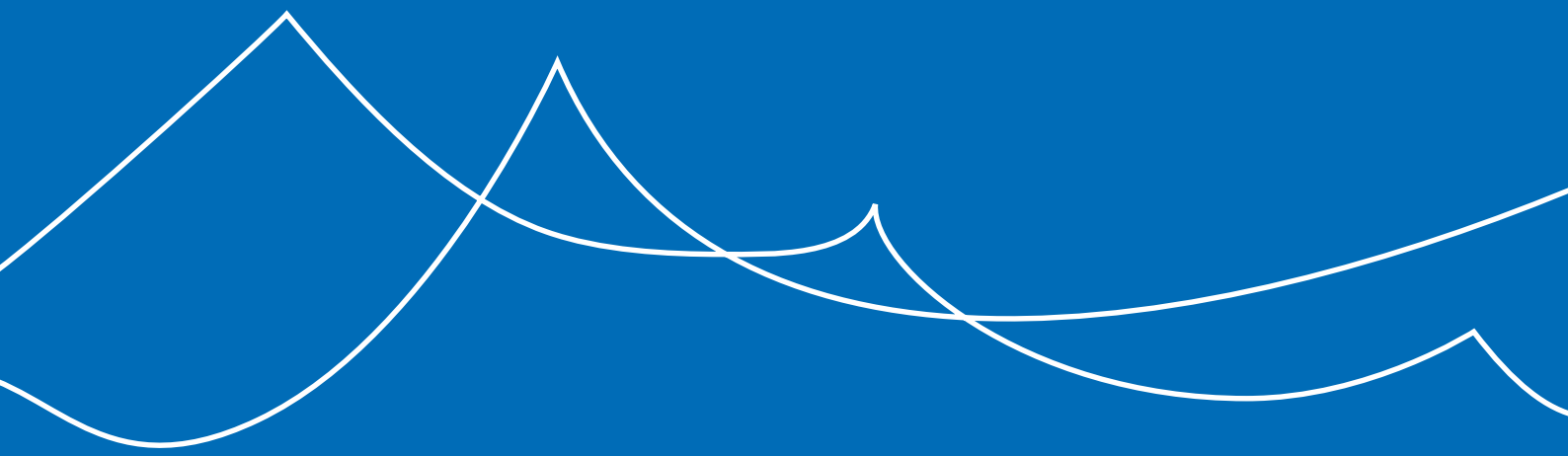
Plenary Session 3: Biodiversity Benefits for and from the Alps



Introduction

Presentation: Jean-Jacques Brun, Roland Psenner

Biodiversity is — beside climate warming and global change — one of the major issues humanity has to tackle in the 21st century. Although we know something about climate warming, greenhouse gases and worldwide socio-economic changes, biodiversity remains an open question for mainly two reasons: first, we do not know enough about real biodiversity, neither by classical studies nor by modern molecular techniques. Second, we can hardly predict which ecosystem services will be impaired or lost altogether if we push biodiversity beyond certain thresholds. We do know, however, that biodiversity is decreasing at an unprecedented rate in human history and that the expansion of cities in the valleys and the decline of agriculture on the slopes increase the rate of biodiversity losses in the Alps. The five presentations of this section focus on different aspects of biodiversity, from the snowy peaks to the metropolises.

Ulrike Tappeiner and Erich Tasser analyze the anthropogenic effects on biodiversity on the level of genes, species, and ecosystems. It is the benefits, the goods and services which ecosystems provide for humanity which everybody accepts as "commodities" delivered for free. Tappeiner and Tasser discuss biodiversity hot spots in the Alps and the problems related to land use changes by urban sprawl and highlight two aspects of biodiversity decline, i.e. ethical and aesthetic values and ecosystems properties.

Annamaria Giorgi and Massimo Pecci point out two interesting aspects of diversity. First, biodiversity has to be considered as an essential element for mountain development and the uniqueness of what mountains can produce and express; the tastes of mountain traditional foods, for instance, are strictly depending on the biodiversity of the places where they are produced. The second aspect is an increasing awareness of the crucial importance of cryodiversity, i.e. the diversity of ice and snow ecosystems.

Mario Broggi's focus of interest are lifestyles and the corresponding use of resources in the Alps, whereby the extremes seem to oscillate between purely artificial worlds (Heidiland) and wilderness. Both positions tend to neglect that also the cultural landscape has an enormous value and should be protected because it is endangered from both sides, i.e. abandonment and over-exploitation. So his plea is to keep nature and history in coexistence and to carefully manage the remains of the cultural product in the mountain environment. Preservation, however, does not mean to keep the status quo but to understand the drivers of change.

Josef Reichholf holds a different view by comparing large cities with natural landscapes, for they both have mountains and large rocks (i.e. tall buildings), separated by valleys or ravines (i.e. streets) etc. So he comes to astonishing conclusions, for instance that biodiversity increases with the size of cities and that cities on their part provide protection, forming a kind of reservation for species endangered by modern agriculture.

Stefan Leiner highlights the EU policy to prevent or reverse biodiversity losses, and points out that the first "health check" assessing the conservation status of species and habitats protected under the Habitats Directive published in 2009, revealed that only 17 % of both species and habitats have a favourable conservation status. Consequently, the 2020 EU biodiversity target requires to stop the loss of biodiversity and the degradation of ecosystems and to restore them as far as feasible.

Biodiversity in the Alps: Anthropogenic Changes and Related Effects on Ecosystem Properties

Ulrike Tappeiner, Erich Tasser

Introduction

Human activities have changed and are continuing to change the environment at all scales, from local to global, inducing dramatic modifications in biological diversity at genetic, species and ecosystem level. These changes not only cause great concerns for ethical and aesthetic reasons, but have also a strong potential to alter ecosystem properties and the goods and services they provide to humanity (Hooper et al. 2005).

On a global and regional scale mountains are often hot spots of biodiversity (Körner 2004). The causes of this high biological diversity are manifold:

1. rapid altitudinal change of climatic conditions over a very short distance and hence a compression of life zones,
2. great variety of microhabitats due to topography-climate interactions, each with its specific set of organisms,
3. habitat isolation and fragmentation leading to local or regional diversification,
4. corridor function.

The European Alps are situated between the temperate Central European and the Mediterranean climate zones, they stretch along a 1,200 km long and 150 to 250 km broad arc, which extends from the continental gradient running from West to East and along a vertical gradient from the colline to the nival belt. These dimensions lead to an impressive variety of different ecosystems. Hence the Alps are a centre of biodiversity for the whole of Europe. They host about 4,500 plant species, more than a third of the flora recorded in Europe west of the

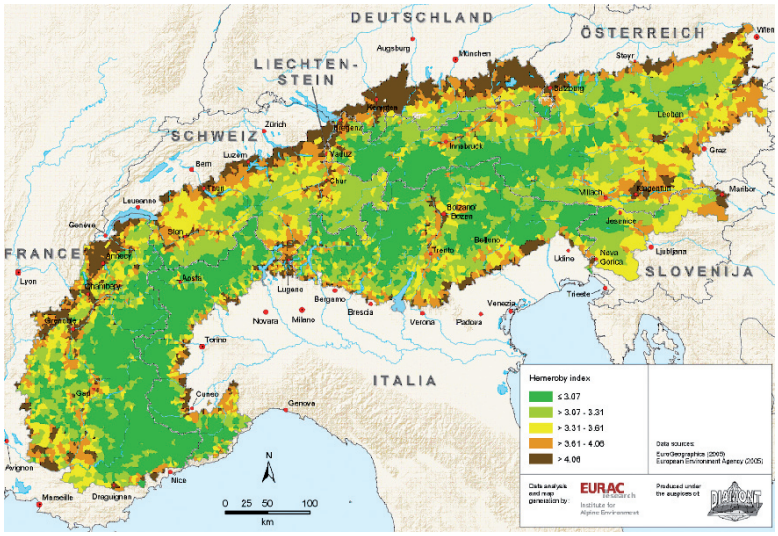


Fig. 1: Hemeroby (Degree of Anthropogenous Influence on the Environment) in the Alps Based on Corine Land Cover 2000 (from Tappeiner et al. 2008). Hemeroby value of 1 indicates regions that are unaffected by anthropogenous influences, whereas a value of 7 was applied to industrial areas and densely built-up settlement areas. Not surprisingly, hemeroby rises from the Central Alps to the Alpine rim. Within the Central Alps, large areas of the Alpine and the nival zones remain natural. On the Alpine rim but also in the larger Alpine valleys, human pressure on land is much higher, since many forms of land use (e.g. urbanisation and intensive agricultural use) are concentrated here, leaving hardly any space for natural areas.

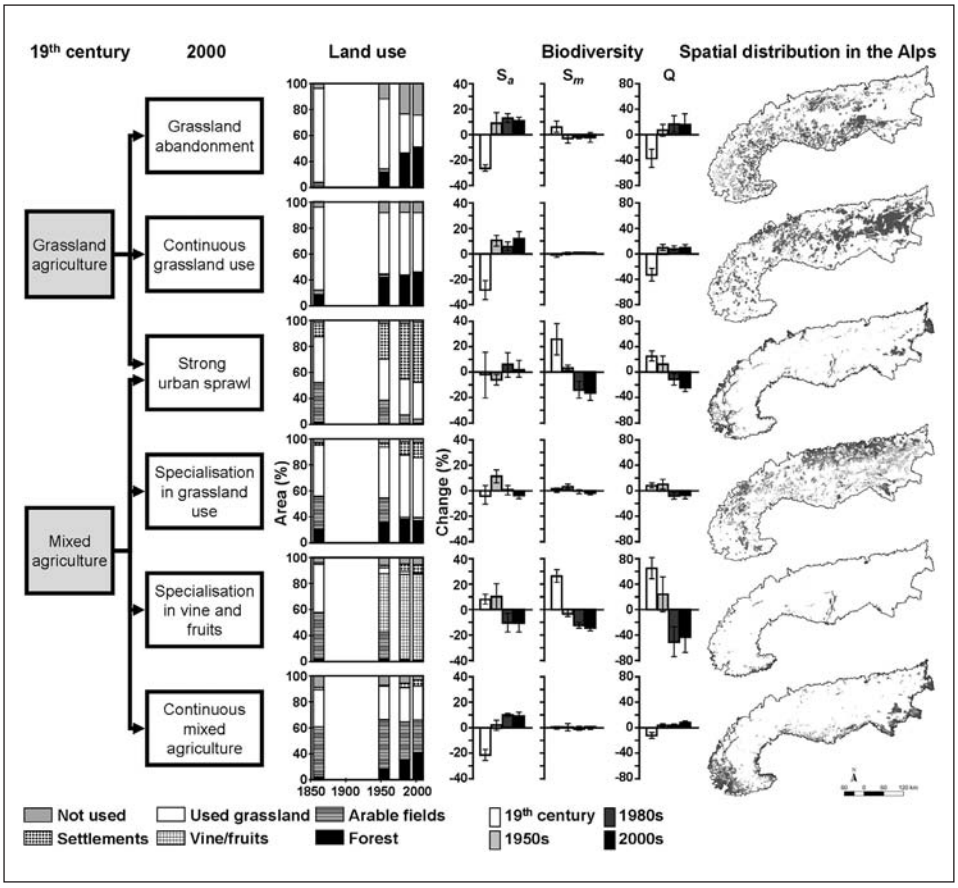


Fig. 2: Main Land-Use Trends Since the 19th Century and Biodiversity Change in the European Alps. For the indicators the relative deviation from the average of all years is shown. Sm = area-weighted mean species richness of vascular plants; Sa = frequency weighted absolute species richness; Q = Rao's quadratic entropy (from Tasser et al. 2010).

Urals, and almost 400 plants that are endemic to the Alps. The fauna of the Alps might reach 30,000 species (Chemini & Rizzolli 2003).

Changing Environments and Biodiversity

The Alps have a long history of human presence and exploitation. A large part of the biological diversity of the Alps at all levels (genetic, species, ecosystems) is therefore linked to artificial or semi-natural environments (Fig. 1) and to traditional land-use. In the last two centuries the Alps were exposed to strong land-use changes, bringing with them changing biodiversity patterns. Due to high natural and socioeconomic heterogeneity, various developments appeared, both within and between different Alpine regions.

In a pan-Alpine study we have

– distinguished the main agricultural land-use/land-cover (LULC) trends that have occurred across the Alps since the 19th century and

– assessed how landscape-scale plant diversity is affected by spatiotemporal LULC patterns (Fig. 2).

Five main agricultural land-use trends could be found. Areas with grassland farming either experienced:

1. grassland abandonment or
2. continuous grassland use.

Areas with mixed agriculture either underwent

1. a specialisation in grassland farming,
2. a specialisation in vine and fruit cultures or
3. the continuous use of arable fields.

Vine and fruit farming had the most negative impact on all aspects of landscape-scale biodiversity. The effects of abandonment usually depended on its temporal progress and the considered diversity aspect. Strong ongoing abandonment, however, tended to reduce diversity. In addition to the agricultural trends, urban sprawl showed a high potential to decrease biodiversity in Alpine valleys. In general, it could be shown that land-use trends have altered biodiversity all over the Alps. Even if the changes do not necessarily mean a decline of all diversity aspects, the typical biodiversity patterns of the Alps are at risk.

In contrast to vegetation, animal species differ widely in their vulnerability to current threats and disturbance, and in their ability to exploit the new opportunities. Communities are more resilient to threats if they have faced similar challenges in the past. Human activity acts as a major extinction filter, and extinction is lowest in the longest settled, most disturbed areas, because losses already occurred in the distant past (Chemini & Rizzoli 2003).

Although the atmospheric changes exert less dramatic and less immediately visible consequences for mountain biodiversity, numerous studies could already highlight measurable biodiversity threats

(e.g. Körner 2004). This affects immigration of taxa from the lowlands to the highlands, shifts in the elevation range of many taxa, invasion of non-native species, as well as shifts in community structure due to greater N-deposition (e.g. acidification of aquatic systems, favouring grasses over forbs in natural Alpine grasslands). Although CO_2-enrichment studies showed no significant effect on biomass production of Alpine grasslands or dwarf shrubs, species responded differently and this may turn out in long-term biodiversity changes. Furthermore, the increase in CO_2 could interfere with the relationships between plants and herbivores, since an increase in the C/N ratio in plant tissues results in a decrease of the nutritional value of plants.

Functional Implications of Mountain Biodiversity

Hooper et al. (2005) showed in their comprehensive review that ecosystem properties depend greatly on biodiversity in terms of functional characteristics of organisms and their distribution and abundance over space and time. Functional characteristics operate in a variety of contexts, including effects of keystone and dominant species, ecological engineers and interactions among species, like competition, facilitation, mutualism, disease and predation. Alteration of biodiversity does not always show an immediate effect on ecosystem properties, because ecosystems may have multiple species carrying out similar functional roles, some species may contribute relatively little to ecosystem properties or properties are primarily controlled by abiotic environmental conditions. The last effect can often be observed in mountain environments. Furthermore, if one considers longer time periods or larger areas, more species are needed to ensure a stable supply of ecosystem goods and services as spatial and temporal variability increases.

Although these general relationships are well known in ecology, the actual evidence for such functions of mountain diversity is scarce. Nevertheless, it is evident that an insurance component of biodiversity comes into play in mountains (e.g. Körner 2004). The insurance hypothesis of biodiversity suggests that the more diversity (e.g. genetic diversity, morpho-types) exists, the less likely extreme events or natural diseases will lead to a decline in ecosystem functioning or to a failure of vegetation to prevent soil erosion. In steep terrain, more than anywhere else, catchment quality is intimately linked to ecosystem integrity. The provision of sustainable and clean water supply is the most important one. Furthermore, healthy mountain ecosystems provide harvestable products, are an increasingly sought-after target for tourism and recreation, and have a rich natural and cultural heritage.

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Biodiversity: an Opportunity Generator for Mountain Lands

Annamaria Giorgi, Massimo Pecci

"*A definition of biodiversity that is altogether simple, comprehensive and fully operational … is unlikely to be found*" (Noss 1990).

The concept of diversity can be defined simply as the number of different items and their relative abundance. At the biological level, diversity regards all the items present in the biosphere, from complete ecosystems to the chemical basis of living organisms. Thus, the term includes different ecosystems, species, genes, and their frequency. At least biological diversity, simply stated, is the diversity of life and its processes. Biologists and ecologists commonly define biodiversity as the variety and variability among living organisms and the ecological complexes in which they occur. Biodiversity is the driving force of life.

Biodiversity can be measured and results function as a marker of richness of environmental systems. Different sites are characterized by different levels of biodiversity; human actions often lead to irreversible losses in terms of diversity of life: that's why commonly there is an inverse proportion between the high presence of human beings and the level of biodiversity, as shown by the poorness of biodiversity of urban systems as compared to that of natural environments. It's well known that biodiversity contributes to many aspects of human well-being, for instance by providing raw materials and contributing to health.

Biodiversity plays an important role in generating a lot of services provided by ecosystems. These services include: supplying foods, freshwater, wood and fibres; controlling, regulating and stabilising climate, hydrogeological structure, disease diffusion barrier, waste recycling, fresh water quality; supporting soil production, photosynthesis, nutrient recycling. There are also cultural implications strictly connected with biodiversity, because high levels of biodiversity contribute to generate beautiful landscapes, characterised by aesthetical and spiritual values, supplying leisure and wellness to human beings. From that point of view, biodiversity has to be considered as an essential element for mountain development: in fact, it is a determinant factor of the specificity and uniqueness of what mountain systems can produce and express. The tastes of mountain traditional foods are strictly depending on the biodiversity of the place where foods are produced — cheese, for example, whose organoleptic properties are influenced by the botanical characteristic of the grazing lands together with meat and honey. It's clear that sustainable development for mountain areas is strictly connected with the development of activities based on the specificity and uniqueness of mountain richness and productions. Thus, the preservation of biodiversity is a priority for the development of mountain territories and an opportunity for the lands in which mountains are located, because they can relay on all the goods deriving from them and that have a concrete value that society has to recognise and appreciate.

Furthermore in the case of the high-elevation environment in the Alpine (and also Apennine) mountain ranges generally above 2000–2500 m a.s.l., it is necessarily important to take into account the fast evolution and disappearance of glacial and periglacial environments, processes and landforms: we are dealing with a particular kind of diversity, strictly depending on the cryosphere and, consequently, definable "cryodiversity" (sensu Pecci 2009; Pecci 2010).

SERVICES	BIODIVERSITY	CRYODIVERSITY
Supply	Food, freshwater, wood and fibres	Melting water and nutrient for life-support
Control and regulating	Climate stabilising, hydrogeological structure, disease diffusion barrier, waste recycling, fresh water quality	Influence on climate system, water storing and regulating
Cultural implications	Aesthetical and spiritual values, leisure	Aesthetical and spiritual values, leisure, tourism, identity
Support	Soil production, photosynthesis, nutrient recycling	Storing of water resource

Tab. 1: Comparison between Services Provided by Biodiversity and Cryodiversity.

In fact, an increasing awareness about the crucial importance of cryodiversity (Rosenfeld 2005) is widely perceived, namely due to the effect of global warming. According to the role and the definition of biodiversity, it is possible also for cryodiversity to self-identify where there is the presence of water in a solid state, together with correlating processes that could be even ecosystemic.

In this way, forcing an analogy between cryosphere and biosphere, the importance of cryodiversity and, at the same time, of biodiversity resides in the services provided by both ecosystems, compared and summarised in table 1.

A superficial reading of the complexity of the processes regulating the Earth-life system might suggest that only the polar ice caps perform a fundamental role for mankind and life survival, certainly not the little glaciers, ice fields and glacierèts, where life is present particularly in the primary forms, as in the case of yeasts (Branda et al. 2010).

The progressive melting and the subsequent shrinking of snow, ice and permafrost environments, processes and landforms, or in other terms the complete loss of cryodiversity, is able to produce unexpected effects directly linked to the definitive disappearing of whole ecosystems that originally survived only in the presence of snow- and ice-melting environments.

In such a framework, the little shrinking glaciers, glacierèts and snowfields represent feasible elements of high cryo-environmental interest, because of their high sensitivity and reactivity to global changes and not so much for water supply to local mountain communities.

With a particular focus on the Mediterranean cryosphere (Southern Alps and Apennine included), its recent and fast shrinking and degradation highlight a particular evolution on the top of the middle latitude high mountain area, characterised by an increasing complexity in terms of spatial and temporal distribution (reduction, fragmentation, subdivision, degradation and, finally, disappearing) processes and scenarios, coupled to a loss of cryodiversity.

Fig. 1: An Alpine landscape (Ghiacciaio dei Forni, Monte Cevedale Group, Southern Alps) that explains very well the relationship between the recent past (in the reflected white image), the present (in the ice-free slopes) and, in the middle, the driving human presence and action.

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Centres of Biodiversity in the Alps and Comparisons with the City of Munich

Josef H. Reichholf

The Alps form a centre in Europe and also a borderline. They are the source of most of the large rivers of Western and Central Europe and they separate the northern and western part of the continent from the Mediterranean region. Due to this geographical position elements of the southern flora and fauna are often found within close range of their northern, western and eastern counterparts, but often remain separated to a significant degree. Where different biotas meet each other, centres of biodiversity emerge, not only in an additive way, but also by rapid evolution of new forms (subspecies and species). This evolutionary effect is enhanced by two factors essential to species formation, i.e. small scale geographical separation (allopatric and/or close parapatric pattern of distribution) due to structural diversity, and small populations due to restricted range sizes. The smaller a population which is able to survive on its numbers, the faster the evolutionary differentiation processes can become and vice versa. Very large populations with unrestricted gene flow persist in long term inertia.

Mountains form barriers in various ways. They separate climatic regions and create local climates with dry and hot sunny sites as well as wet and cold shaded sides which change additionally depending on elevation and exposition to air currents. Mountains also are often rich sources of minerals and water from precipitation. These physical effects of differences and separation are further enhanced if the mountain chains are fractured and interrupted. Each mountain thereby can form something

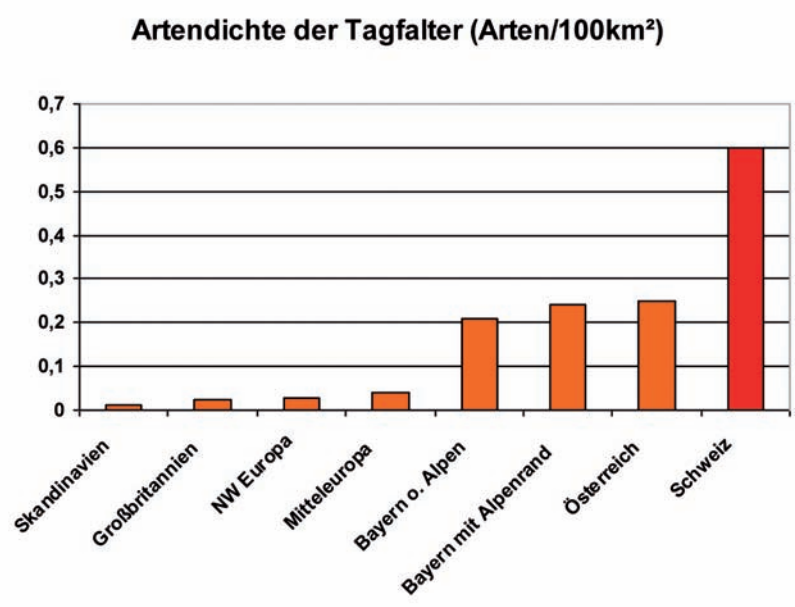

Fig. 1: Species Density of Butterflies (Numbers per 100 km²) from Scandinavia and Great Britain Across North-Western and Central Europe to Bavaria Without and With the Alpine Part and Austria to Switzerland.

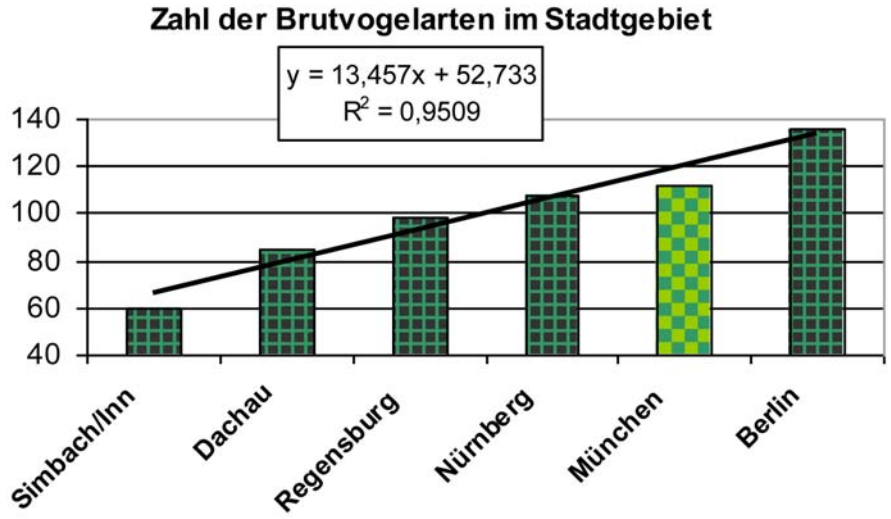

Fig. 2: Number of Breeding Bird Species Within Cities.
The number increases with the size of a city: Simbach/Inn – 10,000 inhabitants, Regensburg 110,000, Munich 1,300,000 and Berlin 3,500,000. The city of Berlin contains two thirds of all breeding bird species of Germany in an area of only 880 km².

quite similar to an island and, together with others, an archipelago of a multitude of islands. These are well-known and thoroughly studied facts and concepts of biogeography, condensed in a set of "rules" like the "species-area-relationship", "island species richness" and "richness of contact zones". As an example, compared to Northern and Central Europe species density of butterflies in Switzerland (Fig. 1) surpasses markedly the general continental relation between area size and species number per unit of area. The Alps in general form a region of rich species diversity, but several sub-centres emerge on a smaller scale in the southwest, the south and the east. The reason is obvious: Where the Western Mediterranean biota meets the "Atlantic" fauna and flora in an area with the highest elevations, the region accordingly should be richest in species. Where the Eastern, especially the "Pannonian", biota comes into contact with the Northern Alpine and the Balkan counterparts as well as with Eastern Mediterranean elements, species richness should be correspondingly high and varied. The same applies to the Northern Italian border area of the Alps where Mediterranean and Central/Northern European elements come into contact with each other. The pattern was not fixed permanently, however, but developed in the thousands of years following the end of the last glaciations. The process is still going on with species coming from the East and others from the West or from the South. The Alps, therefore, have always been an area of passage too – for wild species and humans. Human passage acted as a carrier of species since earliest times. Biogeography in the Alps inevitably has a human component and not only "pure" biological causes.

This human component increased considerably in intensity and relevance in modern times, though we should not underrate former influences since pre-Roman times. In the bundle of human influences, however, one factor became outstanding in importance, and that is the separation and isolation of mountains and ranges by constructions for transport and traffic itself. In former times, earthbound species could move quite freely along and across the streets which, in fact, favoured migration and crossing. Additionally to the separation effect, the remaining areas of habitats in a semi-natural or natural state became smaller and smaller. Again, the basic concepts of biogeography provide the tools for reasoning that the smaller an island/habitat is, the less species can survive therein, and the more effectively it is isolated, the less likely is a natural re-colonization. In nature conservation this problem is generally known and in a region like the Alps it is much more difficult to maintain or create anew such structures which act as connection lines and walkways for species from habitat to habitat.

It is this aspect which makes the seemingly strange connection of the Alps with cities like Munich meaningful. Cities bear quite a number of very important similarities with a complex of mountains like the Alps. The buildings to some degree "resemble" mountains and large rocks, their complexes form "islands" and "archipelagos" of hard and steeply rising structures. They are separated by "valleys" or "ravines" of streets with a more or less dense flow of dangerous vehicles. Components of forests and open grassland exist in all sizes up to real forests within the boundaries of cities. Often there are also ponds and lakes, rivers and creeks, and the water courses flow through the settled areas in a comparable way like the rivers pass through the mountain ranges. With the exception of glaciers, all types of habitats typical for mountains are found in big cities. They even provide several advantages for birds and mammals which are persecuted outside by hunters or farmers or which need safe places for nesting, caves or old, hollow trees. They may live in

the towns without any significant persecution and they can find their spaces because the area of a city is much less subjected to agricultural production than the open landscape. Even in the forests on the mountain slopes the old and decaying trees are in short supply and not tolerated by forestry. Steep mountain walls are used extensively for climbing. Game animals are kept alert and shy by hunting and harassment. Finally, big cities are considerably warmer than their surroundings, which can be important for birds and mammals when coping with severe frosts.

Comparisons of very different habitats may be revealing, but to what significance? This is the question with respect to the Alps and a number of problems associated therewith. Some tentative answers can be given.

1. Very dense human populations and activities do not necessarily diminish biodiversity: In fact, diversity increases with the size of cities (Fig. 2).
2. Cities offer the opportunity to look for minimal critical sizes necessary for the survival of local and highly isolated populations; these are facts which may be very important for conservation schemes in regions like the Alps.
3. Despite the general impression that "natural" habitats in cities are abnormally separated and isolated from each other, the results of research show a surprisingly effective exchange (dispersal) for many taxa.
4. In lowland cities like Munich quite a number of species came from higher and mountainous areas and adapted very successfully to the new and warmer living conditions. We should investigate this fact more deeply, especially with respect to the expected reactions and assumed intolerances of mountain dwelling species to climate warming.
5. The biodiversity of cities, which is generally well above the average compared to areas of similar size, points distinctively to the main causes for species decline and loss of biodiversity: Modern super-productive agriculture and its so called side effects (overdosing the soils and waters with growth promoting plant nutrients) are to be blamed in the first place, with forestry based on monocultures of coniferous trees in the second position, closely followed by hunting, which keeps many animals extremely shy and unnaturally nocturnal.

For maintaining biodiversity in an area under such enormous economic pressures like the Alps, we should open our mind for unconventional approaches. Apparently strange comparisons can be helpful. The chances to preserve most, if not all, of the high biodiversity in the Alps together with the diversity of human lifestyles are not so bad. The increase of natural diversity and life quality in towns and cities in our times is an encouraging message.

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Urban Lifestyles and Resource Use in the Alps: Between Heidiland Dreams and Wilderness

Mario F. Broggi

This paper focuses on the central question: What more can be done for wide-scale protection of the cultural landscape and what are the appropriate responses to the wilderness scenario? This summary only permits the question to be answered in outline and a few conclusions to be drawn.

The Alpine Myth

The Alpine myth may have been useful for Swiss trans-Alpine transport policy but it can also encourage people to clutch at an image that no longer matches the reality and politicians to make inappropriate decisions in the allocation of funds. Attempted structural entrenchment leads to distorted views and is anathema to sustainable land use in the Alps. The rural element is at risk of becoming a prop and the harmony of the countryside a mere fiction. Wherever the traditional cultural landscape is no longer part of the production processes, the provision of public money for financial support must be viewed with a critical eye.

What More can be Done for Wide-scale Protection of the Cultural Landscape?

The question is considered here with reference to mountain agriculture, but the findings also apply mutatis mutandis to other land uses in mountain areas. Extensive funding is available for farm-based agriculture, but in the EU it is said that 20 % of the farmers now receive 85 % of the subsidies, with a resulting shift towards industrial forms of agriculture. General direct payments must therefore be increasingly transformed into payments based on performance with clearly defined goals. The socio-cultural contributions of mountain agriculture are in general generated by a large sector of the population.

Mountain agriculture offers the following products and services:

– maintenance of production as a contribution to de-centralised settlement
– preservation of the traditional cultural landscape
– preservation of the fertility of the soil with sustainable methods of farming
– maintenance of family businesses in an advanced manner
– preservation of traditional animal breeds and plant species.

Mountain agriculture has the following potential:

– graduated use and intensity of production according to location, with "low-energy" agriculture with open grassland maintained by grazing and meat production probably assuming a bigger role in the future
– product diversification
– declared production methods (product labelling and certificates of origin)
– regional marketing
– produce processing and a range of income mixes.

For the individual small regions, a regional land use mission statement needs to be developed as a kind of social contract. A coherent chain of production with corresponding value-added is a further precondition.

Arguments for Wilderness

The recognition of relatively undisturbed Alpine ecosystems on as large a scale as possible constitutes a significant contribution to nature protection in Europe and hence to the preservation of the natural heritage in the Alps. For the national economy,

Fig. 1: Wilderness in the Italian National Park of Val Grande ...

Fig. 2: ... and the Rural Idyll in the Swiss Toggenburg.
Both scenarios must be the product of social discourse at the local level with suitable instruments to be provided.

wilderness areas are a logical alternative to the traditional cultural landscape where a realistic cost-benefit analysis is applied. In some cases this also includes the decision to forego tourism development projects in the international bed night race.

It is difficult, however, to prioritise the "do nothing" approach because the wilderness debate is viewed with suspicion by the people who live in the mountains (Opitz 1994). They see it as a threat to their fundamental needs in terms of employment, income and security. As long as this mistrust persists, wilderness areas can only be a by-product of economic constraints. Nor has anyone developed suitable strategies for environmental and social compatibility in the management of large areas. So far, wilderness has rarely been considered of intrinsic value. And yet the core areas of National Parks would be suitable candidates, with payments to be made for the land made available as a service of public interest. Equally, it might be possible to integrate instruments for achieving the goals of climate change policy, all the more so as the carbon-storage role of the forests seems to be indispensable for achieving national climate goals (Walz & Stöckli 2009). It would be only logical to make use of the National Park core zones as temporary carbon sinks, which could be acquired by the public authorities as a public service or put on the voluntary market. At all events, the value of the core zones has not so far been properly exploited nor combined with other objectives to generate synergies. "The process of becoming less should not be reduced to mere subtraction; one also has to find the 'other' that lies within the less" (Weber & Höferl 2009).

Some Conclusions

1. It is not a question of either/or; my plea is for the right to both the rural idyll and the wilderness. Allocation to the one or the other scenario must be the product of social discourse at the local level, with suitable instruments to be provided.

2. The Alpine cultural landscape, with all its small-scale diversity, is an asset in itself. In every case it also reflects a long history of anthropological use. The value of the cultural landscape, where it is still deserving of the term, has not yet received adequate recognition on the marketplace of competing resource use interests.

3. Processes of both growth and contraction must be recognised as phenomena; so far it seems we have only had eyes for growth. Potential spaces for free natural development are to be found everywhere, on the urban fringe as well as in the Alps. The basic right to self-determination that we take for granted for human beings must apply to nature, too. Nature goes the way of variation and unpredictability. Variation offers space for innovation, which guarantees the unforeseeable, so that a maximum number of options remain open for anticipating the unthinkable.

4. Allowing wilderness presupposes mental acceptance on the part of the population. Such thinking does not yet seem to command a majority; it seems to be more acceptable in the urban centres than in the country. A — hopefully — growing "Green Metropolis" will have a positive influence on environmental policy (nature protection as a flourishing idea where in short supply, i.e. in the cities). The rural space must be recognised as a complementary space and due expression given to its appreciation.

5. In Central Europe we need nature and history in co-existence, and careful management of the remains of the cultural product in the mountain environment, which dates back over the millennia. It is important to appreciate and preserve the extant product and to combine it with aspects of change. To that extent areas permitted to revert to wilderness are also part of the cultural landscape.

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3

The EU Biodiversity and Nature Policy — Opportunities for the Alps

Stefan Leiner

The EU Biodiversity and Nature Policy started more than 30 years ago, when the 1979 Birds Directive[1] was adopted, followed by the Habitats Directive in 1992[2]. This same year saw the establishment of the Convention on Biological Diversity to which the EU and all its 27 member states are parties. In 2001, the EU target to halt biodiversity loss, and in 2002, the global target to significantly reduce the rate of biodiversity loss were agreed upon. The EU developed a comprehensive Biodiversity Strategy[3] aimed at supporting achievement of both these targets. Despite some major progress achieved, such as the establishment of the EU NATURA 2000 network which consists of sites designated under both the Birds and Habitats Directives, or the gradual integration of environment and biodiversity into the Common Agricultural, Cohesion and Development Cooperation policies, both targets have not been achieved. The first "health check" assessing the conservation status of Species and Habitats protected under the Habitats Directive published in 2009, revealed that only 17 % of both species and habitats assessments have a favourable conservation status[4].

To start off the International Year of Biodiversity, the Commission presented to the EU Council and Parliament a new communication on "Options for an EU vision and target for biodiversity beyond 2010"[5] . On 15 March 2010, the Environment Council agreed on a new vision and target for biodiversity, reflecting the most ambitious option (option 4) set out in the Commission communication[6]. The 2020 EU biodiversity target requires "halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss". The Spring European Council (i.e. all the EU Heads of State) subsequently endorsed the 2050 vision and 2020 target on 26 March[7], noting that "there is an urgent need to reverse continuing trends of biodiversity loss and ecosystem degradation". This new target is hence now amongst the top policy priorities of the EU.

To deliver on this biodiversity target a new EU strategy will be developed as soon as possible after the 10th Conference of the Parties to the Con-

1 Directive 2009/147/EC on the conservation of wild birds (this is the codified version of Directive 79/409/EEC as amended) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025:EN:PDF

2 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

3 COM(2006)0216 final http://ec.europa.eu/environment/nature/biodiversity/comm2006/index_en.htm

4 Report from the Commission to the Council and the European Parliament Composite – Report on the Conservation Status of Habitat Types and Species as required under Article 17 of the Habitats Directive COM/2009/0358 final http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52009DC0358:EN:NOT

5 COM(2010)4 final 19.01.2010 http://ec.europa.eu/environment/nature/biodiversity/policy/pdf/communication_2010_0004.pdf

6 http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/envir/113373.pdf

7 http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/113591.pdf

vention on Biological Diversity in October 2010. The Council has provided some guidance as to what this strategy should include. It has called on the Commission, among other issues, to:
– set a limited number of ambitious, realistic, achievable and measurable sub-targets for different ecosystems, driving forces, pressures and responses;
– ensure their integration into relevant internal and external EU sectoral policies;
– promote the use of best practices and the use of flexible approaches in line with existing legislation;
– set a clear baseline outlining the criteria against which achievements are to be assessed;
– strengthen the evaluation tools and indicators;
– ensure coherence with the results of the CBD and international negotiations on a global target and framework for tackling biodiversity loss in setting EU action;
– identify the necessary, feasible and cost-effective measures and actions for the sub-targets;
– enhance implementation of the EU Nature legislation.

As groundwork for such strategy, the Commission is preparing the 2010 progress report for the EU Biodiversity Action Plan adopted in 2006. A new EU biodiversity baseline was developed by the European Environment Agency and presented on 1st of June 2010.

One of the most important instruments to achieve the new biodiversity target will be a full implementation of the EU Birds and Habitats Directives (the EU nature legislation), especially the NATURA 2000 network of protected areas. This is critical to the success of environment policy in the EU and will form a central pillar of the post 2010 policy framework. NATURA 2000 is comprised of more than 26,000 sites in all member states covering nearly 20 % of the EU territory. NATURA 2000 is also a most highly effective tool for climate change mitigation and adaptation. The key challenge for the coming years is therefore full implementation of the nature legislation, achieving effective protection and sustainable management of the NATURA 2000 network. To that end, the Commission will be working with the member states so that they put in place effective management systems for the NATURA 2000 sites. Another priority will be to secure adequate EU financial opportunities and incentives under the next financial perspective from 2013 to support the adequate management of NATURA 2000 and hence Europe's most valuable species and habitats. The Commission will develop a communication on this topic towards mid 2011. There is also a need to strengthen communication and public awareness measures, so that there will be a much better appreciation by EU citizens of the importance of EU nature legislation in safeguarding Europe's natural heritage, and of the critical role of NATURA 2000 in reconciling nature protection with economic development and providing "space for nature" in the face of climate change.

More widely on biodiversity, the EU Commission will continue working on the development of the green infrastructure concept and on a strategy on how to combat invasive species. Additionally, it will step up efforts to better integrate biodiversity concerns into other policies, especially in view of delivering on the EU 2020 Strategy regarding the goals of achieving sustainable growth and resource efficiency and combating climate change. In the run up to the reforms of the Common Agriculture Policy, Common Fisheries Policy and the Cohesion Policy, the Commission will identify how these policies can fully contribute to the achievement of the 2020 target and will propose the necessary changes. The UNEP-led study on "The Economics of Ecosystems and Biodiversity (TEEB)", launched by the German Federal Ministry for the Environment and the European Commission, with the support of several other partners will present its final results at COP10 in Nagoya, Japan, and analyse the global economic benefit of biological diversity, the costs of the loss of biodiversity and the failure to take protective measures versus the costs of effective conservation.

The Alps will be a clear case in point in meeting the new biodiversity target. Particularly vulnerable from climate change and particularly rich in – and dependent upon – biodiversity, they are largely covered by NATURA 2000 sites. Demands on developing infrastructures (e.g. for tourism and renewable energy) are growing. Article 6 of the EU Habitats Directive is an essential tool in ensuring that such developments go hand in hand with the need to preserve our natural heritage. The EU biodiversity and nature policy developments and measures described above will help in ensuring better valuation of the ecosystem goods and services provided by Alpine nature and biodiversity and their integration into those national, regional and local policies affecting the biodiversity which underpins those services.

Workshops

3/1 Monitoring Biodiversity

Presentation: Thomas Spiegelberger, Eva-Maria Koch
Input: Christian Körner, Patrick S. Bourgeron

Worldwide biodiversity is decreasing due to climate and land-use changes. Ecosystems at high altitudes such as subalpine and alpine habitats are particularly threatened.

Monitoring is a useful tool to observe biodiversity and its development in space and time. In many cases monitoring programmes are restricted to local scales, being well-adapted for a certain region and the results being interpreted thoroughly for that specific site. However, climate change is a global challenge and therefore should be observed at a range of scales from local to global. This suggests a need to consolidate different methods and data sets into comparable results, to improve current techniques and to develop future monitoring systems.

There are many observational and experimental (sub)-alpine sites around the world, which are often already organised in networks. Worldwide acting networks increase the efficiency and the comparability of each participating site as it is the case in the Global Observation Research Initiative in Alpine Environments (GLORIA), the Global Mountain Biodiversity Assessment (GMBA) or the Long-term Ecological Research Network (LTER). Several networks are restricted to European regions such as the Alpine Network of Protected Areas (ALPARC) or are focused on a special topic such as the Mountain Invasive Species Network (MIREN). Some of these networks use their own monitoring method, well appropriate for their aims and purposes. However, no common platform exists where different approaches may be compared and further developed for (sub)-alpine-nival monitoring sites in Europe.

Therefore, the main idea of the workshop is to
– discuss the possibility to create a platform of (sub)-alpine-nival sites in Europe,
– envisage its possible organisation,
– consider its integration and collaboration with existing networks such as GLORIA, GMBA, LTER-Europe, ALPARC and others.

The aims and benefits of such a network will be:
– to compare European data sets in order to predict future patterns in European mountain biodiversity,
– to exchange information on practical monitoring and observational methods,
– to enable rapid responses and collaborations on forthcoming research calls about mountain biodiversity.

The workshop will be stimulated by two keynote speakers:

Christian Körner, president of the Global Mountain Biodiversity Assessment (GMBA) will talk about the importance of mountain biodiversity and past, recent and future activities of the GMBA.

Patrick S. Bourgeron, vice-president of LTER-US, Chair of the ILTER Science Committee, a long time manager of the LTER-sites in Boulder, Colorado, will speak about coupled social-ecological systems in high elevation ecosystems. He will further give an overview about the potential benefits of a thematic network of LTER-Sites working in the (sub)-alpine-nival zone.

Mountain Biodiversity – an Experimental Field of Nature (Ch. Körner & E. M. Spehn)

Worldwide c. 12 % of the terrestrial land area are mountains, and c. 3 % of mountain terrain fall into the treeless alpine zone present at all latitudes. Despite considered hostile, these high elevation ecosystems are richer in species of plants and animals than one would expect from the available area (Körner 2004). Globally, the alpine plant species diversity is estimated to represent 4 % of all species, and in Switzerland alone, 20 % of all higher plant species are alpine. The Global Mountain Biodiversity Assessment (GMBA, Basel), a cross-cutting research network of DIVERSITAS, aims at quantifying high elevation organismic diversity, explain its causes (both natural and anthropogenic ones) and

also evidence its significance (function) for ecosystem integrity and functioning in steep terrain. Over the past 10 years, GMBA has synthesized a great deal of knowledge in this field, helped in creating a corporate identity of the concerned research community, and induced new avenues of research (Körner & Spehn 2002, Spehn et al. 2006).

Good evidence had been provided from around the globe that habitat diversity and steep environmental gradients are important causes of the far above average biological richness of mountains. Because a single mountain may host bioclimatic zones otherwise only found over thousands of km of latitudinal distance at low elevation, one can protect more biodiversity per unit of land area in mountains than anywhere else. The steep climatic gradients over short distances are nature's test fields for adaptation, and thus offer ideal possibilities for ecological and evolutionary research (e.g. Zhu et al. 2010). Sustainable land use has been shown to contribute positively to biodiversity (Spehn et al. 2006), stabilizes slopes and thus contributes to erosion control and catchment value (hydroelectric yield; Körner 2004).

Electronic biological archives offer new possibilities to test ecological and evolutionary theory in mountains. They offer completely novel avenues to study mountain biota (Körner et al. 2007, Spehn & Körner 2010).

At the occasion of the 10th anniversary, GMBA will launch a "Mountain Portal" in May 2010, allowing to search data from GBIF (Global Biodiversity Information Facility, Copenhagen) in a mountain specific context, in order to facilitate creative scientific data mining and to advance our understanding of mountain biodiversity globally. Climate change research can greatly profit from such broad data base information. By encouraging and training data holders to become compliant with GBIF (open access, standard formats, metadata documentation), GMBA aims to increase the availability and quality of geo-referenced biodiversity data in mountains provided online, e.g. from the Himalaya and the Caucasus.

Coupled Social-ecological Systems in High-elevation Ecosystems of the Colorado Front Range: Thresholds, Stable States, and Trade-offs Across Ecosystems Services in Response to Climate and Human-induced Changes (P. Bourgeron, H. Humphries, M. Williams & T. Seastedt)

Mountain ecosystems are of particular interest because:

1. they provide important ecosystem services worldwide, including clean water, wood, minerals, livestock forage, and recreation, among others; and

2. they have been identified as particularly sensitive to, and impacted by, the array of human-induced environmental changes that currently challenge society. Forecasting change in high-elevation systems presents significant challenges, as they are likely to display non-linear responses, i.e., they are more easily pushed or "tipped" across critical thresholds.

To investigate the behavior of high-elevation ecosystems in response to change and associated changes in ecosystem services, we have developed observational, experimental, and synthesis initiatives that incorporate empirical and modeling approaches to integrate complex information at the scales of Colorado Front Range coupled natural-human systems.

First, we have developed a feedback loop model for the Colorado Front Range based on the US-Long Term Ecological Research network integrative and iterative conceptual framework for social-ecological research (Collins et al. 2007) that was formulated to explicitly integrate socio-economic and ecological disciplines via a series of broad questions.

Questions for the high elevation ecosystems of the Colorado Front Range are as follows:

1. How do the pulse disturbances of extreme droughts and other large/high intensity disturbances interact with long-term disturbances to influence threshold behaviors and associated state changes in ecosystem structure and function?

2. How are the feedbacks between landscape patterns and community structure and function affected by extreme and long-term changes in climate, fire regimes, and land-use?

3. How do ecological changes affect regional climate and fire regulation, regional water budgets, and the supply of economic and recreational resources to residents?

4. How will management of water systems and fire/insect outbreak, landscapes for products and amenities be adjusted to observed, perceived, and predicted changes?

5. How do perceptions and outcomes affect human behavior?

6. Which combinations of individual and institutional decisions and actions affect the interactions between pulse/press disturbances by influencing landscape configuration, landscape connectivity, fuel loading, and fire regimes?

Second, we investigated the circumstances under which crossing a single threshold between alternative regimes often leads to a "cascading effect" in which multiple thresholds across scales of space, time, and social organization, and across ecological, social, and economic domains may be breached.

Third, the impact of such changes on ecosystem structure and function – including the creation of

new stable states and or novel ecosystems – extends to ecosystem services, their interactions, and trade-offs. We analyzed the interactions between ecosystem services as a result of management for each of several individual ecosystem services. For example, as climate regulation (C storage) has increased as a function of increasingly closed and dense forests, the capacity of landscapes to mitigate the size and intensity of disturbances (such as fires and insect outbreaks) has decreased. Trade-offs in ecosystem services, then, occur across space and time with different degrees of reversibility. But more than that, they often result in multiple ecosystem services being compromised for the benefit of a solitary ecosystem enhancement. We also analyzed the relative change in ecosystem services since European settlement. Recreation value, for example, has increased at the expense of both water availability and natural hazards.

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3/2 Ecological Networks Within and Beyond the Alps

Presentation: Leopold Füreder, Christian Walzer
Input: Anke Hahn, Sylvia Hysek

The Alps are one of the best-known mountain ranges as well as one of the richest in biodiversity; this mountain area, however, is also one of the most densely populated. Although as a mountain range, they are a geographical entity with manifold continua of diversified natural habitats, their ecological connectivity is diminished or fragmented. More and more human activities and constructions are interfering, especially in corridors. Habitat loss and fragmentation, climate change, changes of agricultural practices and pollution count among the most important reasons for biodiversity loss and landscape destruction of the Alps.

The traditional tool used to conserve biodiversity and the natural environment has always been the creation of protected areas; however, it has become increasingly obvious that a majorly important aspect in the conservation process is to connect protected areas to one another to allow the movement of species across the entire Alpine range. Genetic flow across the entire Alpine range is important particularly to support species in adapting to environmental transformations brought about by climate change. To successfully protect biodiversity across the whole Alpine range a coordinated and transnational approach was initiated in the EU Alpine Space project ECONNECT in accordance with the legal framework provided by the Alpine Convention.

ECONNECT strives towards an ecological continuum across the Alps. Therefore, besides securing protected areas as core zones, specific activities focus on linking these areas in order to achieve connectivity between Alpine ecosystems. As animals and plants need to migrate — even more in times of climate change — between habitats, it is essential to maintain, improve and create ecological networks across the entire Alpine region and to surrounding lowlands and mountain ranges. To achieve an ecological continuum across the Alps and beyond, the ECONNECT project considers not just the purely naturalistic aspects (such as, for example, sustainable land use) but also the economic and social dimensions which are just as important in promoting ecological networks.

The Wildlife Perspective (Christian Walzer)

Today wildlife populations are highly fragmented within and over the Alpine range. For many species an ecological and habitat continuum no longer exists. The reasons for these fragmentations are highly diverse. These disruptions in the ecological continuum occur at various scales and range for example from local interruptions of amphibian migrations to major segregations along the Alpine

Fig. 1: The Alps are a geographical entity with manifold continua of diversified natural habitats, however their ecological connectivity is diminished or fragmented (Photo: L. Füreder).

east-west axis. Beyond the more obvious barrier and fragmentation functions of densely populated and heavy trans-Alpine traffic routes, the continuum for wildlife is also significantly disrupted by legal and policy constraints. This results in highly varied wildlife management strategies throughout the Alpine range countries. The situation is further exacerbated by the lacking implementation of common Alpine-wide conservation goals with respect to wildlife. In today's multi-user Alpine landscape, wildlife management and conservation, in many cases, rapidly engender deeply rooted conflict and subsequently rupture of the ecological continuum. Within the ECONNECT project we employ several wildlife species as functional indicators for an Alpine-wide ecological continuum. While use of individual species to assess fragmentation and resistance is generally problematic, we feel strongly that species facilitate continuum-rupture identification and analysis and greatly aid in communicating the highly complex and varied issues.

The Four-Dimensional View of Riverine Landscapes (Leopold Füreder)

Riverine landscapes are complex systems with a specific role in connecting aquatic and terrestrial habitats and consequently functioning themselves as habitats, dispersal and migration routes and corridors, but also barriers for animals and plants. In densely populated areas of the Alps and especially in zones surrounding protected space, riverine landscapes were altered intensively, therefore these important features as functioning habitats and corridors were degraded in various ways. For an adequate consideration of the four dimensions of riverine landscapes a discussion process has to be initiated

Fig. 2: Riverine landscapes have been put under high pressure by human activities. Various constructions cause for landscape fragmentation and decreased connectivity in several dimensions (Photo: L. Füreder).

at political, management and social levels. Besides identifying typical habitats, typical riverine species (brown trout, grayling, bullhead, tamarisk, bird, amphibian and invertebrate species, etc.) and barriers which are effective in the longitudinal, lateral, vertical and temporal dimensions of river systems, important strategies include a) the improvement of data availability and usability across natural and administrational borders, b) the strengthening of the significance of ecological connectivity within the existing frameworks and directives, the analysis of the potential to increase connectivity and decrease barrier effects and fragmentation (indicators, tools) and c) the communication (transfer and exchange of knowledge) among watershed managers, governmental authorities and stakeholders.

Transnational Ecological Networks in Central Europe (Anke Hahn)

TransEcoNet is implemented through the CENTRAL EUROPE Programme and is co-financed by the European Regional Development Fund from January 2009 until April 2012. 16 partners from 6 countries analyse and assess transboundary landscapes with high natural value. Focal points of the analyses are their spatial connectivity beyond borders and the detection of gaps within the existing protected area network. Further project activities are dealing with the history of these landscapes in assessing historical cartographic and non-cartographic documents to reconstruct changes of land use and vegetation. Some GIS-applications have been elaborated to analyse and assess landscape development of selected investigation areas back to the 18th century. The development of biological diversity and ecosystem services of selected landscape patches are being investigated within TransEcoNet. Last but not least, to make people aware of ecological networks and their natural and cultural heritage and to pick up this issue as the essential concept of biodiversity conservation within environmental education, for example in protected areas, is an important pillar of the project.

As a final result, TransEcoNet elaborates strategies and gives recommendations how to develop and manage transnational ecological networks in Central Europe. These recommendations and strategies should be adapted by regional planning authorities and protected area administrations in the long run. The project regions are situated within or between the wide-ranging ecological networks of the Alps, Carpathians and of the Green Belt. Thus, TransEcoNet would like to contribute to and enrich the discussion of the pan-European interlinkage of these ecosystems and to their sustainable spatial development.

AKK – Alpine-Carpathian-Corridor (Sylvia Hysek)

The aim of the Alpine-Carpathian-Corridor project is to safeguard the ecological connectivity between the Alps and the Carpathians. Migration and genetic exchange among wildlife populations, especially for large mammals such as red deer or lynx and with them the whole range of forest species, shall be secured. Situated within the Centrope region, between Vienna, Bratislava and Sopron — a region that ranks among the most dynamic economic areas in Europe — high-ranking roads and residential areas interrupt the traditional migration route for wild animals between the Alps and the Carpathians. In terms of two EU co-funded multisector and cross-border projects between Austria and Slovakia, nature conservation and dedicated spatial planning should define specific measures for cross-border habitat networking and implement them in an exemplary manner, together with partners such as transport, agriculture and forestry, hunting, tourism and the communities involved. The project also wants to trigger a sustainable development which considers the requirements of both man and wildlife.

Wildlife passages are one important measure to mitigate fragmentation effects of motorways. For two motorways (in Austria and in Slovakia) technical documentations for wildlife passages shall be prepared in the framework of the AKK project. ASFINAG in addition is committed to build one green bridge (with own funds) during the project.

Main causes for the fragmentation of the landscape are also intensive agricultural land-use and an increasing demand for build-up land. In the AKK projects these problems will be addressed by specific improvements in sustainable land-use in the course of the Alpine-Carpathian-Corridor and by means of spatial planning (including wildlife-ecological spatial management). To identify the best places for mitigation measures (bottlenecks of the corridor) harmonized ecological data will be prepared in a GIS-corridor-modeling (with top-down approach) for the whole region between the Alps and the Carpathians. This spatial data set can also be used in the future for e.g. environmental impact assessment. To raise the awareness for the need for ecological networks, specific information-tools will be set up and environmental education programmes will be conducted. Because of the multisector and cross-border approach a broad action plan for the Alpine-Carpathian-Corridor shall include all and located measures.

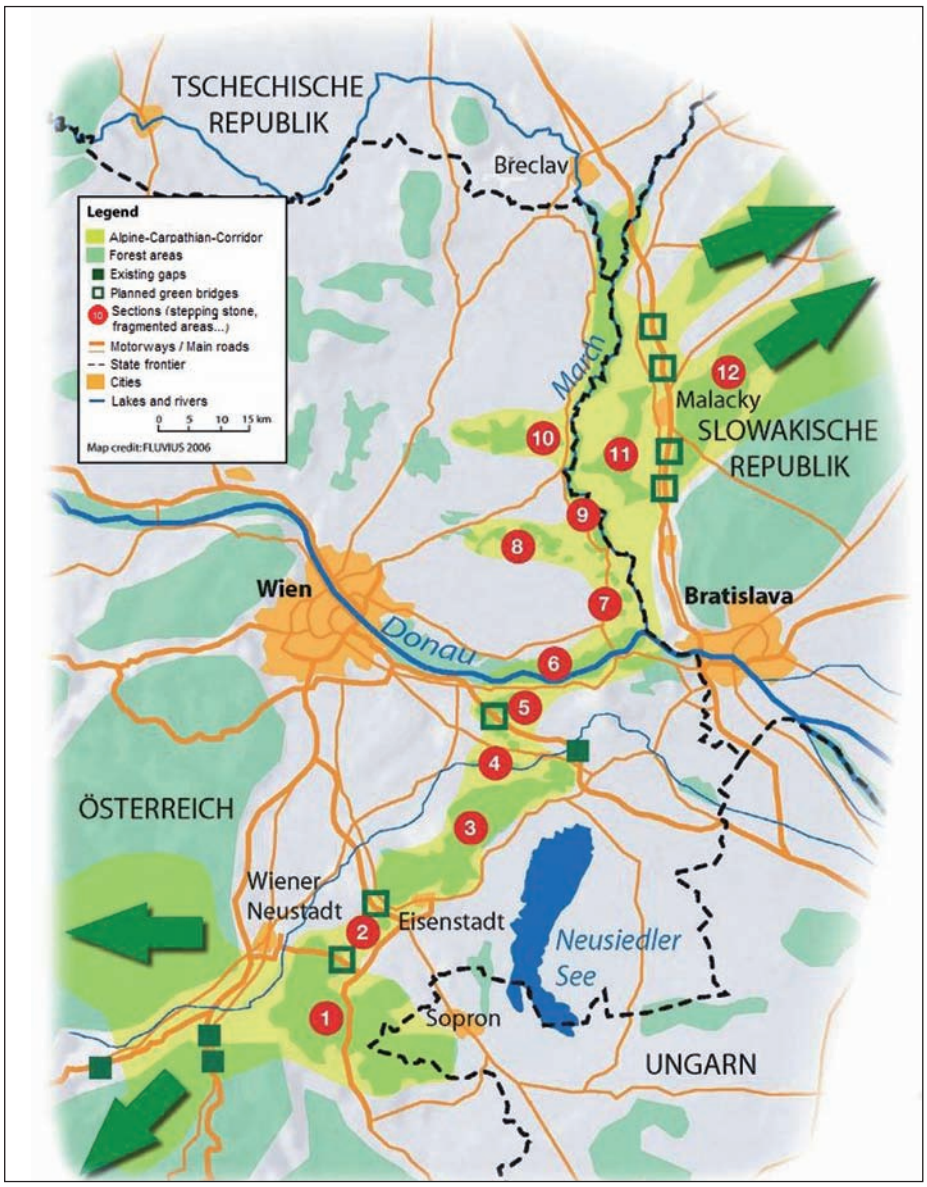

Fig. 3:
The Alpine-Carpathian-Corridor was/ is one of the high-ranking traditional European migratory routes for numerous wild animals. In terms of a multi-sector project between Austria and Slovakia specific measures for cross-border habitat networking will be defined.
(Map: Alpine-Carpathian-Corridor, Sylvia Hysek).

The Pan-European Vision

The establishment of an ecological continuum across the Alps, although achievable only with huge common effort, is only a first step in the realisation of a wider, pan-European network. A common vision for an intact migration and dispersal space for all kinds of organisms is the foundation of a mountain network spanning across Europe from the Pyrenees over the Alps to the Carpathians. A trans-boundary approach towards ecological concerns is necessary along the mountain ranges crossing the continent. Already existing strategies at European level, e.g. NATURA 2000 network, Water Framework Directive, FFH-Directive, Birdlife Directive, have to incorporate the requirements for this pan-European mountain belt. At least 16 European countries with different languages and cultures would have to work on a common topic as complex as nature conservation. Besides the implementation of existing directives, a thematic exchange in order to identify important issues for the enhancement and maintenance of ecological connectivity needs to be addressed (e.g. controlled tourism development, sustainable development and land use, river monitoring, species monitoring, preserving natural habitats, habitat restoration in a larger context). For the successful implementation of such a wide spanning project there is a need for a common strategy and international, multi-level collaborations, including strategic lobbying and activities to increase public awareness for nature conservation. A long-term cooperation between the Pyrenees, the Alps and the Carpathians would be necessary in order to consider the possibility of creating ecological corridors for species migration and genetic exchange, as well as exchange of knowledge among the protected areas of the mountain ranges for the sustainable management of the natural and cultural mountain belt.

3/3 Mountain Sustainability: Transforming Research into Practice

Presentation: Axel Borsdorf
Input: Claudia Drexler, Fides Braun

The European Union spends a lot of money for scientific projects in different programmes (Framework Programme, Interreg, etc.). However, these projects usually end with the delivery of the final reports and the publication of a book or scientific articles. In many cases the homepages are abandoned at the project's finalization, and, even more significantly, there is no time left to transform the results into practice.

This is where mountain.TRIP comes into play: the EU project mountain.TRIP (Mountain Sustainability: Transforming Research into Practice) identifies projects with a high importance for practitioners in European mountain regions, transforms their outputs into applicable results, and elaborates innovative tools for communication, exchange and dissemination. To do so, the support of practitioners is necessary. Only with their help can the project team find out about the real needs of those working in the mountain regions of Europe.

The project outputs mountain.TRIP is working with can be summarized under the heading of instruments for sustainable mountain development. A closer look reveals a broad range of topics: from tools and models for hazard mitigation and assessments of ecosystems under climate change to scenarios for mountain agriculture or methods for local participation.

The inputs will be given by mountain.TRIP collaborators. Axel Borsdorf, IGF, will present the objectives and structure of the project, Claudia Drexler, MRI, will give an overview of the topics and tools for practitioners which mountain.TRIP has found in 50 research projects, and Fides Braun, IGF, introduces the mountain.TRIP portal, the central information and exchange platform for practitioners and scientists, based on web 2.0 communication technology.

The workshop primarily invites practitioners of European mountain regions: please join us to tell us about your interests and needs regarding research results. What are the topics you are interested in? What is missing? Through which communication channels are you learning about research results — and what form should information about research results ideally have?

Reference:
http://www.mountaintrip.eu

3/4 Future of Mountain Agriculture: Research Needs

Presentation: Urs Gantner
Input: Andrej Udovč, Markus Schermer

The goal of the workshop is to discuss the research needs for mountain agriculture and the possibilities to approach these needs within a European perspective. The following questions shall be discussed:

– Which are the upcoming challenges and future "framework conditions" for mountain agriculture?

– What will / could be the future roles of agriculture in mountain regions?

– What are the main issues to be tackled by science (research and development) for strengthening mountain agriculture?

– How can widespread European research institutions cooperate to bring forward these issues? What could be the role of SCAR (Scientific Committee for Agricultural Research in Europe)?

– Who is willing to get involved?

Introduction (Urs Gantner)

Future of Mountain Agriculture – Research Needs

The presenter will focus on challenges for mountain agriculture, such as high economic pressure (opening up of markets), adaptation of structures, ecologically sensitive areas, growing forests, climate change. He will present a few examples of EU-research projects and international collaborations. He will discuss the research needs for a successful mountain agriculture and he will close with an outlook discussing a European research approach.

Inputs Concerning the Workshop Questions (Andrej Udovč & Markus Schermer)

The Upcoming Challenges and Future "Framework Conditions" for Mountain Agriculture

Andrej Udovč: Looking at the different calls and agendas for conferences, symposia, workshops or meetings where the participants are to discuss the developments, expectations and trends in mountain agriculture, it is becoming evident that global topics such as climate change, biodiversity loss, land use changes, multi-functionality or social innovations are of increasing importance. Mountain agriculture will very likely have to deal with the listed problems most of the time also in the future. Thus, the main challenge will definitely be the question of how to optimally combine all or most of the listed topics in an holistic approach to a solution which is by origin an economic activity based on private initiative. Of course society has already acknowledged the problem in question, but as we can see from the experiences with common agricultural policy, the effects of this policy are not as successful as hoped. It works pretty well for plains but not for mountain regions.

Markus Schermer: The basic challenge will remain the same as until now: adaptation to changing conditions. Climate change will have effects in the medium and long term. It will force agriculture to take on board new tasks, esp. in securing the living conditions of local populations and tourism. On the other hand there might be new options for mountain agriculture with new crops (e.g. horticulture) and new possibilities of income combinations.

Socio-economic changes will already affect agriculture in the short and medium term. Demographic changes with growing urbanization will force agriculture to take up new tasks in maintaining rural infrastructure (physical and social) in peripheral areas. Furthermore it will be necessary to create new rural-urban linkages in food production as well as to provide leisure-time possibilities. Urban growth will lead to an increased scramble for land in the valley bottoms, which might lead to intensification processes there, while at the same time mountain pastures and meadows will suffer from intensification and abandonment.

In the short term the changes in the CAP with the abandonment of the milk quota system will be the most dramatic challenge. As at the same time with the current fiscal constraints in most EU-countries a decline of payments allocated to rural development must be anticipated, the main challenge will be to foster local and regional relationships between agriculture and other societal and economic stakeholders. Regional support for mountain farming, in form of regional food webs and as transfer payments for the production of public goods, will most probably gain importance for the survival of mountain farming.

What Will / Could Be the Future Roles of Agriculture in Mountain Regions?

Andrej Udovč: Agriculture in mountain regions of the Alps will continue to be important in the areas of maintaining the existing landscapes and producing quality to high-quality agricultural products for local consumption (within the Alps and belonging areas). The Alps will not feed the world. With maintaining the existing landscape, I have not only in mind the mowing of Alpine meadows and grazing of Alpine pastures, but providing the whole rainbow of environmental, economic and social functions for the Alpine area. And here we are again at the question of how to do it? In my opinion the only sustainable way is a combination of reasonably targeted agricultural policy for the area and introduction of appropriate social and technological innovations, all combined with the existing stubbornness and enthusiasm of the people farming there.

Markus Schermer: The role of mountain agriculture has always been multifunctional and this will continue in the future. Besides the production of food, the provision of public goods and other ecosystem services has always been more important in mountain areas than elsewhere. As indicated above, the importance of mountain farming to secure living spaces and to provide leisure-time possibilities might increase. This will require increased cooperation within the farming community, but also between farmers and other societal groups.

What Are the Main Issues to Be Tackled by Science (Research and Development) for Strengthening Mountain Agriculture?

Andrej Udovč: What should science do in this context? First of all we have to keep in mind that science will also in the future do what it has done since its beginnings — seek new universal knowledge and try to find answers to questions. And secondly, the contribution of science is to strengthen mountain agriculture. Speaking from the experience in my own country, science seeks too often to answer universal questions, while at the same time overlooking the local questions where the existing expert knowledge isn't enough. Thus, there should be an effective system where the transfer of scientific knowledge will result in innovations and answers to development challenges.

Markus Schermer: The challenge for natural science will be, besides research in adapted technological innovation, to model the effects of climate change on a regional local basis and to uncover mechanisms of landscape change and their trends.

Social science will have to research options for territorial development, regional food networks, possibilities of valorisation of mountain products and services etc. Special attention should be given to the role of collective social innovation and collective learning processes.

While comparative studies including non-Alpine and non-EU mountain regions are certainly of high value, the comparative approach of studying conditions in mountain areas and non-mountain areas can give better perspectives on the specific situation of mountain agriculture.

How Can Widespread European Research Institutions Cooperate to Bring Forward these Issues?

Andrej Udovč: The fragmentation of the European research space and research institutions is a well-known fact and has been dealt with now for several years with different policies and measures even at the EU level. How successful this approach really is can be judged by each scientist who participated in them by his own experience. But the fact is that the common interests and common questions do bring people together, so the exchange of information is one of the key answers. And as today the exchange of information itself is not a problem any more, our task is to think about how to facilitate the process of the information exchange. And here the role of different international institutions and bodies is becoming invaluable.

Markus Schermer: There are a number of international and interdisciplinary research programmes which can be used for collaborative projects on mountain farming (like EU-framework or INTERREG programmes). Networking and a better exchange of research results about national and international research are still of crucial importance. The development of a joint research agenda for mountain agriculture would be a giant step forward. One possibility to achieve that could be through a specific COST Action.