastures or abandonment, letting free succession towards the climax stadium forest happen.
3. Applied research and monitoring for the evaluation and optimisation of requirements of conservation during planning and implementation of measures.
4. Partial protection of habitats and communities against human impact and livestock:
   - Stopping the construction of roads in not yet accessible parts of the landscape and not difficult to reach high pastures
   - Creating exclosures for susceptible communities like springs, banks of running and still waters, wet meadows, fens
   - No pasturing in grassland above the climatic forest line
5. Free succession meaning no forestation in closing former pastures, especially in calcareous grassland
6. Conservation of special sites and structures (stone heaps, and walls, erosion patches, rocky grasslands, dolines, old and dead wood, wet meadows...) as hot spots for faunistic diversity and endangered species.

Natural forest in opposite to non-native timberland is in no case an enemy of nature conservation, but the natural, species rich final stage of a succession (climax) in all altitudes below the climatic forest line and worth of protection.

Is forestation equal to biological impoverishment? Answers for politics

The abandonment of extensive high pasture management brings a loss of species and habitat diversity in the montane and subalpine belt fostered by man over centuries and millenia.

Site specific, rich in structures and only marginally or not at all used forests with a high proportion of old and dead wood harbour also a high number of endangered species and are all over Central Europe only left in small areas. Protection and promotion of natural forests and their heavily endangered communities has a high priority for nature conservation.

Need for action for the conservation of plant and animal diversity, as well as their habitats as our natural heritage can therefore be found in several areas. Balancing the consequences of land use changes has to be done in advance of the creation of subsidy programmes, considering the complexity of ecological as well as socio-economical interrelations. Results of research ought to help with well-founded decision making.

A main target of the research platform Eisenwurzen is to disseminate results of research to both decision makers as well as stakeholder. Embedded into the European research landscape the return of results from socio-economic and ecological long-term research into European politics should be better guaranteed (Mirtl et al. 2015).

References

1. *Diethard, F. (2007): Struktur und Dynamik in einer naturnahen, totholzreichen Waldzelle im Nationalpark Gesäuse. Diplomarbeit, Univ. für Bodenkultur, Wien, 157 pp.*
2. *Friess, T. (2006): Naturschutzfachliche Analyse der Wanzenfauna (Insecta: Heteroptera) unterschiedlicher Almflächen im Nationalpark Gesäuse (Österreich). Denisia 19: 857-873.*
3. *Gubert, F. (2006): Einflussfaktoren auf die floristische Diversität im Almbereich. Laureatsarbeit an der Freien Universität Bozen, 94 pp.*
4. *Hasitschka, J. (2005a): „Die Geschichte der Ebersangeralm". Unveröff. Studie i.A.d. Nationalpark Gesäuse GmbH, 11 pp.*
5. *Hasitschka, J. (2005b): „Die Geschichte der Wolfbauernhochalm". Unveröff. Studie i.A.d. Nationalpark Gesäuse GmbH, 16 pp.*
6. *Hasitschka, J. (2005c): „Die Geschichte der Eggeralm". Unveröff. Studie i.A.d. Nationalpark Gesäuse GmbH, 18 pp.*
7. *Komposch, Ch. (2009): Spinnen (Araneae). In: Rabitsch, W. & Essl, F. (Red.): Endemiten - Kostbarkeiten in Österreichs Tier- und Pflanzenwelt. Ökologie. Naturwissenschaftlicher Verlag für Kärnten und Umweltbundesamt, Wien, pp. 408-463.*
8. *Komposch, Ch., Friess, T., Blick, T., Holzinger, W. & Kunz, G. (2010): Naturschutzfachliche Evaluierung aufgelassener Almen im Nationalpark Gesäuse. Bewertung anhand der Indikatorgruppen Spinnen, Zikaden und Wanzen - Bearbeitungsjahr 2005. ÖKOTEAM - Institut für Tierökologie und Naturraumplanung. Im Auftrag der Nationalpark Gesäuse GmbH. Graz, 157 pp.*
9. *Miller-Aichholz, F. (2007): Vegetationsökologische Analysen unterschiedlich intensiv bewirtschafteter Almen im Nationalpark Gesäuse. Diplomarbeit, Universität Wien, 103 pp.*
10. *Mirtl, M., Bahn, M., Battin, T., Borsdorf, A., Dirnböck, T., Englisch, M., Erschbamer, B., Fuchsberger, J., Gaube, V., Grabherr, G., Gratzer, G., Haberl, H, Kreiner, D., Mayer, R., Peterseil, J., Richter, A., Schindler, S., Stocker-Kiss, A., Tappeiner, U., Weisse, T., Winiwarter, V., Wohlfahrt, G. & Zink, R. (2015): Research for the future. LTER-Austria White Paper 2015. On the status and orientation of process oriented ecosystem research, biodiversity and conservation research and socio-ecological research in Austria. LTER-Austria Series, Vol 2.*
11. *Prévosto, B., Kuiters, L., Bernhardt-Römermann, M., Dölle, M., Schmidt, W., Hoffmann, M., Uytvanck, J.V., Bohner, A., Kreiner, D., Stadler, J., & Klotz, S., Brandl, R. (2011): Impacts of Land Abandonment on Vegetation: Successional Pathways in European Habitats. Folia Geobot, DOI 10.1007/s12224-010-9096-z.*
12. *Werschonig, E. (2008): Vegetationskundliche Untersuchung dreier aufgelassener Almen im Nationalpark Gesäuse: Aufnahme der Vegetation und Untersuchung der Sukzession auf der Egger- der Ebersanger- und der Wolfbauernhochalm im steirischen Nationalpark Gesäuse. Diplomarbeit, Wien, 109 pp.*

AUTHORS

Daniel Kreiner[1)], Thomas Frieß[2)], Christian Komposch[2)], Andreas Bohner[3)]

[1)] National Park Gesäuse GmbH, Department of nature conservation/environment
Weng im Gesäuse 2, 8913 Admont, Austria
E-mail: daniel.kreiner@nationalpark.co.at

[2)] ÖKOTEAM - Institute for Animal Ecology and Landscape Planning
Bergmanngasse 22, 8010 Graz, Austria

[3)] Agricultural Research and Education Centre Raumberg-Gumpenstein
Raumberg 38, 8952 Irdning-Donnersbachtal, Austria