

Ecological Continuum Initiative

CATALOGUE OF POSSIBLE MEASURES TO IMPROVE ECOLOGICAL CONNECTIVITY IN THE ALPS



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6 October 2011



This publication reproduces the online „Measure Catalogue“ on www.alpine-ecological-network.org/measurecatalogue. As the online version is continuously updated and revised, the publication is also updated from time to time.

The Ecological Continuum Initiative: restoring the web of life

The Ecological Continuum Initiative aims to maintain or restore ecological connectivity in the Alps by facilitating and catalyzing relevant projects and initiatives. The Initiative partners (Alpine Network of Protected Areas ALPARC, International Commission for the Protection of the Alps CIPRA and International Scientific Committee Alpine Research ISCAR) provide an interface between policy, practise and science to allow the exchange and pooling of knowledge, lessons learned and expertise. The partners cooperate with the European Alpine Programme of WWF.

The work of the Ecological Continuum Initiative is supported by the Swiss MAVA Foundation for Nature. The measures catalogue has also received financial support from the German Federal Agency for Nature Conservation with funds provided by the Federal Ministry of the Environment, Nature Protection and Nuclear Safety, and the French Ministry of Ecology, Energy, Sustainable Development and the Sea.

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I INTRODUCTION

In the long run, protected areas alone cannot preserve biodiversity in the Alps. What is really needed is a sustainable way of use in the whole region, in particular outside the protected areas. By connecting habitats and protected areas, focused measures and support programmes will help to realize an ecological network.

The measures catalogue of the 'Ecological Continuum Initiative' has been prepared to support the realization of an ecological network throughout the Alps in seven alpine pilot regions. However, the catalogue should also be of use for other regions and actors in the Alps and beyond who are committed to improving ecological networks.

A source of actions and examples

In the "Catalogue of possible measures to improve ecological connectivity in the Alps" you will find information on a wide range of possible landscape actions which improve the functioning of ecological networks. Examples from the various countries in the Alps show how areas and structures serving as connecting elements of an ecological network can be created, preserved or restored. It is important that individual measures contribute to a large-scale network of biotopes by focusing on areas that are particularly important for the creation of natural networks or for specific species.

At present, the catalogue contains 71 measures. These are described on info sheets and have been assessed on various social, technical, ecological and economic criteria. The information only serves as a starting point: the actual planning and realization of measures will require additional investigations. Individual measures can be downloaded under www.alpine-ecological-network.org/information-services/measure-catalogue. You can create a combination of measures, depending on which criteria interest you most.

Selected measures deemed to be of particular interest on account of their innovative approach, originality or exemplary execution. They are described in more detail on the basis of concrete examples. Apart from providing you with a stimulus, these practical examples provide practical information such as contact persons and references.

Before implementing one of the suggested measures you should check whether it is in line with the local targets for biotope networks. Adaptation to local conditions may be needed. Furthermore, a large number of different sectors and fields are important when implementing measures.

Share your experience with others

All users of the measure catalogue can contribute examples of practical experience gained in pilot regions and elsewhere in the Alps on www.alpine-ecological-network.org/information-services/measure-catalogue, making that experience available to the public. We also welcome additional information on the measures described or the examples given with them (aurelia.ullrich@cipra.org).

Notes on the assessments

The assessments were largely based on available information partly reflecting the experience of individual projects. The information is therefore schematic and should be seen as no more than a starting point. The four evaluation levels of “high”, “medium”, “low” and “no direct effect” have been applied to the “ecological impact” and “socio-economic impact” categories. In terms of “ecological impact”, this scale has been set in such a way that the more frequently a measure’s positive effects on biodiversity, and on ecological connectivity in particular, have already been verified in scientific studies and projects, the higher its impact is estimated to be. Conversely, the impact has been rated as low if the evidence is scarce. Accordingly, an evaluation of “high” in terms of economic impact means that there is a possibility of making or saving money through this measure, and vice versa. Direct positive effects, as well as indirect ones such as job creation possibilities or contributions to regional development, are all included under socio-economic impact.

It should also be borne in mind that the “socio-economic impact” criterion, in particular, is a rough estimation that has in some cases been made on the basis of individual projects. Consequently, the situation can deviate widely in individual cases. The costs were often difficult to research as well, partly due to the fact that the actual costs of all the measures are highly dependent on a number of different factors and therefore vary widely. The situation at the outset, the size of the area and the specific conditions in a particular area all play an important role. These estimations are therefore rough ballpark figures and should not be regarded as firm amounts.

The same is true of ecological impact, which is also determined by the actual conditions in the area at the outset, and depends on whether the measure fits the respective context, whether it has been planned and implemented with care, and whether it has been appropriately regionalised. The evaluation in the table only provides an approximate indication and this may be different on actual implementation.

II LEGAL BASIS

A large number of laws at both international and regional level refer to the importance of ecological networks for the preservation of Alpine biodiversity. The Convention for Biological Diversity (CBD), Natura 2000 and the Alpine Convention in particular, have paved the way for a pan-Alpine ecological network. The framework established at a European level is gradually being extended to national and regional levels, with individual tools being developed to suit local needs and circumstances. With this in mind, an increasing number of European countries have passed national legislation to promote ecological connectivity in the landscape in recent years, which is a measure of the importance attached to the preservation of ecological networks for the long-term protection of biodiversity.

Alpine Convention

The Alpine Convention, a framework agreement for the protection and sustainable development of the Alpine region, was signed by the eight countries of the Alpine region - Germany, France, Italy, Austria, Slovenia, Principality of Monaco, Switzerland, the Principality of Liechtenstein - and the European Union.

Article 12 of the Alpine Convention's Protocol "Conservation of nature and the countryside" calls for the establishment of "a network of existing national and transboundary protected areas, of biotopes and other protected elements or those to be protected." Accordingly, the transnational network of protected areas was integrated into the Alpine Conference's multiannual programme (MAP) 2005 to 2010. One of the main areas of the Program is entitled "Nature, agriculture and forestry, cultural landscape;" one of the key issues it addresses is the conservation of landscapes, habitats and species. Biotope networks are also mentioned here as a way to achieve this aim. Further steps to promote cross-border networking of protected areas and establishing links with other ecologically significant facilities are also cited as a priority area for the future work of the Alpine Conference (MAP, 2.4.).

In 2007 the Alpine countries established the Ecological Network Platform. Through this group of experts, alpine countries are able to share, compare and revise crucial information on measures and methodologies. The platform, which brings together representatives of the Alpine countries, protected areas and Alpine institutions and experts, provides an important link between policy makers, the scientific community and practitioners. It also encourages more efficient cooperation with other sectors. Within the platform, experts are working on three key areas of concern: scientific support for the establishment of an ecological network, its project-oriented implementation, and communication and PR work.

Alpine Convention: www.alpconv.org, Platform Ecological Network: www.alpine-ecological-network.org/platform

Natura 2000

The main objective of Natura 2000 is to create a coherent European ecological network of habitats and characteristic species in the EU member states. Natura 2000 therefore aims to achieve a coherent and functional habitat and biotope network. The Habitats Directive calls on member states to maintain and where appropriate develop connecting features of the landscape with a view to improving the ecological coherence of the Natura 2000 network (Articles 3 and 10). This does not create any obligation to designate new protected areas but means that in addition to the Natura 2000 areas, the need for connecting elements must be considered in landscape planning.

The legal basis for Natura 2000 comes from Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) and Council Directive 79/409/EEC on the conservation of wild birds (Birds Directive). The EU-wide network of protected areas is intended to help preserve the European natural heritage in all its diversity. Natura 2000 also aims to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest, as listed in the Annexes of the two Directives. In order to ensure that they are representative, biogeographical regions based on the species' distribution areas are defined as a frame of reference. The Alpine arc, together with other European mountain regions, forms the Alpine biogeographical region.

Another important aspect of Natura 2000 in relation to ecological connectivity is the obligation to maintain, on a permanent basis, favourable conservation status of the species and habitat types through appropriate protection and development measures. For all areas of Community interest, measures must be identified to maintain the natural habitat types and species defined in the Directive, and these measures must be specified in appropriate management plans. One criterion for judging conservation status is ecological connectivity. As a means of guaranteeing implementation, the provisions of both the Habitats Directive (Article 17) and the Birds Directive (Article 12) require member states to draw up a report at regular intervals for the European Commission on the implementation of the measures taken under the two Directives. The Habitats Directive specifies that a report on the status of the elements of the Natura 2000 network must be submitted every six years. To that end, member states are required to undertake surveillance of the conservation status of the natural habitats and species of Community interest (Article 11 of the Habitats Directive). This surveillance should also take place outside Natura 2000 areas, as its purpose is to monitor the conservation status of the natural habitats and species with particular regard to priority natural habitat types and priority species, regardless of territorial context.

With these legally binding provisions and objectives, a range of instruments to promote ecological connectivity has been made available in the context of Natura 2000. The planning and implementation of measures to improve ecological connectivity must therefore be viewed in close association with Natura 2000. Furthermore, management plans and reporting and monitoring obligations within the Natura 2000 framework can make a targeted contribution to biotope connectivity, and have therefore been included in this catalogue of measures.

Natura 2000: http://ec.europa.eu/environment/nature/natura2000/index_en.htm, Habitats Directive: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm, Birds Directive: http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm

European Water Framework Directive

The European Union has set uniform environmental goals for the protection of ground water and surface water in all EU member states through the Water Framework Directive (WFD, Directive 2000/60/EC) in force since December 2000. To achieve these goals, the Water Framework Directive has adopted a broad, integrated, cross-border approach, which puts the sustainable protection of resources and the preservation of the ecological viability of bodies of water at the centre. The principal objective of the WFD is for rivers, lakes, coastal waters and ground water to achieve good ecological status by the year 2027.

With this in mind, the directive pays particular attention to the ecological function of bodies of water as a habitat for different plants and animals. The targets for improving the condition of bodies of water also encompass dependent terrestrial ecosystems and their interconnection. In addition to this, priority will be given to the restoration of ecological continuity for aquatic organisms and the transport of sediment in naturally occurring flowing water systems (Article 4 and Annex V). For example, migratory fish species, such as trout, can only reach their natural habitats in the upper reaches of a body of water if this continuity is provided. The isolation of individual sections of flowing water, e.g. through weirs, hydroelectric plants, reservoirs or piped stretches of water, can also cause problems for invertebrates.

With its legally binding standards and objectives the WFD provides concrete tools for the creation of a pan-Alpine ecological network, since with the adoption of the WFD member states have made a commitment to restoring the ecological continuity of all free flowing water, as far as possible. The implementation of the WFD requires specific measures to improve the structures of bodies of water and their continuity e.g. the construction of fish ladders or fish by-pass channels at hydroelectric plants and weirs or the dismantling of pipe work and falls.

Water Framework Directive:
http://europa.eu/legislation_summaries/agriculture/environment/l28002b_en.htm

National Legislation

Austria: Guideline on Game Protection

The Federal Ministry of Transport, Innovation and Technology (BMVIT) has initiated a revision of the Guideline on Game Protection (RVS 3.01), which stipulates that in transport planning, specific road planning and environmental impact assessments the ecological aspects relating to game as detailed in the Guideline must be taken into account. This Guideline sets out minimum wildlife/ecological standards for wildlife passages on roads. The Österreichische Autobahnen und Schnellstrassen GmbH (Austrian Motorway and Expressway Company) was involved in the development of the Guideline (cf. SCHWARZEL et al. 2000).

Wildlife/ecological spatial planning (German acronym: WÖRP) is an instrument developed in 1983 by the Forschungsinstitut für Wildtierkunde und Ökologie (Research Institute for Wildlife Ecology) in Vienna. It provides a fundamental wildlife/ecological concept that is used in a number of Austrian states, as well as the canton of Graubünden in Switzerland and Liechtenstein. The aim of this concept is the long-term incorporation of species of wildlife into the cultural landscape. This will be achieved by harmonising the creation of biotope networks with studies on game stocks and the carrying capacity of biotopes. WÖRP includes large-scale spatial planning (nationwide basic planning) related to the spatial distribution of wildlife populations and detailed regional planning.

Red Lists of endangered types of biotope were drawn up for Austria, with the Federal Environment Agency as lead agency.

France: National ecological network “Trame verte et bleue”

In France, the green and blue network “Trame verte et bleue” is one of the great national projects that issued from the ‘Grenelle de l’Environnement’ environmental debates held in October 2007. The objective of these debates was to make long-term decisions on the environment and sustainable development, and in particular with regard to restoring biodiversity. The ‘Trame verte et bleue’ is a spatial planning tool for ecological recovery throughout France. It is the outcome of joint efforts of the government, regional and local authorities and a large number of actors from science, voluntary associations, etc.

Through this project, the concept of ecological continuity is introduced in French law. The concept will be realized over a number of years as part of a package of measures for biodiversity protection incorporated or defined more precisely in the law Grenelle II, now being drafted. Under this law, the French government is required to define national guidelines. Each region is expected to develop its own plan for ecological connectivity, based on these guidelines, before the end of 2012. The municipalities in their turn must take the regional plan into account in their own planning documents.

At the regional level, some régions develop initiatives for ecological networks. The most advanced projects are the ones of Nord-Pas de Calais and Alsace. But also the régions Rhône-Alpes, Ile-de-France and Basse-Normandie started to take actions.

Since 1996, the Isère department, which includes several important protected areas, has been working on the development of an ecological network. In 2001, a map of the departments ecological network (REDI) was produced. Since then, numerous activities have been undertaken to implement this ecological network (game bridge and tunnels, speed limits, public relations work, integration in planning processes).

The French federation of regional nature parks has developed a method for implementing ecological networks within the regional nature parks. Parks like Oise-Pays de France, Scarpe-Escaut, Pilat, Caps et marais d'Opale, Haut Languedoc and Lorraine currently test this method.

Furthermore, the nine parks in the Massif Central want to identify the ecological continuums at the level of the massif to assure a connection between the Alps and the Pyrenees.

Trame verte et bleue: <http://www.legrenelle-environnement.fr/grenelle-environnement/spip.php?rubrique=282>, Departments ecological network Isère: <http://www.pathsoflife.eu>, ecological network massif central: <http://www.trame-ecologique-massif-central.com/>

Germany: Federal Nature Conservation Act

Since the amendment of the Federal Nature Conservation Act (BNatSchG) came into force in March 2002, each of Germany's states is required by law to establish an interstate network of interlinked biotopes on at least 10 % of its total area. The aim of this network, as described in Article 3 of the Act, is to protect native species and their habitats and to conserve or restore functioning ecological interrelationships. To do this, a three-stage procedure is needed to determine which areas are already contributing to the network of biotopes, ascertain the need for further suitable areas and identify suitable areas for development. In the process, it has to be taken into account that ecological interrelationships occur in extremely different spatial/geographical dimensions. For the network of interlinked biotopes required by Article 3 of the Act, the international and regional levels are significant. All areas, including those with protected status, will only be counted as being part of the network of biotopes if they are suitable for achieving the goal set out in Article 3 (2) of the Act. This means that scientific criteria for selecting suitable areas must be developed.

Recommendations on this were developed by a panel of experts representing the central government and the states (BURKHARDT et al. 2004). In applying these criteria, a research project took stock of the areas that are of national significance for an ecological network (FUCHS et al. 2007). The areas of so-called "green belt" along the former inner-German border form an important part of the national ecological network.

Federal Nature Conservation Act: <http://www.buzer.de/gesetz/8972/index.htm> (de)

BayernNetz Natur and Bavaria's biodiversity strategy

The creation of a Land-wide network of interlinked biotopes has been enshrined in Bavaria's Nature Conservation Act since 1998. It is to be implemented first and foremost as part of largescale nature conservation projects. Precious habitats for rare species of plants and wildlife are to be created, and nurtured in several hundred BayernNetz Natur [Bavarian Nature Network] projects. BayernNetz Natur projects are characterised by the close co-operation between those involved (who include farmers, local authorities, associations, communities, etc.). The overriding principle is the voluntary nature of all the measures and the co-operative approach. BayernNetz Natur projects are financed through various subsidies drawn from Land, federal and EU funds. Foundations and sponsoring agreements provide additional financing options. One of the four key objectives of the Bavarian Biodiversity Strategy is to make migration barriers such as roads or dams and weirs passable from an ecological viewpoint. The current biotopes of more than 100 km², which are not dissected by public roads and are characterised by low traffic density, represent a high ecological value which should be preserved. In addition roads and railway tracks as well as weirs and other structures spanning across rivers need to be made even more ecologically penetrable than before. Bavaria's biodiversity strategy is to be implemented in co-ordination with the Land's other departments and by involving those concerned, first and foremost the land users and land owners.

BayernNetz Natur: <http://www.bayernnetznatur.de>, Bavaria's biodiversity strategy: <http://www.stmug.bayern.de/umwelt/naturschutz/biodiversitaet/index.htm>

Italy: Ecological agriculture

In Italy, agricultural development programmes are defined at regional level. Each province draws up a plan for rural development, stating the goals of its contractual measures. The agrienviromental programmes are jointly financed by the central government and the regions. Apart from purely agricultural programmes, there are also programmes targeting the cultural landscape, in which measures for landscape conservation and development are proposed. Schemes to preserve the traditional cultural landscape, particularly in mountain regions, include conservation of important historical landscape features such as dry stonewalls and hedgerows, along with other measures such as project-based payments for traditional fences and irrigation canals. Landscape conservation payments are used to conserve individual features of the cultural landscape. Landscape conservation payments are available for the conservation of particularly valuable habitats (land-related payments). The various regions develop landscape models, inventories and plans to provide guidance for individual measures and support programmes. The landscape conservation payments compensate, for example, for extra work involved in using traditional farming methods and for lower yields.

Liechtenstein

By its incorporation into the Worldwide International Instruments and the Pan-European Instruments systems, Liechtenstein has been now fundamentally integrated into international and cross-border cooperation. For Liechtenstein, as a country with a very small land area, foreignpolicy objectives are as a general principle always closely coordinated with its neighbouring states, the Austrian state of Vorarlberg, and the Swiss cantons of St. Gallen and Graubünden. Thus, even if it was not always explicitly stipulated by particular legislation or other national instruments, cross-border collaboration on matters concerning nature and the environment has always been important to us. This collaboration on nature and landscape conservation exists, for example, on matters of freshwater ecology, forest reserves, wetlands, management of wild ungulate species, species of large predators, invasive species, wildlife passages and many other areas.

2008 will see the implementation of the “development strategy for nature and agriculture” (Entwicklungskonzept Natur und Landschaft), for which extensive base data has been acquired in recent years. This strategy will involve implementing rehabilitation and networking projects in Liechtenstein in close cooperation with agriculture. Transregional corridors will also be set up jointly with the Swiss canton of St. Gallen and the Austrian province of Vorarlberg.

development strategy for nature and agriculture: http://www.llv.li/amtsstellen/llv-awnl-natur_und_landschaft/llv-awnl-natur_und_landschaft-entwicklungskonzept_natur_und_landwirtschaft.htm

Slovenia: Programme to develop Slovenia's forests

Forests are of particular significance in Slovenia. With forest covering 56.4 % of its land surface, Slovenia ranks third in Europe in terms of proportion of forested land. That proportion is increasing as agricultural land is abandoned. Slovenia's forestry policy is based on principles of sustainability, near-natural and multi-function forest management.

The “Programme to develop Slovenia's forests” of 1996 contains the key facts on Slovenian forests and their role in conserving biodiversity. The fact that the forests have a high degree of conservation, cover a significant proportion of the country's land surface and are home to many of Europe's endangered species gives them special importance in any Alpine network. Ecologically important habitats and wetlands in the forests and forest reserves enjoy special protection status.

The development programme envisages involving the forestry agency, as well as the hunting authority and hunting associations in aspects of spatial planning, in particular infrastructure plans, to ensure that habitats for game are preserved.

Programme to develop Slovenia's forests:

http://www.zgs.gov.si/fileadmin/zgs/main/img/PDF/ZAKONI/Program_razvoja_gozdov_Slovenije.htm

Switzerland: Ordinance on Ecological Quality and Guideline on dimensions for wildlife passages

One of the conditions that farmers in Switzerland have to meet to be eligible for direct payments is that they establish ecological compensation areas (ECAs) on at least 7 per cent of their agricultural production land. Ecological compensation areas are species-rich, extensively farmed meadows and pastures, straw fields and hedgerows, along with other semi-natural habitats. Currently, ECAs account for around 10% of agricultural production land in Switzerland. Since 2001, the Ordinance on Ecological Quality (ÖQV) has provided outcome-oriented incentives aimed not only at promoting biological quality, but also at linking up ecological compensation areas. The aim of this is to use target or reference species typical for the region to connect remaining populations that have become isolated. In the case of meadows, quality evaluation is carried out on the basis of indicator plants. For other types of habitat, additional criteria are also used; for example, for hedges they include structure, minimum width, origins of species, management. The cantons are obliged to participate financially. The allowances for link-up and quality measures are cumulative. In a short space of time, the market incentives provided by the Ordinance have – particularly in mountain regions – brought about extensive network and biological enhancement of species-rich meadows and pastureland that had become endangered by intensive farming and abandonment of pastures.

In 2001, the Swiss Federal Department of Environment, Transport, Energy and Communications (UVEK) issued a guideline on dimensions for wildlife passages stipulating that passages along wildlife corridors with nationwide significance should be 45 +/- 5 metres wide. In the process of developing this stipulation, the Federal Highways Agency (ASTRA) and the Federal Environment Agency (BAFU) agreed to take remedial action to improve the situation for wildlife along the Swiss network of motorways and major roads. This concept includes plans to establish around 50 wildlife passages over the next few decades to increase the passability of the road network by native wild mammals. The conflict points in need of remedial action were roughly defined in the “corridor report” (SRU 326). The detailed planning – in particular the exact siting and design of the structures and their surroundings – will take place within the framework of concepts developed by the cantons. Relevant documents – either the overall strategy for the whole canton or simply relating to those corridors which are part of the above list – are already available in six cantons and are in the planning stage in others. Moreover, detailed planning for the construction of wildlife passages has started for three sites. Information from the “corridor report” – supplemented to some extent by that provided by the national ecological network, or REN, (SRU 373), including details on the location of each of the wildlife corridors and specific degree of risk – was also incorporated into the structure plans of 17 cantons, thus increasing the level of protection afforded to these important connecting axes.

Ordinance on Ecological Quality:

<http://www.bafu.admin.ch/landschaft/00522/01649/01651/index.html?lang=de>

III ACTORS /SECTORS

Do you work in tourism, are you a spatial planner or forest owner? On this page you can read why your commitment to networked habitats is important.

Agriculture, the backbone of our landscape

Farming has a crucial impact on biodiversity in the Alps. Many habitats originated from traditional human land use. Intensive agriculture in valleys is can be a major obstacle to the migration of fauna and the spread of wild plants. However, extensively farmed high fields can still be of outstanding biodiversity value. Yet these fields are increasingly threatened by the abandonment of traditional farming practices. Farmers can make a significant contribution to maintaining and promoting ecological networks. In intensively worked fields, for example, green margins or structural elements like hedges and dry-stone walls can be created, to aid connectivity. More extensive forms of management, without the use of fertilisers or insecticides, for example, also help to maintain biodiversity and ecological networks. Farmers should receive appropriate compensation for this contribution to the promotion of biological diversity and connectivity, because these measures are helping to conserve biodiversity as a basis for life and create an attractive living environment for the whole of society.

Hunters and foresters as ambassadors for ecological networks

The Alpine landscape is dominated by forest – more than a third of the area is covered in woodland. Apart from its significance as a habitat, recreational area, natural environment and an economic area, the forest is also directly associated with a number of benefits to the ecosystem (water and soil protection, climate regulation, reducing the impact of natural disasters). At the same time, with its huge interconnected swathes of land, the forest is an important link in the connectivity of the landscape. In the light of the crucial importance of the forest in ecological terms, hunters and foresters, through their traditional role in society in many areas, are in fact ambassadors for ecological networks.

Sustainability has always played a significant role in their work. They can therefore contribute to awareness-building among the population as regards the importance of sustainable forest and wildlife management. Because a near-natural forest, with a high proportion of dead wood and mature trees is particularly well suited to the connectivity of valuable habitats. So forest reserves can help protect and preserve elements that are of value in terms of nature protection in general and biotope connectivity in particular, such as stands of mature trees and coppices. Alternative timber harvesting methods cause less damage to the vegetation and the soil. Forest margins are all the more capable of fulfilling their role as stepping stone biotopes and retreats when they have an adequate degree of structural variety. Appropriate hunting activity is also important in this context, as it helps to preserve a near-natural forest and this creates the ideal conditions for life and propagation for the widest possible spectrum of species. Areas with no or limited hunting can also be used by sensitive animal species as

core zones or stepping stone biotopes. Habitat restoration measures can also be taken to support this.

Waterways as natural motorways

Water courses serve important functions within the ecosystem. They provide habitats, cover and food and constitute “natural motorways” for the flora and fauna, i.e. linear connecting elements within ecological networks. Fish-passes and similar structures enable fish and other flowing water species to overcome obstacles like weirs and retention basins. In the long run, only well-maintained river courses, high-quality water, and revitalised riparian zones can play this important role. Functional floodplain forests and wet areas also play a decisive role in biodiversity.

Apart from water management, fishing is also to be encouraged for the conservation and promotion of near-natural water systems. Fishermen know the habitats and their inhabitants and the interconnections within the ecosystem, and are therefore particularly alert to any change. They can support nature conservation and water management initiatives and are consequently important partners in the ecological connectivity of rivers, lakes and floodplains. Because apart from promoting biological diversity, sustainable fishing and near-natural water systems are also beneficial to the fisheries themselves and all those using the watercourses for recreation.

Land use and traffic planning: two crucial ingredients

Land use and traffic planning play a key role in the creation of an ecological network. With intelligent, targeted planning and its subsequent implementation, ecological connections can be established in the landscape and secured in the long term. This means that connectivity needs and other land use interests need to be enshrined in all supra-regional, regional and local planning processes on equal terms from the outset. Especially in valley locations, the traffic infrastructure is the main contributor to habitat fragmentation. Points of conflict between traffic and wild animals can be mitigated through the creation of green bridges and tunnels, for example, or by periodical road closures and traffic reduction schemes.

Attractive landscapes for locals and visitors

Distinctive landscapes are part of the local identity and provide an important basis for tourism and leisure use by the population. Structurally rich, diverse landscapes, with their interconnected habitats accommodate a huge range of plants and animals and at the same time represent a varied environment with a high potential for tourism. Near-natural flowing waterways with their surroundings and other elements of the landscape form ecological corridors connecting the habitats of plants and animals. As green lungs they also provide better air quality and offer attractive opportunities for locally based recreation and tourism.

Tourism can benefit directly from a network of biotopes. Tourism projects, and in particular the consequences of high-density tourism, can however have a negative effect on the

landscape and hence the network of biotopes. Hotel developments, ski runs and transport infrastructure can severely restrict or even destroy the connections between the habitats of plants and animals. Some sports and recreational activities disturb plants and animals and damage their habitats. Tourism chiefs are therefore important partners to have on board in the protection of the landscape and interconnected natural environments. By providing services based on sustainable development and raising visitors' awareness, tourism can also make a significant contribution to the promotion of ecological connections in the landscape.

Joined up nature conservation

Sustainable use of the landscape is important for the preservation of biological diversity. Acting in a way that is compatible with nature should not however be restricted to protected areas but is essential in all areas, even outside protected zones. The preservation and promotion of ecological connections in the landscape are an important contribution towards successfully protecting the endangered flora and fauna of the Alps and enabling previously indigenous species to return.

Nature conservancy measures play a crucial role in ecological connectivity – they help to conserve and improve the habitats. These are important in the biotope network as core zones and as transitional habitats or stepping stone biotopes. As nature conservancy measures are implemented connecting areas or structures are created, enhancing the penetrability of the landscape overall or in specific points of conflict. Nature conservancy bodies at all administrative levels are called upon to work together with nature conservancy associations, as well as other stakeholders, such as the population, agriculture and forestry, or regional development agencies, to take the necessary action.

A political challenge

Ecological networks can be supported through a variety of measures in the field of nature protection, e.g. the conservation and restoration of important habitat patches and river revitalisation, as well as management decisions in forestry or agriculture (such as ecological compensation sites and extensive farming). Sustainable traffic and zoning regulations can also play a role.

These measures must be taken by local actors and promoted by policy-makers at the regional and national levels. Policy-makers can support naturefriendly development, for example, by including the consideration of ecological network in the criteria required to obtain funding. This is already the case in the agricultural sector in some countries. The local authorities have a particular responsibility here, as they manage large tracts of the landscape and through intelligent, targeted planning measures, can influence the forms of use.

In whichever field the measures are taken, it is essential to ensure that they are not taken in isolation and that they always form part of an overriding strategy to create or promote the maintenance of an ecological network.

Providing information and raising awareness

The creation of an effective network of habitats relies on an understanding of the importance of ecological networks and open communication. Interconnection with the socio-economic and cultural sector also has a significant part to play in this.

Environmental education and public relations are therefore central to the planning of projects for ecological networking. Information aimed at specific target groups and raising the awareness of various stakeholders, as well as the wider population can make an important contribution to the long-term success of biotope network initiatives, because there is a direct correlation between raising awareness of the importance of ecological networks and the number of supporters and sponsors to come forward.

Every individual can play a part

Ecological networks do not only work on a large scale. Everyone can contribute. There are numerous opportunities of promoting interconnected habitats on private land. This can help to reduce the negative impact of the increasing fragmentation of our Alpine landscape. Already, measures such as keeping to specific mowing times or sowing a rich variety of species in meadows and residential areas are enriching the overall appearance of the landscape and improving the connections between natural environments. Even small-scale initiatives can have an impact. Each and every individual can contribute to a biotope network in various ways for example, by tending an organic garden, using the landscape sustainably or reducing their impact on the natural environment while enjoying the countryside.

Ecological networking as a community endeavour

Activities to preserve and promote ecological connections in the landscape should be spread over a wide platform. The more stakeholders can be involved, the higher the approval and support for campaigns to improve ecological networks. Motivation is particularly high, when the proposed project has a personal relevance. Depending on the nature of the activities a much higher number of new stakeholders can be brought on board, such as sports associations, churches, schools, and kindergartens as well as energy companies or the local planning department, if they can see the relevance of the project.

IV MEASURE DATABASE

Nature conservation

Conservation, management and creation of new standing water bodies



Standing water bodies include a wide variety of aquatic habitats such as lakes, pools, ponds and tarns. © Rainer Sturm/ pixelio.de

Involved sectors

Agriculture, Forestry, Hunting, Spatial planning, Nature protection, Local population/citizens

Affected habitats

Waterbodies

Description

Standing water bodies include a wide variety of aquatic habitats such as lakes, pools, ponds and tarns. They are refuges for rare protected aquatic plants and animals (amphibians, reptiles, birds, etc.) and are therefore key elements of a biotope network. At appropriate sites, they can be networked with other wetlands and with flowing waters. Standing water bodies are often drained or filled in so that they can be used for other purposes, making their conservation particularly important. Management interventions may be helpful in keeping smaller standing water bodies clear; they may also be conducive to various siltation stages and beneficial to habitats and the transformation of nutrient-rich and silted-up water bodies into near-natural ecosystems. The creation of standing water bodies (e.g. as protected areas for amphibians) is also an option, although conservation should take precedence over the creation of new small water bodies.

Impact

Impact in particular on Reptiles, Amphibians, Birds, Insects, Fish

Ecological impact

Improvement or preservation of habitats Use of appropriate management measures (e.g. creation of buffer zones against fertiliser and pesticide inputs, thinning-out of riparian woodland) improves habitat quality.

Element of ecological network Standing water bodies are important elements of a functioning network of different wetlands (e.g. peat bogs, headwaters, humid forests, etc.) as a stepping stone system consisting of near-natural wetland biotopes.

Time of realisation for measure Weeks: Depending on starting conditions, the impact of appropriate management measures may occur within the short term; when creating new ponds, a number of key criteria must be adhered to.

Impact scope Local (municipality): In general, the impact is local but depending on the connectivity situation, it may also be regional in scope.

Implementation

Implementation period Months: Most management measures at standing water bodies can be implemented in the short term. Larger interventions in a water body's internal structure (restoration and remediation) requires more comprehensive planning.

Frequency Recurring: Most maintenance measures must be repeated.

Economic and legal aspects

Costs Medium (10'000-100'000 EUR): Costs vary considerably depending on the type of measure being implemented. Costs of creating new standing water bodies are estimated at approx. € 20,000 (2000 m²) - 70,000, depending on size.

Socio-economic impacts Low: Intact standing water bodies contribute to an attractive and diverse landscape appearance (tourism).

Sources of financing Public: local, Public: regional, Public: national, Public: European

Legal situation Management measures can be supported from various funding programmes (e.g. contract-based nature conservation). Payments amount to around € 450-600/ha. Near-natural lakes are generally legally protected nature conservation areas.

Further information

Evaluation	Management measures at standing water bodies have long made an important contribution to the conservation, management and development of ecologically valuable areas. Relevant experience is available from the responsible authorities/nature conservation associations.
Information	Other: The various nature conservation agencies and organisations (NABU, BUND, LBV, Pro Natura etc.). More information and examples can also be accessed at: http://www.landwirtschaft-mlr.baden-wuerttemberg.de/servlet/PB/menu/1064781_11/-index1221750829191.html

Controlling invasive species



Ambrosia - one of the best known invasive species. © Martin Richter/ pixelio.de

Involved sectors

Agriculture, Forestry, Water management, Hunting, Nature protection, Local population/citizens

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Invasive species are alien plants and animals that have negative impacts on other species, biological communities or biotopes and thus pose a threat to biodiversity. Invasive species may also cause economic problems (e.g. when present as weeds) or health problems (such as allergies and diseases). Hybridisation with native species can also occur. In Switzerland, 107 alien species are classed as problematical, including mammals, birds, reptiles, amphibians, insects and plants. When dealing with alien species and adopting measures to limit them, prevention, monitoring, acceptance, surveillance and control all have a role to play. In the context of ecological connectivity, particular account must be taken of invasive species as they are able to use the emerging connecting bridges in the landscape to penetrate into new areas. In the case of invasive neophytes, this applies especially to stream margins and riparian zones (distribution along collapsed river banks and via erosion and flooding), which, as natural connecting elements in the landscape, are also important elements of the biotope network.

Impact

Ecological impact

Improvement preservation habitats	or Awareness of the impacts of invasive species is required, justifying control of measures (e.g. specific threat posed to rare or endangered species, risk of penetration of invasive species into new areas).
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Element ecological network	of Control measures constitute major intervention and generally entail considerable effort as well as damage to other species (e.g. scarification as a result of root removal)
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Other	Measures should only take place if it is certain that the habitat concerned can be restored to a stable ecological state following the measure and its long-term conservation in this state is guaranteed.
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Time realisation measure	of Years: The duration of measures until the attainment of an effect is for difficult to estimate and depends substantially on the species concerned and the measures taken.
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Impact scope	Very localised (plot): The impact of measures is very limited in spatial terms.
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Implementation

Implementation period	Months: Here too, many different measures and implementation periods are possible.
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Frequency	Recurring: Generally long-term strategies are needed to fight invasive species effectively.
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Economic and legal aspects

Costs	High (100'000-1 Mio EUR): Very variable. Cost of controlling all stocks of Japanese Knotweed in Germany, for example, is € 6.2 mill. + € 16.7 mill. for subsequent stabilisation of river banks.
Socio-economic impacts	Medium: High costs of control can be set against the very substantial economic impacts associated with alien species, estimated at USD 13.8 billion p.a. in the US.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	International treaties, European and national legislation regulate the management of invasive species: Convention on Biological Diversity, Habitats Directive, Birds Directive, federal states' nature conservation legislation, plant protection legislation, hunting legislation.

Further information

Evaluation	In view of the many examples, a species-specific perspective must be taken. Comprehensive experience has been gained with various measures to deal with some species (e.g. Japanese Knotweed: mowing, grazing, herbicide use, combined procedures). It is always important to weigh up the relationship between the negative impacts, on the one hand, and intervention and its costs, on the other.
Information	Other: Comprehensive information on neophytes in Germany: http://www.floraweb.de/neoflora/index.html , Delivering Alien Invasive Species In Europe (DAISIE): http://www.europe-aliens.org/ , North European and Baltic Network on Invasive Alien Species (NOBANIS): http://www.nobanis.org , Report on invasive species in Switzerland: http://www.nobanis.org/files/invasives%20in%20CH.pdf ; aquatic alien species: http://www.aquatic-aliens.de/species-directory.htm

Restoration of wetlands



The removal of trees and shrubs is a measure for the renaturation of fens and bogs. © Bund Naturschutz Ostallgaeu

Involved sectors

Agriculture, Forestry, Water management, Spatial planning, Tourism and leisure, Nature protection

Affected habitats

Bogs and fens, wetlands

Description

Wetland habitats are especially species-rich and are a dominant feature of the natural landscape structure in the Alpine region and the pre-Alps. Wetlands also provide a habitat for numerous rare and highly endangered species (e.g. the Azure Hawker (*Aeshna caerulea*)) and are therefore important elements of a biotope network. Wetland restoration measures can bring about an improvement in the hydrological regime of degraded wetlands and generally enhance habitat quality. Peat growth resumes in the rewetted areas, allowing an increase in typical wetland species. This also improves the function of wetlands as CO₂ sinks and water stores, supporting the avoidance of and adaptation to climate change. Rewetting can include impounding measures, e.g. blocking drainage ditches, changes in the type of use, and management measures such as the removal of tree and shrub cover.

Impact

Impact in particular on

Reptiles, Amphibians, Birds, Insects

Ecological impact

Improvement or preservation of habitats

Improving the quality of wetland habitats (typical wetland vegetation and fauna) through mowing of wet meadows and litter meadows, debushing and impoundment. Development of structurally rich forest/open land transitions as habitats for black grouse and wood grouse (capercaillie).

Element of ecological network	Intact peat bogs are important elements of a network of different wetlands (headwaters, humid forests, etc.)
Time of realisation for measure	Years: Wetland restoration measures must be long-term in focus and constantly reviewed. Depending on the measure and the starting conditions, impacts may be achieved quickly or over the long term.
Impact scope	Regional: The scope of impact can be increased if relevant measures are embedded in a comprehensive (regional) strategy.
Implementation	
Implementation period	Years: Wetland restoration measures should be embedded in a long-term comprehensive strategy, although individual measures can be implemented over the short term.
Frequency	Recurring: Includes a wide variety of measures, many of which should be long-term and repeated regularly.
Economic and legal aspects	
Costs	Medium (10'000-100'000 EUR): Costs vary with size of area, measures to be implemented and implementation period (approx. € 150-6000/ha).
Socio-economic impacts	Low: Tourism and marketing strategies can be promoted as part of a comprehensive strategy (e.g. use of litter, "peat bog tourism").
Sources of financing	Private sponsor, Public: local, Public: regional, Public: national, Public: European
Legal situation	Wetland restoration measures can be integrated into various countryside management programmes and receive appropriate funding on that basis.
Further information	
Evaluation	Numerous wetland restoration initiatives exist. Often, such measures are successfully implemented as part of biotope network initiatives. Socio-economic aspects such as sensitising and informing the public and political decision-makers, promoting "peat bog tourism" and the development of marketing strategies for agricultural products from the region play a role (e.g. Allgäuer Moorallianz).
Information	Other: http://www.cipra.org/de/cc.alps/wettbewerb/moorrenaturierung , http://www.bfn.eu/allgaeu110.html
Contact	Germany: Dr. Christine Margraf, Bund Naturschutz in Bayern e.V. christine.margraf@bund-naturschutz.de

Good Practice	<u>Wetland restoration in the Bavarian Alps: the Allgäuer Moorallianz</u> <u>Renaturation des tourbières : l'exemple de l'Allgäuer Moorallianz</u> <u>Rinaturalizzazione delle torbiere: l'esempio della Allgäuer Moorallianz</u>
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Establishment of resting areas for birds along streams



The structures associated with flowing waters are often important resting areas. © Mensi/pixelio.de

Involved sectors

Water management, Fishery, Spatial planning, Tourism and leisure, Nature protection, Other: Sports Associations

Affected habitats

Waterbodies

Description

The structures associated with flowing waters, such as gravel banks, provide important habitats for a number of species which breed on gravel areas (e.g. the Common Sandpiper (*Actitis hypoleucos*) and Little Ringed Plover (*Charadrius dubius*)). These areas are often used for recreation and sporting activities. Management strategies, such as the creation of quiet zones for breeding birds at particular times (including bans on access), can cut through existing conflicts and contribute to habitat improvement. Relevant measures can include the adaptation and development of infrastructure, the creation of observation points, and channelling of and information for visitors using info-boards and signage.

Impact

Impact in particular on	Birds
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Ecological impact

Improvement or preservation of habitats	The creation of a quiet environment on gravel banks during breeding periods improves habitat quality for gravel-breeding species.
Element of ecological network	Natural flowing water systems and their associated structures are valuable elements of a biotope network and form stepping stone biotopes for some species.
Time of realisation for measure	Months: Depending on the time of implementation, the quiet zones can soon start to be used as a breeding ground.
Impact scope	Regional: The breeding areas may be of transregional importance for some species.

Implementation

Implementation period	Years: When planning measures at the specific site, a longer time period should be planned (involvement of all stakeholders, assessment of stocks of breeding birds, etc.)
Frequency	Non-recurring: For greater effectiveness, this should be a long-term activity adapted to emerging needs.

Economic and legal aspects

Costs	Medium (10'000-100'000 EUR): Costs are heavily dependent on starting conditions and the scope of the requisite measures.
Socio-economic impacts	Low: When combined with attractive offers for visitors, tourist value-added can be generated.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	Relevant measures can be funded from countryside management programmes.

Further information

Evaluation	As part of the Interreg III B Project "Living Space Network" (Pilot Project "Running Waters"), a conservation strategy for gravel-breeders at Halblech was developed. However, conflicts between gravel-breeding species of bird and recreational use exist at almost all stretches of rivers where gravel banks still exist. There are also examples of the creation of quiet zones, with low disturbance, for wild mammals and birds along the Danube.
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Information	Austria: INTERREG project: http://www.lsn.tirol.gv.at/de/doc/kiesbrueter.pdf Danube: http://www.land-oberoesterreich.gv.at/cps/rde/xchg/ooe/hs.xsl/73053_DEU_HTML.htm
Contact	Austria: e.g. Office of the Government of Upper Austria, Department of Spatial Planning, Economic and Rural Development, Nature Conservation Division

Taking account of bat roosts during the restoration and renovation of old buildings



The Alpine area is characterised by a fauna rich in bat species. © IRKA

Involved sectors

Nature protection, Transport, Local population/citizens, Other: Church, Building authorities, Architects

Affected habitats

Areas for settlements and transport

Description

Because of its near-natural state and landscape diversity, the Alpine area is characterised by a fauna rich in bat species. Many species of bat are heavily dependent on buildings for their roosts because natural hiding places have become rare in woodlands as a result of intensive forms of cultivation. During the restoration or renovation of old buildings, disturbances to the bats and their roosting places can therefore easily occur. Appropriate measures during the restoration or renovation of old buildings can help to preserve bat roosting places. There is already a wealth of experience among bat experts, who often provide support during the renovation of buildings. Targeted consideration of relevant information on the ecology of roosting places of various species of bat can thus make a major contribution to habitat connectivity.

Impact

Impact in particular on Small mammals

Ecological impact

Improvement or preservation of habitats Many species of bat (including several listed in Annex II of the Habitats Directive) are dependent on old buildings for their roosts.

Element of ecological network The roosts, together with the hunting grounds, are important elements of an ecological network. The distance between exits and the nearest vegetation and potential hunting grounds must be considered.

Time of realisation for measure Months: With appropriate restoration measures, the roosts may be colonised by the bats within the first year.

Impact scope Local (municipality): Measures focus on individual buildings but the connectivity situation (e.g. proximity of hunting grounds) should be considered. A comprehensive strategy should also be in place, requiring support from bat experts during restoration work.

Implementation

Implementation period Months: Relevant measures can be integrated into restoration work. The measures should be carried out while the bats are absent and should not lead to major changes to the characteristics of the roosts.

Frequency Non-recurring

Economic and legal aspects

Costs	Low (1'000-10'000 EUR): Costs depend on starting conditions and the needs of the bat species concerned; compensation payments may be available in some cases.
Socio-economic impacts	Low: Taking account of bats during the restoration of buildings may incur additional costs.
Sources of financing	Private sponsor, Public: local, Public: regional, Public: European
Legal situation	Restoration of bat roosts often requires permission under nature conservation legislation.

Further information

Evaluation	Within the framework of the Interreg III B Project “Living Space Network”, comprehensive Guidelines for the Renovation of Buildings were produced, drawing on more than 230 case studies relating to the renovation of buildings, mainly from the Alpine area, and containing specific information for around 20 different bat species.
Information	Other: Guidelines: http://www.lsn.tirol.gv.at/de/doc/leitfad_fledermaus.pdf ; Interreg Project: http://www.alpine-space.org/uploads/media/LSN_Handbook_for_Bats_Protection_DE.pdf , http://www.fledermausschutz.at/downloads/GuidelinesfortheRenovationofbuildings.pdf (en)
Contact	Other: Dr Guido Reiter, Austrian Co-ordination Centre for Bat Conservation and Research (KFFÖ) Dr Andreas Zahn, Co-ordination Centre for Bat Conservation in South Bavaria
Good Practice	Habitat connectivity for bats in the Alpine region Mise en réseau des habitats de chauves-souris dans l'espace alpin Messa in rete degli habitat dei pipistrelli nell'arco alpino

Specific species conservation measures: wood grouse (capercaillie)



The wood grouse is a characteristic species of light, structurally rich boreal and montane forest habitats. © Eidgenössische Forschungsanstalt WSL

Involved sectors

Forestry, Hunting, Tourism and leisure, Nature protection

Affected habitats

Forest, Grassland

Description

The wood grouse (capercaillie) (*Tetrao urogallus*) is a characteristic species of light, structurally rich boreal and montane forest habitats. Due to its extensive spatial and specific habitat requirements, it is regarded as an umbrella species for the high-montane community. Acutely endangered as a result of habitat losses and degeneration, it is a target species under the EU Birds Directive. The species therefore plays a key role in nature conservation and spatial planning, not only from a conservation but also from a socio-cultural and socio-economic perspective. Due to its habitat requirements, support measures for capercaillie contribute directly to the implementation of biotope network concepts, e.g. through the creation of mosaics of different habitats and corridor and stepping stone structures.

Impact

Impact in particular on

Birds

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

Reduction of fragmentation effect of normal commercial forest stands.

Improvement or preservation of habitats

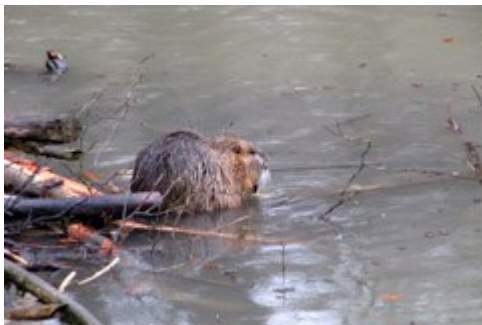
All measures primarily aim to improve the habitat for grouse and thus address the primary threat to the species.

Element of ecological network	Structures which characterise wood grouse (capercaillie) habitat are suitable as connective structures for other species as well.
Other	Various potential fields of conflict are addressed in relation to the wood grouse (capercaillie) (tourism/recreation, commercial forestry).
Time of realisation for measure	Years: Management measures for wood grouse populations entail long-term commitment and permanent changes to usage and procedures.
Impact scope	Local (municipality): With wood grouse in particular, measures always have regional as well as local significance.
Implementation	
Implementation period	Days: Individual management measures do not take up much time, but a regular and comprehensive approach is required to achieve the desired impacts.
Frequency	Recurring: Most of the relevant measures require regular implementation.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Varies widely according to the measures undertaken; no general estimate possible.
Socio-economic impacts	Low: Measures which benefit the wood grouse will also have a positive impact on other species in montane forests.
Sources of financing	Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	Wood grouse is protected by a raft of legislation (Natura 2000).
Further information	
Evaluation	In some regions, wood grouse is regarded as an umbrella species for biotope network projects. It is reliant on richly structured and differentiated habits. Ecological connectivity is therefore particularly important here, especially as wood grouse populations are often highly endangered.
Information	Other: e.g. Capercaillie Action Plan, Federal Office for the Environment (FOEN), Switzerland. Detailed information about the wood grouse (capercaillie): http://www.waldwissen.net/

Contact

Other: e.g. National coordination centre of the Swiss species recovery programme for birds: Ueli Rehsteiner, Swiss Association for the Protection of Birds SVS/BirdLife Switzerland ; Reto Spaar, Swiss Ornithological Institute

Specific species conservation measures: beaver



Lots of animals establish living spaces in unique waterbodies that were shaped by beavers.
© Marion Heidemann-Grimm/pixelio.de

Involved sectors

Agriculture, Forestry, Water management, Hunting, Nature protection, Transport, Other: Energy

Affected habitats

Waterbodies

Description

Hardly any other species shapes and influences its habitat as actively as the beaver. The beaver makes burrows in riverbanks, builds dams, and fells trees. Before humans began to shape the landscape actively through their land use, there was a broad network of pools, created by beavers, along the watercourses. Many other species of fauna have developed in a water landscape which the beaver has done much to create. And yet the beaver was on the verge of extinction in Europe. It is now progressively recolonising numerous watercourses. Since its return, the beaver is bringing many of the watercourses made moribund by human activity back to life and restoring their dynamism. It creates a mosaic of new habitats and structures by opening up vegetation, promoting deadwood, and creating pools and dams. This results in more attractive landscapes and a biotope network along the

watercourses and helps to improve watercourse and flood protection.

Impact

Ecological impact

Improvement preservation habitats Many other species of fauna have developed in a water landscape or which the beaver has done much to create. It is therefore described as of a key species of fauna for small water bodies. Long-term studies in Germany have shown that the beaver has an extremely positive effect on numerous species of aquatic and riparian flora and fauna.

Element of ecological network The beaver helps to restore water bodies and thus actively increases species diversity and the diversity of water body structures, thus creating natural corridors along the watercourses.

Other The beaver also helps to clean the watercourses; the water flows more slowly as a result of the dams built by beaver, causing sediments and substances such as chemicals and nutrients to be deposited. These substances would otherwise promote algal growth and lead to oxygen depletion. More flood events occur in regions without beavers' dams.

Time of realisation for measure Long term: The restructuring of watercourses by beaver is a long-term process.

Impact scope Regional: Measures to promote beaver, but also the problems caused by them, must be addressed at both local and regional level.

Implementation

Implementation period Long term: In areas where beaver occurs, conflicts will always arise. Coexistence with beaver must be re-learned for the long term.

Frequency Recurring: Long-term implementation of a series of measures, area management is essential.

Economic and legal aspects

Costs Low (1'000-10'000 EUR): Varies according to the measures adopted. Farmers receive payment for ecological services in areas with beaver.

Socio-economic impacts Low: The beaver provides various "ecological" services, including flood protection.

Sources of financing of Public: local, Public: regional, Public: national, Public: European

Legal situation In some federal states, the beaver is covered by hunting legislation.

Further information

Evaluation	There are various conflicts with beaver: collapsed pathways, felled trees, agricultural damage. However, this damage rarely occurs more than 10 m from the river bank. This should be established as a buffer zone along watercourses in order to restore their natural dynamism and thus make an effective contribution to the biotope network.
Information	Switzerland: e.g. Biberfachstelle (Beaver Advice Centre), Neuchatel, Switzerland
Contact	Switzerland: Contact person at Beaver Advice Centre: Christof Angst

Preparation of Natura 2000 management plans



Natura 2000 is an EU-wide network of protected areas intended to preserve the endangered habitats and species in the EU. © Dieter Schütz/ pixelio.de

Involved sectors

Agriculture, Forestry, Water management, Hunting, Tourism and leisure, Nature protection

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Natura 2000 is an EU-wide network of protected areas intended to preserve the endangered habitats and species in the EU. It comprises the protected areas defined in Council Directive 79/409/EEC on the conservation of wild birds (Birds Directive) and in Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive), and aims to build a coherent ecological network. Binding provisions apply to the implementation of Natura 2000, including a requirement to produce management plans defining mandatory conservation measures for the area in question. The plans consist of a basic part and a section containing relevant measures, which describes which species and habitat types contribute to the specific ecological value of the area and the conservation objectives that this creates for the area concerned. This gives rise to an obligation to maintain and where appropriate develop connecting features of the landscape with a view to improving the ecological coherence of the Natura 2000 network (Articles 3 and 10). Member states are also required to take measures to improve the connectivity of the Natura 2000 areas outside these areas themselves (Article 10).

Impact

Impact in particular on

Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects, Fish

Ecological impact

Improvement or preservation of habitats

The measures laid down in the management plan must impact positively on the areas' environmental status with all its species and habitats (favourable conservation status, requirement for improvement).

Element of ecological network

The coherence of the Natura 2000 network must be safeguarded. Measures should be promoted that protect both the specific network of habitats inside and outside an area and the overall site which has other valuable biotopes (national biotope network).

Time of realisation for measure

Years: The production of management plans usually takes a period of 1-3 years, and the measures to be implemented are only carried out after the planning process has been completed.

Impact scope

Regional: The measures contained in the management plan must take account of the specific connectivity in the area; individual management measures can be of transregional importance.

Implementation

Implementation period

Long term: The measures contained in the management plan are planned for a long period of time (approx. 10 years). The implementation periods of the individual measures can differ greatly.

Frequency Recurring: Implementation of management plans is a long-term activity.

Economic and legal aspects

Costs High (100'000-1 Mio EUR): Depending on the species and habitats in the area concerned, about €150-190 per km².

Socio-economic impacts No direct impact: In the case of Natura 2000, account must be taken of socio-economic interactions with other sectors as well as of the environmental structure and nature conservation concerns.

Sources of financing Public: local, Public: regional, Public: national, Public: European

Legal situation The management plans are based on the Habitats Directive, the Birds Directive and No. 6.1 of the Joint Declaration of 4 August 2000 concerning the protection of the European Natura 2000 network. The implementation of the measures is to be supported by state programmes (e.g. contract-based nature conservation programmes).

Further information

Evaluation The management plans for most Natura 2000 areas are currently being produced. Few experiences have therefore been made as to how connectivity measures are actually being included in the management plans and what the long-term impacts of these will be. In principle, the demarcation of Natura 2000 areas alone will not be enough to achieve the goal of a coherent ecological network.

Information Other: EU information:
http://ec.europa.eu/environment/nature/legislation/-habitatsdirective/index_en.htm

Contact Other: Further information may be obtained from the national authorities concerned.

Reporting duties and general monitoring in the Natura 2000 framework



The Flora-Fauna-Habitat Directive protects the otter in the context of Natura 2000 areas.
© Templermeister/ pixelio.de

Involved sectors

Agriculture, Forestry, Water management, Hunting, Tourism and leisure, Nature protection

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Natura 2000 is an EU-wide network of protected areas intended to preserve the endangered habitats and species in the EU. It comprises the protected areas defined in Council Directive 79/409/EEC on the conservation of wild birds (Birds Directive) and Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive), and aims to build a coherent ecological network. The designation of Natura 2000 areas creates an obligation to maintain, on a permanent basis, favourable conservation status of the species and habitat types through appropriate protection and development measures (management plan). To this end, member states are required to draw up a report at regular intervals (6 years) on the implementation of the measures taken under the two Directives. The Habitats Directive also requires member states to undertake surveillance of the conservation status of the natural habitats and species of Community interest. The reports should therefore include the key findings of this surveillance. Consideration should also be given to improving the ecological coherence of Natura 2000 outside the designated Natura 2000 areas.

Impact

Impact in particular on	Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects, Fish
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Ecological impact

Improvement or preservation of habitats	The reporting duties and monitoring activities relate to the measures laid down to preserve favourable conservation status and their impacts. This is the first comprehensive statutory regulation for monitoring success in nature conservation.
Element of ecological network	The coherence of the Natura 2000 network must be safeguarded. Measures should be promoted that protect both the specific network of habitats inside and outside an area and the overall site which has other valuable biotopes (national biotope network).
Time of realisation for measure	Long term: Reports have to be produced on the status of the Natura 2000 network components every six years and member states should also undertake general surveillance of the natural habitats and species in question.
Impact scope	Regional: General surveillance should also take place outside Natura 2000 areas, as its purpose is to monitor the conservation status of the natural habitats and species with particular regard to priority natural habitat types and priority species, regardless of territorial context.
Implementation	
Implementation period	Long term: As part of Natura 2000, measures to improve the connectivity situation (conservation status of species) are planned and monitored over the long term.
Frequency	Recurring: Ideally, mowing should be managed over a number of years.

Economic and legal aspects

Costs	High (100'000-1 Mio EUR): Very variable as they are heavily dependent on the data already available, the reported species and habitats, the conservation status etc.
Socio-economic impacts	No direct impact: In the case of Natura 2000, account must be taken of socio-economic interactions with other sectors as well as of the environmental structure and nature conservation concerns.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	Pursuant to Article 11 of the Habitats Directive, general surveillance of the species and habitats of community interest should be undertaken and the main results of this general surveillance must be included in the report. The reporting duty is carried out pursuant to Article 17 of the Habitats Directive.

Further information

Evaluation	The current reporting period runs from 2007 to 2013 and the next reports must be submitted in 2013. For the first time, these must be based on suitable monitoring systems, and can include a comparison with the previous report (2007). This will show the effectiveness of the measures undertaken, also in relation to the connectivity situation.
Information	Other: EU information: http://ec.europa.eu/environment/nature/-legislation/habitatsdirective/index_en.htm
Contact	Other: Further information may be obtained from the national authorities concerned.

Agriculture

Land set aside



Areas of wild herbs on agricultural fields provide important areas for resting, breeding, feeding, mating or cover. © Kerstin Ziebandt/ pixelio.de

Involved sectors

Agriculture, Nature protection

Affected habitats

Bogs and fens, wetlands, Grassland, Arable land

Description

Set-aside areas distributed across the agricultural landscape can create high-quality habitats for wild fauna and flora and thus contribute on a sustainable basis to the conservation of characteristic communities in open farmland. Diverse vegetation structures, e.g. areas of wild herbs on agricultural fields, provide important areas for resting, breeding, feeding, mating or cover (e.g. for Corn Bunting (*Emberiza calandra*), Skylark (*Alauda arvensis*) and Brown hare (*Lepus europaeus*)) and provide overwintering areas for insects and spiders. They can compensate for the loss of former near-natural habitats and take on regulatory functions. They also act as a buffer to other habitats and due to their insular distribution, are important elements of the biotope network in the otherwise intensively used agricultural landscape. Areas of wild herbs on agricultural fields can be established as rotational fallow and wildflower strips (established for 2-6 years in the agricultural landscape; the fields are sown with native field species and wild herbs and are not fertilised or treated with pesticides).

Impact

Impact in particular on Small mammals, Big mammals, Birds, Insects

Ecological impact

Improvement or preservation of habitats Set-aside areas act as buffer zones between different forms of use, especially close to ecologically valuable biotopes, and provide a habitat for rare species.

Element of ecological network Fallow areas act as stepping stone biotopes. This impact is greatly increased through the inclusion of the areas in local planning.

Other Set-aside areas reduce nitrogen inputs and contribute to soil protection.

Time of realisation for measure Months: Areas enhanced in this way provide year-round habitats.

Impact scope Local (municipality): The impact of the measure can be greatly increased if individual sites are integrated into a broader network (e.g. field margins, extensively managed areas, hedges).

Implementation

Implementation period Weeks: Establishment and maintenance (seeding with site-appropriate mixes of native grasses/herbs, soil management) of the set-aside areas can be well-integrated into routine land management.

Frequency Non-recurring, Recurring: The set aside land can change annually, but should be part of an overall set aside concept.

Economic and legal aspects

Costs	Very low (less than 1'000 EUR): Set-aside may be subsidised by up to €200/ha p.a.
Socio-economic impacts	Low: Subsidies can provide a basic income for farmers. Set-aside also enhances the appearance of the landscape and safeguards pollination of crops.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	Relevant measures are subsidised through various countryside management and cultural landscape programmes.

Further information

Evaluation	Set-aside was introduced by the EU from 1988/89 (mandatory from 1993/94) to 2007/08 with the aim of regulating the quantities of farm goods being produced. In Switzerland, direct payments are still linked to "evidence of ecological performance", which includes, among other things, the provision of an appropriate proportion of ecological compensation areas.
Information	Switzerland: http://www.landwirtschaft.ch/de/wissen/oekologie/ Further information is available from the relevant authorities.

Extensive use of grasslands



Extensively used grassland is often species-rich. © Markus Jenny

Involved sectors

Agriculture, Hunting, Nature protection

Affected habitats

Grassland

Description

Extensively used grassland is extremely important for the biotope network due to its species richness. Alongside direct extensivisation of use (e.g. zero to moderate fertilisation, no use of plant protection products, no ploughing up of grassland or sowing), low frequency of cutting (max. 2-3 times a year), together with later cutting and specific mowing techniques can also help to improve biotope functions. High cutting (mowing height 10-12 cm) can protect amphibians, ants and ground breeders. By using mosaic and phased mowing (i.e. mowing at different times on different areas), and by leaving peripheral areas unmown, food sources can be created for insects (especially bees) as well as refuges for wild fauna.

Impact

Impact in particular on Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Reduction of fragmentation or creation of new valuable habitats	Extensivisation increases the permeability of the landscape matrix and thus mitigates possible barrier effects of farmland.
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Improvement or preservation of habitats	Species-rich grassland fulfils the habitat requirements of rare species and acts as a buffer zone between different forms of use and intensively used areas.
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Element of ecological network	Extensive areas of grassland are important elements of the biotope network. The impact is increased if individual areas are integrated into a network of extensively used margins and scattered dry meadows.
Other	Supports groundwater and soil protection; protects against erosion.
Time of realisation for measure	Months: Species-rich grassland provides valuable refuge areas, including in winter. The impact is especially high during the vegetation period.
Impact scope	Local (municipality): Local planning of a network of extensively used areas and scattered species-rich meadows increases the impact of individual sites.
Implementation	
Implementation period	Weeks: Extensive management practices can be well-integrated into land management. Some specialist equipment may be required (e.g. double blade cutting bar). Long-term strategies (min. 5 years) should be aimed for.
Frequency	Recurring
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): Renunciation of mineral fertiliser use is subsidised to approx. €150/ha; up to approx. €300/ha is paid for adherence to provisions governing cutting times.
Socio-economic impacts	Low: Enrichment of landscape appearance and therefore increased recreational value; ensures pollination of agricultural crops.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	Extensive grassland use is an element of cultural landscape/countryside management programmes and contractual nature conservation. Subsidies are therefore provided for specific extensivisation schemes.
Further information	
Evaluation	The promotion of extensive grassland has long formed part of cultural landscape conservation programmes and contractual nature conservation. Further information can be obtained from the relevant authorities and nature conservation organisations. Funding criteria and conditions vary widely according to country and region.
Information	Other: All relevant nature conservation and agricultural authorities.

Species rich seeding on agricultural fields



Species rich seedings enrich the landscape's appearance. © qay/ pixelio.de

Involved sectors

Agriculture, Hunting, Nature protection, Other: Beekeepers, Countryside management associations

Affected habitats

Arable land

Description

Species-rich seeding of wild and cultivated plants on set-aside or other areas (e.g. "green" areas created in compensation for natural spaces lost through construction of roads etc.; fallow land in residential areas), can enrich the landscape's appearance and make a valuable contribution to the biotope network. Seeding with wild species provides a source of food and cover for wild fauna and, depending on the mix of seeds used, can also provide habitats for insects (butterflies, bees, ground beetles, spiders). Sown areas are also used by hedge dwellers (e.g. the Red-Backed Shrike (*Lanius collurio*)) as substitute habitats. Seeding should take place from mid-April to the end of June, and depending on the condition of the site, may require preparatory measures (e.g. removal of weeds, ploughing etc.). Suitable seed assortments are commercially available.

Impact

Impact in particular on

Small mammals, Big mammals, Birds, Insects

Ecological impact

Improvement or preservation of habitats

Areas which have undergone species-rich seeding provide habitat for rare species and can have a buffer effect in the intensively used agricultural landscape.

Element of ecological network The relevant areas can act as stepping stone biotopes in the biotope network, and the impact can be increased if integrated into a broader strategy.

Other Soil fertility.

Time realisation measure **of** Months: Some months elapse between the adoption of the preparatory measures **for** and the appearance of the full impact during the vegetation period.

Impact scope Local (municipality): If integrated into a broader strategy (local planning) which includes field margins, for example, a heightened impact can be achieved.

Implementation

Implementation period Weeks: Seeding does not involve a great deal of work, and generally, no management is required afterwards.

Frequency Non-recurring, Recurring: Preferable long-term programmes, but implementation of a single measure can be effective.

Economic and legal aspects

Costs Very low (less than 1'000 EUR): Costs are likely to amount to approx. €150/ha p.a. over a 5-year period.

Socio-economic impacts Medium: Depending on the seed mixture, specific plants can be used (herbs, flowers). Enhances the visual appearance of the landscape (tourism). Significance for hunting, bee-keeping.

Sources of financing **of** Public: local, Public: regional, Public: national, Public: European

Legal situation Species-rich seeding can form part of countryside management/cultural landscape programmes.

Further information

Evaluation Areas which have undergone species-rich seeding have long formed part of contractual nature conservation programmes. There are various examples of schemes which have been implemented as part of biotope networking initiatives. In Bavaria, a pilot project ("The Biotope Network in the Cultural Landscape") was carried out from 2000-2005, and various seed mixtures are available via this scheme.

Information Germany: : http://www.lwg.bayern.de/landespflege/-landschaftspflege/25786/ansaat_pilotpro.pdf, http://www.lebensraum-brache.de/Projekte/Lebensraum_Brache/index.php/

Contact	Germany: Bavarian State Institute for Viticulture and Horticulture (LWG), Countryside Management Department, contact: Martin Degenbeck
Good Practice	Species rich seeding on agricultural fields, Würzburg district, Germany Exemple du district de Würzburg, Allemagne Esempio della regione di Würzburg, Germania

Promotion of organic farming



Landscape elements enhance biological diversity. © Jan Freese/ pixelio.de

Involved sectors

Agriculture

Affected habitats

Grassland, Arable land

Description

Many endangered species of fauna and flora are dependent on agricultural habitats, so in terms of conserving biological diversity, extensivisation of agricultural use should be the aim on ecologically significant areas. In this context, organic farming has an extremely important role to play, one reason being that it avoids and reduces the environmental stresses which can otherwise arise in farming. Furthermore, the targeted creation of landscape elements (ecological compensation areas such as hedgerows, fallow areas, forest strips and extensive meadows) make an important contribution to the promotion of biological diversity. These areas are also important elements of a biotope network.

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Improvement or preservation of habitats Extensively managed spaces are important habitats for a wide range of species and act as buffer zones in an intensively farmed landscape.

Element of ecological network Extensive areas are important elements of the biotope network. The impact is increased if individual areas are integrated into a network of extensively used margins and scattered dry meadows.

Other Positive impact on soils and the hydrological regime.

Time of realisation for measure Years: A positive impact can already be achieved after the implementation of individual measures (e.g. creation of hedge structures); a longer period is required for full conversion to organic farming, however.

Impact scope Local (municipality): Tends to be localised, as individual organic farms are scattered across the countryside. With a larger-scale approach and the incorporation of other structures, the connectivity impact increases accordingly.

Implementation

Implementation period Years: The length of time required for conversion to organic farming depends, among other things, on operating structures. As a rule, at least 12 months must elapse until produce can be marketed as organic.

Frequency Recurring

Economic and legal aspects

Costs Medium (10'000-100'000 EUR): Conversion is extremely cost-intensive (additional equipment, more space, etc.). Exact costs are highly dependent on operating structures.

Socio-economic impacts Medium: From a long-term perspective, positive effects through financial support and greater security of sales. Good marketing strategies are key.

Sources of financing Public: local, Public: regional, Public: national, Public: European

Legal situation Organic farming and conversion can be subsidised from countryside management/cultural landscape programmes (generally approx. € 200-500/ha p.a.).

Further information

Evaluation The positive impact of organic farming on the natural environment and landscape is recognised and backed by numerous studies. This demonstrates the importance of organically farmed areas as elements of the biotope network. Information about conversion and funding opportunities can be obtained from the relevant ministries, authorities and growers' associations.

Information Germany: Organic farming in Rhön: Innovative example of how to ensure sales: <http://www.bionade.de/de/partner-projekte/umwelt/biosphaererhoen/>

Extensive agriculture



Patches of flowering plants can make a contribution to the extensivisation of use in the farmland biotope. © Hermann/ pixelio.de

Involved sectors

Agriculture, Nature protection

Affected habitats

Arable land

Description

Agricultural extensivisation measures include extensive (restriction of intensive crop cultivation, i.e. maize, wheat) and diverse crop rotation (cultivation of at least five different crops per year), reductions in the use of mineral fertilisers and chemical plant protection products, suspension of cultivation during breeding periods, and reduced density of grain sowing. Winter vegetation as well as green strips and patches of flowering plants can make a contribution to the extensivisation of use in the farmland biotope. In the long term, such measures promote the conservation and improvement of ecologically valuable habitats on farmland sites, especially for field breeders and wild herbs on agricultural fields. By upgrading farmland as a habitat, extensivisation measures make an important contribution to the biotope network. Extensively used areas are important insular and stepping stone biotopes, especially in an intensively used agricultural landscape.

Impact

Impact in particular on

Small mammals, Birds, Insects

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

Extensivisation increases the permeability of the landscape matrix and thus decreases the possible barrier effects of farmland.

Improvement or preservation of habitats	Measures for the extensivisation of agriculture improve habitat quality (species richness) and create buffer zones to areas of intensive use.
Element of ecological network	Extensively used areas are important elements of a biotope network. The impact is increased if individual areas are integrated into a network of extensively used spaces (including other biotope types, e.g. meadows).
Other	Supports groundwater and soil protection, protection from erosion.
Time of realisation for measure	Months: The impact of relevant measures starts soon after implementation.
Impact scope	Local (municipality): Local planning of a network of extensively used areas (including grassland) increases the impact of individual extensive areas.
Implementation	
Implementation period	Weeks: Extensive management practices can be well-integrated into land-use management. The aim should be to establish long-term strategies (at least 5 years).
Frequency	Recurring
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): Depending on the measure, subsidies of €50-1000/ha may be available.
Socio-economic impacts	Low: Extensivisation of agriculture also enriches landscape appearance and hence its recreational value.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	Extensivisation measures form part of cultural landscape/countryside management programmes and contractual nature conservation programmes, with appropriate subsidies for specific extensivisation measures.
Further information	
Evaluation	The provision of support for extensive agriculture is an established part of programmes for the conservation of the cultural landscape and contractual nature conservation programmes. Further information about funding conditions can be obtained from the relevant authorities and nature conservation organisations.
Information	Other: All relevant nature conservation and agricultural authorities.

Reduction or targeted use of fertiliser, pesticides and herbicides in agriculture



On fertilized areas biological diversity is often missing. © Thomas Max Müller/ pixelio.de

Involved sectors

Forestry, Water management, Nature protection

Affected habitats

Grassland, Arable land

Description

Appropriately managed agricultural spaces can act as stepping stone biotopes and connecting areas in a biotope network. As a rule, these areas, if they are to fulfil their function, must be managed extensively and in an ecologically compatible way. Non-use, or at least highly targeted use, of fertilisers, herbicides and pesticides encourages the development of appropriate characteristics and, even if no biotope networking strategy is in place, can help to introduce more biological diversity in the landscape matrix.

Impact

Impact in particular on

Insects

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

Large, intensively managed agricultural spaces contribute to landscape fragmentation. Reduction of inputs on these areas or extensivisation, especially with appropriate distribution of the areas concerned, can mitigate this impact.

Improvement or preservation of habitats

Non-use, or at least reduced use, of fertilisers, herbicides and pesticides preserves species diversity and enhances agricultural areas in ecological terms.

Element of ecological network

Especially if embedded in an overall concept, these areas serve as connecting elements and stepping stone biotopes.

Other

Can help to protect the hydrological regime and soils (erosion).

Time of realisation for measure Immediate: The impact of non-use or reduction occurs immediately; the impacts on water and soil are more long-term in nature.

Impact scope Very localised (plot): The impacts can be felt on the area concerned and in the locality (biodiversity).

Implementation

Implementation period Days: Generally entails a reduced workload.

Frequency Recurring

Economic and legal aspects

Costs Very low (less than 1'000 EUR): Cost savings result from reduced use; possibility of subsidies.

Socio-economic impacts High: Positive impacts on water, soils, health. Farmers may experience reduced yields.

Sources of financing Other private sources, Public: local, Public: regional, Public: national, Public: European

Legal situation The use of fertiliser, pesticides and herbicides in agriculture is regulated by legislation pertaining to agriculture and nature conservation.

Further information

Evaluation As part of biotope networking projects, these measures are only genuinely effective with proper planning and the involvement of many farmers. In Switzerland, however, positive experience has been gained in a number of projects, although compensation payments for farmers also play an important role here.

Information Switzerland: Agricultural and nature conservation authorities, e.g. in Switzerland: <http://www.bafu.admin.ch/>

Species-Rich Grassland Programme



A list of meadow flowers enables to identify extensive species-rich grassland.
© Rainer Sturm/ pixelio.de

Involved sectors

Agriculture, Tourism and leisure

Affected habitats

Bogs and fens, wetlands, Grassland

Description

The species inventory of a grassland reflects the way in which it is managed and its location. If the management method remains unchanged, the species composition will generally remain unchanged as well. This correlation opens up the opportunity to link subsidies for extensive grassland to the occurrence of key species of flora. In order to implement this innovative, results-oriented approach, a list of meadow flowers serves as a simple tool for reliable identification of extensive species-rich grassland. Promotion depends on the occurrence of certain easily identifiable plant species (indicator plants). Participating farmers undertake to preserve the species richness of their grasslands (meadows and pasturage). Farmers retain the choice of practices and resources to be used, so that biodiversity is not seen as a constraint: it calls upon their technical skills and sense of responsibility. They are also sensitised to issues such as nature conservation and biodiversity.

Impact

Impact in particular on Insects

Ecological impact

Improvement or preservation of habitats	With appropriate extensive management of meadows, species diversity of fauna as well as flora is increased.
Element of ecological network	With a sufficient number of areas and appropriate distribution as part of a biotope networking strategy, these meadows can become core and connecting elements of a biotope network.

Time of realisation for measure	Months: The positive impact on flora and fauna continues throughout the vegetation period.
Impact scope	Very localised (plot): The management method only has a direct impact on the plot concerned. For a corresponding impact in a biotope network, areas managed in this way must be appropriately distributed in line with an overall concept.
Implementation	
Implementation period	Days: To achieve the stated goal (species richness), extensivisation of agriculture is generally required, which also reduces workload.
Frequency	Non-recurring, Recurring: Long-term programmes desirable, but a single implemented measure can be effective.
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): In the Regional Natural Park (PNR) of the Massif des Bauges in France, for example, the contract is remunerated with € 89/ha in all participating areas.
Socio-economic impacts	High: If tourism professionals are involved, this measure can add value to tourism (local products, flowering landscape, events such as meadow management competitions).
Sources of financing	Public: regional, Public: national, Public: European
Legal situation	Voluntary participation by farmers in the measure.
Further information	
Evaluation	The Species-Rich Grassland Programme has been under way in Baden-Württemberg (Germany) since 2002 and has proved very successful. Here, more than 10,000 farmers have participated in the scheme, which is funded by the MEKA II and III programmes. In France, a total of eight natural parks are experimenting with similar programmes. Experience in the Regional Natural Park (PNR) of the Massif des Bauges has been very positive, both from the farmers' and the Park's perspective.
Information	Other: Oppermann R., Gujer H.U. (ed.) (2003): Artenreiches Grünland bewerten und fördern - MEKA und ÖQV in der Praxis. Ulmer, 199 p.
Contact	France: Parc naturel régional du Massif des Bauges; contact: Philippe Mestelan

Good Practice

[Project in the Regional Natural Park \(PNR\) of the Massif des Bauges, France](#)

[Exemple du Parc naturel régional « Massif des Bauges », France](#)

[Misura nel Parco naturale regionale “Massif des Bauges”, Francia](#)

Agricultural field margin projects



Agricultural field margin with wild herbs. © Jan Freese/ pixelio.de

Involved sectors

Agriculture, Tourism and leisure, Nature protection

Affected habitats

Arable land

Description

Agricultural field margins are managed strips, a few metres wide, along agricultural fields. They are cultivated without the use of pesticides so that wild herbs and the fauna adapted to them are able to disperse and survive. In some cases, the strips are sown with a mixture of flowering plants (“blossoming belts”) or planted with shrubs and trees. The agricultural field margins not only provide a habitat for rare species of plant and contribute to the protection of soils and water resources; they also constitute important linear transit routes and form buffer zones between various forms of use.

Impact

Impact in particular on

Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Improvement or preservation of habitats

They form buffer zones between various forms of use, especially along well-used field paths and adjacent to ecologically valuable biotopes, and provide habitats for rare species.

Element of ecological network

Along fields and paths, the field margins form a network of linear connecting elements. Inclusion of these areas in local plans increases this impact significantly.

Other

On soils at risk of erosion or on cropland near waterways, positive impacts can be achieved in terms of soil and water protection and lowering of flood peaks.

Time of realisation for measure

Months: Field margins provide habitats all year round. Their main role, however, occurs after the cultivation of the fields in the vegetation period, when the wild herbs on the agricultural fields have achieved full growth.

Impact scope

Very localised (plot): The development of a local plan for the creation of agricultural field margins can greatly increase the impact of the measure by integrating individual sites into a broader network.

Implementation

Implementation period

Days: The management and development of field margins can be well-integrated into routine land management. It is important to select site-appropriate species and to use indigenous seeds and plants of local origin.

Frequency

Non-recurring, Recurring: Long-term programmes are desirable, but an individual measure can be effective as well.

Economic and legal aspects

Costs

Very low (less than 1'000 EUR): The subsidy rates are established regionally. They mainly cover the loss of revenue resulting from set-aside and possible costs of seeding.

Socio-economic impacts

Medium: With their net-like structure in cleared agricultural landscapes, they create an appealing and diverse landscape appearance with increased recreational value.

Sources of financing

Public: local, Public: regional, Public: national, Public: European

Legal situation	Agricultural field margin projects exist in numerous regions. Regional or local guidelines specify the funding rates, application process, conditions for participation, contract period, monitoring procedures, sanctions etc.
Further information	
Evaluation	Implementation of the projects often fails due to excessive red tape. In many regions, however, these projects are being implemented very successfully, also as part of biotope networking initiatives, and adding value to tourism.
Information	Germany: Further information can be obtained from regional agencies (nature conservation and agriculture), e.g. in Baden-Württemberg (Germany).

Preservation, maintenance and replanting of hedges



Hedges are linear connecting elements of the biotope network © Yann Kohler

Involved sectors

Agriculture, Water management, Hunting, Spatial planning, Tourism and leisure, Nature protection

Affected habitats

Bogs and fens, wetlands, Grassland, Arable land

Description

Hedges are linear biotopes. They contribute to biodiversity and biotope connectivity, especially in heavily cleared landscapes with a small amount of, or no, forest or grassland. A healthy hedge with structural diversity provides a habitat for a large number of animals and is an important transit route for numerous small mammals and insects during migration and dispersion and when searching for food. Nowadays, hedgerows have virtually no commercial use and the trimming required for their regeneration tends not to take place. This means that a conscious decision must be taken to maintain the hedgerows as part of a biotope network as ageing hedges accommodate a far smaller number of species.

Impact

Impact in particular on

Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

In cleared agricultural landscapes with large fields and land surfaces, hedges, as transit routes and ecological corridors, can reduce the fragmenting effect of the agricultural land.

Improvement or preservation of habitats

Hedges are very important habitats for numerous birds, insects, amphibians, spiders and also some species of mammals.

Element of ecological network

Due to their linear form, they act as 'transit routes' for birds and bats, for example, and in most cases, they are the only way for reptiles to survive migration. In a biotope network, e.g. with rock fragment piles or small bodies of water, the valuable ecological impact of hedges is increased further by spatial contact with other species.

Other

Hedges have a stabilising effect on the surrounding agricultural landscape, provide visual cover and some noise insulation and are thought attractive by people. They differ greatly from their surroundings in terms of exposure to sunlight, evaporation, temperature, soil moisture, air humidity and wind exposure.

Time of realisation for measure

Months: Depending on the type of hedge and technique used, replanted hedges take different amounts of time to fully develop and become populated by fauna. Their function as transit structures can be fulfilled relatively quickly.

Impact scope

Very localised (plot): The direct impact of hedges is very localised, however they can also gain regional importance when integrated in a biotope system.

Implementation

Implementation period

Days: To allow them to regenerate, the shrubs forming the hedges must be trimmed in sections every 10 to 20 years depending on the type of shrub. The margin must be maintained every 1 to 2 years.

Frequency

Recurring: Hedges must be maintained or cut back over the years.

Economic and legal aspects

Costs

Low (1'000-10'000 EUR): Costs vary greatly depending on the different maintenance and planting or construction techniques.

Socio-economic impacts

Medium: Provision of wood without using any additional land, creation of regional value-added chains, preservation of yield increases from land near hedges, enhancement of the landscape for tourism.

Sources of financing

Private sponsor, Other private sources, Public: local, Public: regional, Public: national, Public: European

Legal situation

In many regions the preservation, maintenance and replanting of hedges are supported by nature conservation or agricultural subsidies.

Further information

Evaluation

The positive impact of hedges in biotope network projects has been described in numerous scientific studies, whereby account must be taken of the objective of these biotope network projects here. Such investigations and strategies to maintain and valorise hedge landscapes exist in the Champsaur Valley, at the edge of the Ecrins National Park in France, for example.

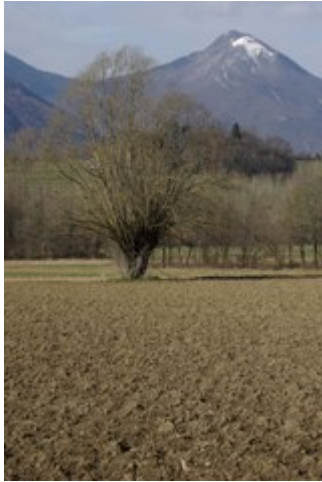
Information

Other: Nature conservation societies, nature conservation departments in authorities, numerous regional biotope network projects (e.g. the Grand Marais (Grosses Moos) biotope network: <http://www.biotopverbund.ch/>)

Contact

Other: "Grosses Moos" project leader: Martin Johner Head of Scientific Department, Ecrins National Park: Richard Bone

Planting of individual trees or tree groups



In agricultural landscapes, individual trees or tree groups act as stepping stones.
© Yann Kohler

Involved sectors

Agriculture, Spatial planning, Nature protection, Transport

Affected habitats

Grassland, Arable land

Description

Individual trees and small tree groups are a key element of the landscape and have high ecological significance. They provide habitats and refuge for many different animal species and are therefore valuable stepping stones in the biotope network. They also enrich the appearance of the landscape (e.g. by visually enhancing large areas of farmland) and increase its recreational value (e.g. by providing shade for seating areas). Due to their cultural and historical value, too (e.g. as symbols of peace, or where they had a role in the execution of justice), individual trees have landscape significance. Old trees in particular should be preserved in farmland, one reason being that their cavities provide particularly valuable micro-habitats. The planting of new trees should also be supported. Trees with a trunk circumference of at least 12-14 cm should be planted, and should be well-adapted to the chosen site.

Impact

Impact in particular on Small mammals, Birds, Insects

Ecological impact

Improvement or preservation of habitats	Individual trees enhance the surrounding landscape and provide an important habitat for numerous species of fauna.
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Element of ecological network	In open countryside and agricultural landscapes, individual trees constitute valuable stepping stones and thus play an important role in connecting isolated near-natural landscape elements.
Other	Beneficial to local climate.
Time of realisation for measure	Years: Newly planted trees develop their function in the biotope network with increasing age.
Impact scope	Local (municipality): Individual trees play an important role as stepping stones in the local biotope network.
Implementation	
Implementation period	Weeks: Prior to planting, meticulous planning is required; maintenance is essential after planting.
Frequency	Non-recurring: In addition, regular maintenance of the trees is needed.
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): Funding can be provided in some regions for individual trees and rows of trees on arable land (approx. € 20/tree); costs depending on size amount to approx. € 100-400/tree; cost of maintenance € 40-100/tree/year.
Socio-economic impacts	Low: Individual trees and groups of trees are valuable landscape-enriching elements and sources of food (fruit, blossom for tea) and of timber and fuelwood.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	In most regions, particularly large and ancient individual trees are often designated "natural monuments" or "protected landscape elements".
Further information	
Evaluation	The major importance of individual trees and groups of trees for nature conservation is apparent, inter alia, from their designation as protected landscape elements or natural monuments. Their importance for the biotope network is recognised and they are often promoted/protected within the framework of biotope network initiatives. They are also suitable as an element of an inner-city biotope network.
Information	Germany: More information can be obtained from the responsible nature conservation agencies and at: http://www.landwirtschaft-mlr.baden-wuerttemberg.de/servlet/PB/menu/1109685/index.html/

Creation and maintenance of dry stone walls



Walls made from rock fragments are important structural elements of the landscape.
© Yann Kohler

Involved sectors

Agriculture, Spatial planning, Nature protection, Local population/citizens

Affected habitats

Shrubs and wooded areas, Bogs and fens, wetlands, Grassland, Arable land

Description

Dry stone walls are traditional landscape elements. They provide various types of habitat depending on their specific micro-climate, especially for thermophilous (warmth-loving) open-country species. The cracks in the walls, which are filled with fine earth, provide specific micro-habitats in which various plant communities and wild flora occur. Dry stone walls are also important habitats for insects, reptiles and amphibians, and provide breeding sites for birds (e.g. wheatears (*Oenanthe*), Black Redstart (*Phoenicurus ochruros*), Blue Tit (*Cyanistes caeruleus*), and Great Tit (*Parus major*)). They constitute valuable stepping stones and insular biotopes in the agricultural landscape and due to their linear structure, have a connective effect. Other near-natural structures such as pioneer areas and margins should also be preserved along dry stone walls.

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Improvement or
preservation of habitats

Promotion of typical plant species such as algae, lichens and mosses, moths and snails. Quiet areas and winter quarters for invertebrates and reptiles. Some species of wild bee (mason bee - *Chalicodoma siculum*) nest in the cracks in the walls.

Element of ecological
network

Dry stone walls often have a corridor function and are important for connectivity. Their significance increases when linked to other near-natural landscape structures and they can, among other things, enhance structurally rich forest edges.

Time of realisation for measure	Immediate: Dry stone walls can be populated immediately after construction.
Impact scope	Local (municipality): Due to their impact as a stepping stone biotope, dry stone walls also play a role in regional biotope networks.
Implementation	
Implementation period	Weeks: The construction of new walls takes place from November to March, and damage is then monitored every year. Heavily overgrown walls should be partially cleared of shrubs, at least half of the wall should be left to grow wild and loose growth should be tolerated.
Frequency	Non-recurring: Regular maintenance of existing or new stone walls is needed.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Depending on the quality of the stones (one tonne per continuous metre), a new construction costs in the region of €310-470 per m ² (excluding excavation works), time expenditure: 2-4 m/day with experienced workers.
Socio-economic impacts	Low: With appropriate subsidies, the additional costs for building and maintaining dry stone walls will be low.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	Subsidies for dry stone walls are possible through countryside management programmes and also within programmes for steep slopes (e.g. viticulture).
Further information	
Evaluation	Dry stone walls are regarded as important structural elements of the landscape and provide habitats for various species of flora and fauna. Their importance in the biotope network is increased when linked to other suitable near-natural landscape structures.
Information	Other: e.g. BirdLife: http://birdlife.ch/sites/default/files/documents/trockenmauern.pdf or: http://www.landwirtschaft-mlr.baden-wuerttemberg.de/servlet/PB/menu/1063566/index.html
Contact	Switzerland: Schweizer Vogelschutz SVS/BirdLife Schweiz

Creation, maintenance and preservation of rock fragment piles



Walls made from rock fragments are important structural elements of the landscape. © Yann Kohler

Involved sectors

Agriculture, Hunting, Nature protection, Local population/citizens

Affected habitats

Bogs and fens, wetlands, Grassland, Arable land

Description

Rock fragment piles are important structural elements of the landscape. From a nature conservation perspective, they constitute valuable stepping stones and insular biotopes in the agricultural landscape. A wide diversity of flora and fauna (insects, spiders, amphibians, reptiles and even small mammals) depend on these man-made habitats as their original habitats have disappeared in today's cultural landscape. These ecologically valuable structural elements must therefore form a key part of future landscape planning. As far as possible, the rock fragment piles should be created near waysides or forest edges or by hedgerows, not in an isolated position, in order to safeguard connectivity with a biotope network. Management involves occasional clearing of vegetation and, if necessary, re-stacking.

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Improvement or
preservation of habitats

Rock fragment piles provide resting places and habitats for various species of animals, as well as frost-proof winter quarters: the sand lizard (*Lacerta agilis*), the white wagtail (*Motacilla alba alba*), various species of mouse and also ground beetles, spiders, woodlice, snails, ants, bugs and wild bees.

Element of ecological network	Rock fragment piles constitute valuable stepping stones and insular biotopes in the agricultural landscape. In a biotope network with a hedge, for example, a spatial contact is produced and the valuable ecological impact is increased further.
Other	If the rock fragments are piled in a linear form, rock fragment walls emerge, which can be important as corridors.
Time of realisation for measure	Immediate: Rock fragment piles can be populated immediately after construction.
Impact scope	Very localised (plot): Most of the species that inhabit rock fragment piles have relatively small ranges. As a stepping stone biotope, however, rock fragment piles also have a part to play in a local biotope network.
Implementation	
Implementation period	Days: Building and maintaining rock fragment piles do not take very long. Occasionally they have to be cleared of vegetation and may have to be re-stacked.
Frequency	Non-recurring: Existing rock fragment piles need regular maintenance.
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): The construction and maintenance of rock fragment piles are not expensive (a few hours of work per year). Subsidies amount to approx. €25 per rock fragment pile.
Socio-economic impacts	No direct impact
Sources of financing	Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	In many regions, rock fragment piles are protected by law. Their conservation is supported by nature conservation and/or agricultural subsidies.

Further information

Evaluation

The ecological importance of rock fragment piles for various species of flora and fauna has been recognised. Their significance in an ecological network comes mainly from the interaction with other landscape structures (hedges, streams, ponds, rock fragment walls etc.). They must also be integrated meaningfully into an overall strategy.

Information

Other: From various nature conservation organisations, the Nature and Biodiversity Conservation Union (NABU), the Federation for Environment and Nature Protection in Germany (BUND), Pro Natura, the French nature conservation organisation FRAPNA,...; and from the various regional administrations (nature conservation and agriculture departments).

Maintenance and preservation of mixed orchards



Mixed orchards are extremely species-rich habitats which require regular. © Yann Kohler

Involved sectors

Agriculture, Tourism and leisure, Nature protection, Municipalities

Affected habitats

Grassland, Arable land

Description

Mixed orchards are a characteristic and attractive feature of the cultural landscape in many Alpine regions and are among the most valuable patch biotopes. Due to the structural diversity in mixed orchards and the resulting diverse mosaic-type habitats, they provide a habitat for a wide range of species of flora and fauna. Scientific studies have shown that mixed orchards – unlike modern dwarf-tree intensive production systems – form very richly structured habitats with species-rich communities. As a result of their declining economic significance, and being fairly high-maintenance, however, more and more mixed orchards have been cleared in recent decades or have fallen victim to ageing. However, in intensively used agricultural landscapes, they constitute important connective structures in the local biotope network. The conservation measures for these areas must include arrangements for mowing, fertilising, management and maintenance, the preservation of ageing trees, etc.

Impact

Impact in particular on Small mammals, Big mammals, Reptiles, Birds, Insects

Ecological impact

Improvement or preservation of habitats	Mixed orchards constitute habitats that are particularly rich in structures and species due to the diverse fruit varieties, the varying tree maturities and the various structures associated with meadows with an abundance of species and flowers. They accommodate up to 5000 species of flora and fauna.
Element of ecological network	They constitute important connective structures in the local biotope network, particularly in intensively used agricultural landscapes.
Other	Mixed orchards have a positive impact on the local climate due to their windbreak function and their cooling effect in summer. Soil protection and water pollution control, conservation of genetic diversity.
Time of realisation for measure	Long term: Their positive impact on flora and fauna comes mainly from their structural diversity: in the case of replanted orchards, this only occurs with time and in existing orchards it is only possible with regular, expert maintenance.
Impact scope	Local (municipality): In itself, a mixed orchard has a high ecological value as a patch biotope, which is increased significantly when it forms part of a network comprising several nearby areas.

Implementation

Implementation period	Weeks: The requisite expert maintenance of mixed orchards comprises several different and regular tasks throughout the year (mowing, pruning, harvesting, tree management, ...)
Frequency	Recurring: Regular maintenance is needed for valuable stands of trees.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Replanting costs in the region of €2500-5000/ha depending on the planting method, preparatory measures, tree density etc. Depending on the land, number of trees and working time, subsidies or aid are granted for product marketing, which vary greatly from region to region.
Socio-economic impacts	Medium: On tourism through the enhancement of the landscape, on the regional economy and identity through local products (labels, old fruit varieties, juice etc.)
Sources of financing	Private sponsor, Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	The Birds Directive and the Habitats Directive deal indirectly with the mixed orchard habitat. They specify a direction while the concrete implementation is based on the precise provisions of national laws, guidelines, promotion programmes and initiatives (in Bavaria, subsidies of approx. €5/tree, max. 100 trees/ha).
Further information	
Evaluation	Various projects within the framework of the 'BayernNetzNatur' (Bavarian Nature Network) biotope network have shown that initiatives relating to mixed orchards not only have positive effects on the inhabitant flora and fauna, but also play an important role in issues such as regional value-added and development, the formation of regional networks, creation of identity etc., and that biotope network projects can be structured around such 'core initiatives'.
Information	Germany: From regional and national authorities (nature conservation, agriculture) and, for example, the "Streuobst 2000 Plus" initiative from the Bavarian agricultural authority to promote the cultivation of mixed orchards in Bavaria.
Contact	Germany: Expert: Stefan Kilian, Bavarian State Research Center of Agriculture, Institute for Agricultural Ecology, Organic Farming and Soil Protection (LFL-IAB)

Encouragement of unpaved paths



Unpaved, greened paths have a greatly reduced barrier effect. © Yann Kohler

Involved sectors

Agriculture, Forestry, Spatial planning, Tourism and leisure, Nature protection, Transport

Affected habitats

Forest, Grassland, Arable land

Description

Depending on their type and the way in which they are built, paths can have a low to high barrier effect. Pathway systems and their peripheral areas do not necessarily have a fragmenting effect on species of flora and fauna, however: if properly designed, they can also form important elements of the biotope network. They provide ways through the landscape and also form buffer zones to intensively farmed areas. From an ecological perspective, unpaved and “greened” paths and the strips of grass and vegetation, wooded areas, hollows, ditches etc. at their margins are extremely important. If the construction of new pathways is unavoidable, the need for sufficiently wide wayside areas should be taken into account during the planning process (at least 2.50 m wide grass and vegetation strips, at least 5 m wide wooded strips along pathways). Sunken paths and 'greened' dirt tracks, too, have diverse ecological functions as they provide many niches for flora and fauna with highly diverse requirements.

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Reduction of
fragmentation or creation
of new valuable habitats

Reduction of the barrier effect of paths for insects (e.g. beetles and spiders)

Improvement or preservation of habitats	Unpaved paths are important for some bird species as well as brown hares (<i>Lepus europaeus</i>). Wet sites by paths are used by some species, e.g. as spawning areas for the yellow-bellied toad (<i>Bombina variegata</i>) or as a source of nesting material.
Element of ecological network	Unpaved paths constitute important elements of a biotope network, particularly in cleared agricultural landscapes, due to their linear structure, the valuable micro-habitats they provide and their margin and border areas.
Time of realisation for measure	Months: The new habitats created by the unpaved paths, or the near-natural design of existing pathways, are populated quickly.
Impact scope	Very localised (plot): In principle, the impact is more localised, but the measure can gain regional importance with a large scale approach.
Implementation	
Implementation period	Weeks: The implementation periods of suitable measures depend on the situation at the outset. The measures can be integrated easily into new pathway projects.
Frequency	Non-recurring
Economic and legal aspects	
Costs	Medium (10'000-100'000 EUR): The exact costs depend on the situation at the outset, and subsidies from countryside management programmes are sometimes possible.
Socio-economic impacts	Low: Unpaved paths are also more attractive for recreational use (hiking, mountain biking) and therefore have a high touristic value.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	The design of pathways is not directly governed by any laws, but the creation of near-natural pathways can be supported through close collaboration with the agriculture and forestry sectors, as well as through landscape planning (developing guiding principles).

Further information

Evaluation

Some examples show that, after the 'greening' of paths, there are more frequent occurrences of animals such as rabbits/hares, butterflies and bees and even songbirds and birds of prey. Unpaved and 'greened' paths can also be advantageous for farmers as, in the long term, they can reduce the costs of controlling insects and mice in their fields. Diverse experiences have been made, e.g. in countryside management associations or nature conservation authorities. In Upper Austria, the preservation and development of paths with little paving have been defined as overarching goals in landscape planning.

Information

Austria: Upper Austria: http://www.land-oberoesterreich.gv.at/cps/rde/xchg/ooe/hs.xsl-/70510_DEU_HTML.htm

Contact

Austria: e.g. Office of the Government of Upper Austria, Department of Spatial Planning, Economic and Rural Development, Nature Conservation Division

Maintenance and restoration of traditional irrigation systems



Artificial water transportation systems are important landscape elements.

© Zaubervogel/ pixelio.de

Involved sectors

Agriculture, Water management, Spatial planning, Tourism and leisure, Nature protection

Affected habitats Grassland, Arable land

Description

As early as the Middle Ages, complex irrigation systems were created in various Alpine regions with low precipitation, in order to bring water from the mountains to the farmed areas in the valleys, often at some distance away. These artificial water transportation systems, often many kilometres in length (e.g. the “suonen” channels in Valais, Switzerland, the “acquedotti” in Val di Non (Trentino/Italy) and the “waale” in South Tyrol) are important landscape features with great significance for various associated habitats (lines of trees, mosaics of wet, semi-dry and dry sites). The conservation, restoration and maintenance of these elements are supported on a project basis or through the payment of maintenance premiums.

Impact in particular on Amphibians, Birds, Insects

Ecological impact

Improvement or
preservation of habitats

As a result of the abandonment of the irrigation systems, pipe installation and the use of sprinkler systems on farmland, important landscape structures and habitats that act as corridors or stepping stone biotopes in a functional ecosystem (e.g. lines of deciduous trees on dry slopes) are disappearing.

Element of ecological
network

Due to their net-like structure, the irrigation systems form linear connecting elements in a biotope network.

Time of realisation for measure	Long term: This is a long-term measure whose initial outcomes can only be observed after several years as the associated flora and fauna only gradually become established and habitats take time to recover and develop.
Impact scope	Local (municipality): These measures are mainly suitable for implementation in regions where such irrigation systems and channels exist. Depending on the size of the system, the measures may affect individual municipalities or entire regions.
Implementation	
Implementation period	Months: Maintenance, repair and management measures are long-term activities.
Frequency	Recurring: Requires implementation of long-term measures.
Economic and legal aspects	
Costs	Medium (10'000-100'000 EUR): In South Tyrol, for example, maintenance of the "waale" receives an amount up to a maximum of 70% of recognised projected costs.
Socio-economic impacts	Medium: In the tourism sector, may be marketed successfully as part of a hiking trail concept (e.g. the Waalweg paths in South Tyrol).
Sources of financing	Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	The management and restoration of traditional irrigation systems are funded by agricultural and/or nature conservation programmes in various areas.
Further information	
Evaluation	Experience has been gained in South Tyrol, which has the most extensive system in the Alpine region, Valais, Switzerland, and elsewhere.
Information	Other: Information about contributions to landscape management in South Tyrol: Amt für Natur- und Landschaft (Office of Nature and Landscape) http://www.provinz.bz.it/natur/ Project: "Kulturlandschaft Zeneggen 2000" (Cultural Landscape Zeneggen 2000) http://www.zeneggen.ch/
Contact	Italy: e.g. Amt für Natur- und Landschaft (Office of Nature and Landscape), South Tyrol

Grazing projects - landscape conservation with sheep



Traditional pasturing with sheep cultivates areas in a sustainable way. © www.sxc.hu

Involved sectors

Agriculture, Tourism and leisure, Nature protection, Other: Countryside management, Associations, Districts and other local authorities

Affected habitats

Bogs and fens, wetlands, Grassland

Description

For a biotope network with nutrient-poor and dry sites, sheep grazing plays a key role. Due to their lack of economic viability using conventional cultivation methods, there is often a risk that these valuable biotopes will cease to be managed and maintained. Furthermore, these areas are in many cases being drastically reduced, with remaining oligotrophic grasslands often becoming isolated. Site gradients are being lost, successional processes terminate at stages of maturity, and there is a lack of new pioneer sites. Traditional grazing using sheep can ensure the sustainable management of these sites. To this end, testing and development of practicable area management methods are required in cooperation with sheep farmers and landowners.

Impact

Impact in particular on

Insects

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

Tests using plant seeds have shown that the diaspores can be found in sheep's wool for a period of several months. Species and gene exchanges can take place in this way, or a new population of a species can occur, even between areas that are kilometres apart.

Improvement or preservation of habitats

In grazed areas, certain plant species are promoted through the browsing and feet of the sheep while others are decimated. Overall, these processes are more dynamic than mowing. Bush encroachment is prevented in these areas.

Element of ecological network	Grazing performs an important function in the biotope network. Flocks of sheep can promote the dispersion of species between individual areas by transporting diaspores and, in rarer cases, even small animals. This can be very important for the exchange of genes and species between isolated areas.
Time of realisation for measure	Immediate: The direct impact of the grazing on the land, as well as the indirect impact from the transport function performed by the sheep, occur immediately after grazing is commenced.
Impact scope	Regional: Regional strategies must be produced to enable sufficient grazing land to be provided for the sheep and achieve connectivity effects through migratory grazing.
Implementation	
Implementation period	Months: During the vegetation period, the flocks of sheep are herded along tracks from one area requiring treatment to the next in accordance with a fixed grazing plan.
Frequency	Recurring: Optimal solution: integrate in a long-term regional grazing concept.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): The costs of sheep grazing are around €175-385/ha/year.
Socio-economic impacts	High: The products from sheep farming (wool, meat, dairy products) provide regional value-added. Sheep farming jobs are created.
Sources of financing	Private sponsor, Other private sources, Public: local, Public: regional
Legal situation	Grazing can be supported at local and regional level by means of contract-based nature conservation and maintenance premiums (approx. €160-260/ha/year).
Further information	
Evaluation	Plants and animals use sheep for transport. A roving flock of sheep can reduce isolation effects in many ways: on the one hand, the tracks create connectivity between the areas, and on the other, the wandering flock of sheep can act as a living biotope network by transporting various organisms in their wool or hooves.
Information	Germany: e.g. the grazing strategy from the Bavarian Environment Agency in the Lech valley (http://www.lfu.bayern.de/)
Contact	Germany: 'Lebensraum Lechtal (the habitat of the Lech valley) project management: http://www.lebensraum-lechtal.de/

Maintenance of open areas by controlled burning



Targeted and expert “controlled burning” can help to preserve an open landscape. © Yann Kohler

Involved sectors

Agriculture, Nature protection, Other: Countryside management associations

Affected habitats

Grassland

Description

Open-country habitats such as embankments in wine-growing areas or terraced landscapes, dry grasslands, heaths or peat bogs are ecologically valuable areas. However, as they are often only of marginal suitability for agricultural use, and are costly and time-consuming to maintain, they are at risk from bush encroachment or the occurrence of problematical vegetation (e.g. Goldenrod (*Solidago virgaurea*) and blackberry). This impacts on the appearance of the landscape and on the ecological functionality of these areas. The maintenance of these areas through controlled burning may be a viable and cost-effective option here. However, this management technique will only be successful, from a nature conservation and technical perspective, if the personnel undertaking the measure are properly trained, as practical implementation of controlled burning requires strict adherence to procedural guidelines.

Impact

Impact in particular on Small mammals, Insects

Ecological impact

Improvement or preservation of habitats	Burning as a method of managing embankments and other sites helps to maintain an open landscape and therefore also open-country habitats such as dry grasslands, sandy dry vegetation, montane dry grasslands, heath and peat bogs.
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Element of ecological network	Open linear spaces such as embankments in managed cultural landscapes form complex networks which can act as connecting elements in a biotope network. Patches of woodland and shrubs increase this effect.
Time of realisation for measure	Immediate: The regeneration and recolonisation of the managed areas take place during the vegetation period. Once the area offers some cover, it can be used as a corridor.
Impact scope	Very localised (plot): When individual sites are managed in this way, the impact remains very localised. However, if several spaces undergo this form of management as part of a broader strategy, important stepping stone biotopes and connecting elements are created.
Implementation	
Implementation period	Days: Controlled burning on specific areas is very swift. However, this management measure should be embedded in a local or regional strategy, and depending on the number of sites to be managed, may be fairly time-consuming.
Frequency	Recurring: To ensure this in the long run, burning must be repeated over a number of years and must be part of an overall concept.
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): The costs of controlled burning amount to approx. ca. € 50-150/ha, so generally, it is up to 50% cheaper than other management options.
Socio-economic impacts	Low: In areas with a structurally rich, open cultivated landscape, controlled burning can help to preserve the landscape appearance. Savings made due to lower implementation costs.
Sources of financing	Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	Burning must comply with local nature conservation and agricultural legislation.

Further information

Evaluation

The outcomes of trials in Baden-Wuerttemberg, for example, which have been carried out for around 25 years, indicate that controlled burning has a role to play in maintaining open grasslands, their structure and species diversity. However, ensuring that farmers comply with the guidelines on controlled burning may be problematical and may lead to conflicts with nature conservation objectives and the local community.

Information

Germany: Global Fire Monitoring Center (GFMC)
<http://www.fire.uni-freiburg.de/>

Contact

Germany: Prof. Dr. Johann G. Goldammer, Head of Fire Ecology Research Group, University of Freiburg

Tree maintenance and preservation of pollarded trees



A freshly pollarded willow. © Yann Kohler

Involved sectors

Agriculture, Water management, Nature protection, Local population/citizens

Affected habitats

Shrubs and wooded areas, Grassland, Arable land

Description

Pollarded willows are characteristic elements of the landscape in various Alpine regions. The unusual shape of the heads of the trees is created when the young trunks and main branches are cut back to promote a more bushy growth of foliage. At the head of the trunk, cavities are formed over time, and in the branches, the bark and especially the cavities, numerous species find a habitat and niches in which to breed. As many as 200 species of fauna can occur in the willows found in intact river meadows, for example. In the past, pollarded willows provided a source of wood, e.g. for fencing, shafts for tools, bindings for wine, basket-making etc., but they have no current value from this perspective today. In the context of large-scale agriculture, too, stands of pollarded willows are often regarded as a nuisance and are therefore removed. The management of pollarded willows is time-consuming and labour-intensive, and if they are not maintained, the trees often break apart. In networks of interlinked biotopes, they constitute important stepping stones and transit routes.

Impact

Impact in particular on Birds, Insects

Ecological impact

Improvement or preservation of habitats	Regular cutting of the willows results in rapid thickening of the trunk, with areas of decay and cavities developing at the upper end as the years pass. In the cracks, niches and hollows of these old stands of pollarded trees, numerous species of small mammals, insects and birds etc. find a habitat and niches in which to breed.
Element of ecological network	As linear structures, e.g. along small watercourses, they can act as transit routes. As isolate trees they form important stepping stones in the cultural landscape.
Other	Pollarded willows are suitable for use to reinforce ditches and banks and can thus replace masonry in the rehabilitation of watercourses to some extent.
Time of realisation for measure	Immediate: Pollarded trees develop their habitat and stepping stone biotope function with increasing age.
Impact scope	Very localised (plot): As part of a local or regional strategy for the management of the pollarded trees, the biotope networking impact can be substantially increased.

Implementation

Implementation period Days: Caring for the trees is time-consuming and labour-intensive. Managing a large number of trees is likely to be fairly time-consuming. Regular cutting only takes place every 8-10 years, however, so that the management can be spread over a number of years.

Frequency Recurring: The characteristic shape of pollarded trees will result from regular pruning every 5-20 years.

Economic and legal aspects

Costs Very low (less than 1'000 EUR): Subsidies can amount to around € 25-30 per tree.

Socio-economic impacts Medium: Pollarded willows provided a source of wood, e.g. for fencing, shafts for brooms, bean poles, bindings for wine, basket-making, firewood, etc.. This has decreased in significance but is now being revived in local projects. The wood is used in schools and kindergartens as a material to build play tunnels, lattice fencing, etc. Willow rods can also be used in private gardens and for reinforcing banks in "green" hydraulic engineering.

Sources of financing Other private sources, Public: local, Public: regional, Public: national, Public: European

Legal situation Management, maintenance and new planting of pollarded willows are subsidised in various Alpine regions. In some regions, these trees enjoy protect status as significant elements of the cultural landscape.

Further information

Evaluation Pollarded trees are important and particularly striking features of a cultural landscape and are closely linked with various traditional forms of use. For that reason, in addition to their ecological function, it is important to integrate them into biotope networking strategies. They can develop symbolic significance for entire projects (see project run by Burgenland Society for Nature Conservation).

Information Other: Braun, Konold (1998): Kulturgeschichte und Bedeutung der Kopfweiden in Südwestdeutschland. Beiheft 89, Veröffentlichungen für Naturschutz und Landschaftspflege in Baden-Württemberg. 240 p.

Contact Austria: e.g. Pollarded tree project run by Burgenland Society for Nature Conservation: <http://www.naturschutzbund.at/burgenland/>

Forestry

Creation of forest reserves



Cross-linked forests are important for a biotope network. © Maja Dumat/ pixelio.de

Involved sectors

Agriculture, Forestry, Nature protection

Affected habitats

Forest

Description

Areas of woodland which are particularly valuable in nature conservation terms are important elements of a biotope network; these include areas with remnants of potential natural vegetation, old-growth forest, coppice forest and special sites (river-meadow and humid forests, gorges, steep slopes). Natural forest reserves can constitute an important tool in maintaining a representative network of forested areas of appropriate quality. Here, the various stages in the development of forest structures and their typical fauna and flora can be maintained, without use, in the various natural forest communities and habitat types. They also act as significant biotopes or stepping stones in a more or less non-natural environment (especially forests on valley floors, (former) river-meadow forests).

Impact

Impact in particular on Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Improvement or preservation of habitats The maintenance of near-natural forested areas without use improves habitat quality for typical and in some cases rare species of fauna (natural processes of forest dynamics, typical species inventory). Forested areas with low levels of disturbance and fragmentation are maintained.

Element of ecological network With close connectivity with other valuable habitats (dry meadows, fens, high bogs, flood plains), forest reserves act as significant biotopes, stepping stones or connecting corridors in a more less non-natural environment.

Time of realisation for measure Years: Depending on the starting conditions in the forest stand, a near-natural state may have to be established first.

Impact scope Local (municipality): Local planning can increase the impact of the measure as individual areas can then be integrated into a broader network (other forested areas, valuable habitats outside the forest).

Implementation

Implementation period Months: The administrative process associated with designation as a forest reserve usually takes some time.

Frequency Non-recurring

Economic and legal aspects

Costs Low (1'000-10'000 EUR): Financial support is usually provided as a basic amount (approx.€ 15/ha) + a flat rate for default on contract (up to € 340/ha).

Socio-economic impacts	Low: Legislation on forests and nature conservation governs the payment of compensation for forest reserves.
Sources of financing	Private sponsor, Public: local, Public: regional, Public: national, Public: European
Legal situation	In most cases, a representative network of natural forest reserves (also: natural forest cells, forest reserves, etc.) is covered by individual legislation applicable to forests. Forest reserves are usually established as a contract-based model with voluntary participation.
Further information	
Evaluation	Natural forest reserves exist in Germany, Austria and Switzerland, for example, where they are well-established as contributions to nature conservation. Information can be obtained from the relevant authorities and various nature conservation organisations.
Information	Switzerland: e.g. St. Gallen's forest reserve strategy: http://www.wald.sg.ch/home/forstdienst/forstorganisation-/waldregionen0/waldregion_4_see/waldreservate.html

Calming measures for forests that merit protection



Calming of forested areas improves habitat quality for typical and in some cases rare species of fauna. © Rainer Sturm/ pixelio.de

Involved sectors

Forestry, Hunting, Spatial planning, Tourism and leisure, Nature protection, Other:

Affected habitats

Forest

Description

Forests are increasingly being used for recreational and leisure purposes by individuals and groups seeking an experience of nature. This can have negative impacts (e.g. noise, creation of informal pathways), especially in forested areas which are valuable from a nature conservation perspective and which form important elements of a biotope network. Areas with remnants of potential natural vegetation, old-growth forest, coppice forest and special sites (river-meadow and humid forests, gorges, steep slopes) are particularly valuable in nature conservation terms and should be kept free from negative influences as far as possible. As a way of calming these areas, various measures can be adopted, including the targeted creation of circular pathways and infrastructural services (visitor and parking facilities) in areas of woodland which are less in need of protection, as well as the production of information boards and brochures and the development of educational pathways.

Impact

Impact in particular on Small mammals, Big mammals, Birds

Ecological impact

Improvement or preservation of habitats	Calming of forested areas improves habitat quality for typical and in some cases rare species of fauna.
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Element of ecological network	Forested areas which have undergone calming measures are important refuge areas and are therefore very important elements of the biotope network. Corresponding measures can also be carried out in peri-urban areas (targeted calming of individual forested areas).
Time of realisation for measure	Immediate: Measures can start to have positive impacts very quickly. However, experience has shown that it takes some time for the measures to be accepted by all user groups.
Impact scope	Local (municipality): Channelling measures should be planned on a broader spatial basis as otherwise, conflicts will simply be shifted to neighbouring areas.
Implementation	
Implementation period	Months: Strategies for the channelling of visitors require comprehensive planning. Stakeholders must be involved from the outset in order to increase acceptance.
Frequency	Recurring: For higher effectiveness, long-term action adapted to emerging needs is required.
Economic and legal aspects	
Costs	Medium (10'000-100'000 EUR): Due to the long planning period and the sometimes cost-intensive measures (infrastructure), several thousands of euros must be reckoned with, depending on the activities being planned.
Socio-economic impacts	Low: Attractive educational pathways and circular pathways can add value to tourism and also be utilised for environmental education purposes.
Sources of financing	Private sponsor, Public: local, Public: regional, Public: national, Public: European
Legal situation	Strategies for visitor channelling should be integrated into landscape and protected area planning (e.g. including Natura 2000 sites). Measures may also be eligible for funding under rural development programmes.
Further information	
Evaluation	The awareness of the need for visitor channelling measures has increased considerably in recent years. Relevant strategies already exist in protected areas of various categories. Strategies for targeted channelling of visitors are already in place in peri-urban woodland in particular.

Information

Germany: e.g. <http://www.unesco.de/3765.html> Project in the Bavarian Alps (Allgäu): <http://www.dbu.de/PDF-Files/A-19778.pdf>

Maintenance and management of coppice forests



Coppice forests are particularly species-rich habitats. © Gerhard Elsner

Involved sectors

Agriculture, Forestry, Nature protection

Affected habitats

Forest

Description

Coppice forests are particularly species-rich habitats and make a contribution to the preservation of cultural and historical diversity. Newly coppiced areas of woodland are sunny spaces which are notable for their diverse habitat mosaic in a relatively small space. They thus contain important habitats for many species of flora and insects, as well as the Sand Lizard (*Lacerta agilis*) and Green Woodpecker (*Picus viridis*), and provide substitute habitats for the Hazel Grouse (*Bonasa bonasia*). Regular cutting on 3- to a maximum of 40-year-old rotation areas can improve the species inventory by promoting structural diversity and, in intensively used farmland, can serve as a stepping stone in the biotope network. Oak, birch, hornbeam, sycamore, black locust, sweet chestnut and black alder are the main species of tree found at colline to sub-montane altitudes. Coppice forests also play a major role in river-related ecosystems (e.g. grey alder coppice forests) and are particularly important elements of a biotope network here.

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Improvement or preservation of habitats Coppice forests are important habitats for many rare species of flora and fauna, including Hazel Grouse and especially thermophilous (warmth-loving) species.

Element of ecological network Use of coppice stands along linear structures (paths, roads, embankments) can form elements of a biotope network.

Time of realisation for measure Years: Relatively swift impact can be expected from the management of existing coppices; where new coppice forests are created, the related structures develop with increasing age of the stand.

Impact scope Local (municipality): By linking measures to wider biotope network planning (e.g. connectivity with fallow land with bushes, and with hedges, oligotrophic grasslands, edges etc.), the impact can be increased.

Implementation

Implementation period Weeks: Relevant measures can be implemented fairly swiftly.

Frequency Recurring: The typical structure is a result of regular use.

Economic and legal aspects

Costs Low (1'000-10'000 EUR): If wood from coppice forests is used for energy purposes, profits outweigh the costs of the relevant measures.

Socio-economic impacts	Low: Coppice forests can be used as renewable energy sources with corresponding economic value-added.
Sources of financing	Private sponsor, Public: local, Public: regional, Public: national, Public: European
Legal situation	Measures for the maintenance of coppice forest may be eligible for funding within the framework of contractual nature conservation programmes in the forestry sector (e.g. "Nature Conservation in Forests" programme in Switzerland).
Further information	
Evaluation	There are some examples of the integration of coppice forests into biotope networks. Various current research projects are under way to explore the potential for energy use of coppice forest stands.
Information	Other: Project examples, e.g. at http://rohrhardsberg-life.de/artikel/niederwaelder or: http://www.baselland.ch/naturschutz_wald-hm.310132.0.html

Extraction of timber: conserving stocks and soils



The use of horses causes less damage to stands and regeneration areas.
© www.agrar.steiermark.at

Involved sectors

Forestry

Affected habitats

Forest

Description

Extraction of timber is a major intervention in forest stocks and inevitably causes disturbance to flora and fauna. Despite careful planning and implementation, it is impossible to avoid damage to the remaining stands. Known as skidding damage, this can have sometimes considerable negative impacts on individual trees and on forest stands. Furthermore, extraction often also involves the creation of forestry roads, which have a fragmenting effect. In terms of landscape permeability, alternative methods of extraction (e.g. cable logging, horse logging etc.) should be given preference. The use of horses, in particular, causes less damage to stands and regeneration areas, and protects the forest floor as it does not leave tracks or cause widespread compaction of soils or oil pollution etc. Horses can also be used on slopes, and if sledges are used, can continue in winter.

Impact

Impact in particular on Small mammals, Birds

Ecological impact

Improvement or preservation of habitats Negative effects of timber extraction (including noise) are reduced by the deployment of less damaging extraction methods.

Other Less damaging timber extraction methods make a contribution to soil protection and water pollution control.

Time of realisation for measure Immediate: Positive effects are noticeable immediately.

Impact scope Very localised (plot): The measure has a very localised impact in the direct timber extraction area. A large-scale approach increases the scope of impact accordingly.

Implementation

Implementation period Days: The measure can be integrated easily into timber extraction activities.

Frequency Non-recurring

Economic and legal aspects

Costs Low (1'000-10'000 EUR): In Austria, depending on the forest's function, subsidies are available for up to 50-70% (at maximum extraction costs of €40 per solid cubic metre) of the costs when horses are used.

Socio-economic impacts Low: Depending on the conditions in the territory and the situation at the outset, the use of horses can be more economical, and financial aid may also be available.

Sources of financing	Private sponsor, Public: local, Public: regional, Public: national, Public: European
Legal situation	Subsidies are available for the use of horses in the preliminary clearing activities required for regeneration, as well as in small-scale clear cutting activities to promote already existing natural regeneration.
Further information	
Evaluation	Currently, horses are only used infrequently for timber extraction, and the experiences are available from the state forestry administrations concerned.
Information	Other: e.g. from the forestry authorities in question.

Conservation of ecologically significant trees i.e. trees with holes



Old and dead trees are important habitats. © Hubertus Schwarzentraub

Involved sectors

Forestry, Nature protection, Local population/citizens

Affected habitats

Forest

Description

In a commercial forest, besides the creation and maintenance of old-growth and deadwood islands, the conservation of specific individual trees (nest and hollow trees, trees with rotten sections or fungal infections, or bizarre trees) in the forest stand plays an important role. Between the old-growth and deadwood islands, these individual trees serve as stepping stones or transitional biotopes, especially for less mobile species of fauna in search of new habitats. These trees are particularly important in intensively used forest stands. They also help to safeguard, in the medium to long term, a sufficient high proportion of biotope trees in the forest. The definition of the number, distribution, species and characteristics of these trees must take place in line with local conditions.

Impact

Impact in particular on Small mammals, Birds, Insects

Ecological impact

Improvement or preservation of habitats The trees enhance the forest biotope and provide a habitat for flora, fungi and fauna (nesting places, deadwood for insects, etc.).

Element of ecological network Between the old-growth and deadwood islands, these individual trees serve as stepping stones or transitional biotopes, especially for less mobile species of fauna in search of new habitats.

Time of realisation for measure Immediate: Depending on the age of the selected trees, they can take on this role immediately or over the long term. The processes of ageing and decay take many years.

Impact scope Local (municipality): With a sufficient number of trees, appropriately distributed, good local impacts can be achieved.

Implementation

Implementation period Days: The selection of trees takes place as part of normal inventory work or during marking of trees for felling; no further work is involved afterwards.

Frequency Recurring: Requires regular management or adaptation and careful land management.

Economic and legal aspects

Costs Very low (less than 1'000 EUR): Subsidies can amount to €40-80 per trunk/p.a. depending on species and number of trees.

Socio-economic impacts Low: Possible loss of revenue through non-use, but this can be compensated regionally from subsidies.

Sources of financing Public: local, Public: regional, Public: national, Public: European

Legal situation	Safety obligations established in law must be complied with during site selection.
Further information	
Evaluation	The positive impacts of old-growth and deadwood, including isolate trees, in the forest stand are scientifically proven and are thus an integral part of sustainable forestry and various certification procedures. They are one of the most important elements of ecoconnectivity in the forest.
Information	Other: Information is available from: http://www.waldwissen.net/ and various forestry authorities.

Conservation and development of old-growth and deadwood islands



Old-growth and deadwood islands are important habitats for numerous animal and plant species. © soquett/ pixelio.de

Involved sectors

Forestry, Hunting, Nature protection

Affected habitats

Forest

Description

In the normal commercial forest, trees are grown for optimum timber quality and are felled before they reach biological maturity. However, many species of flora and fauna are dependent on old, very old and even dead trees. In areas of woodland, groups of trees should therefore be preserved beyond the commercial cutting interval in order to create old-growth and deadwood habitats. These old-growth and deadwood islands also perform an important role in ecological connectivity.

Impact

Impact in particular on Small mammals, Birds, Insects

Ecological impact

Improvement or preservation of habitats Old-growth forest and dead trees provide a habitat for a variety of insects and species of bird.

Element of ecological network By designating old-growth forests rich in deadwood as part of a biotope network, important stepping stone biotopes can be created for rare species (e.g. Three-toed Woodpecker (*Picoides tridactylus*), various species of bat ...).

Time of realisation for measure Long term: Old-growth and deadwood islands develop slowly as part of the development of stands. The associated fauna, too, only becomes established over the long term.

Impact scope Local (municipality): A network of old-growth stands and deadwood islands with a mesh width of approx. 500 m should be developed at municipal or, if possible, at regional level in order to achieve genuine impacts as part of a biotope network.

Implementation

Implementation period Long term: Old-growth and deadwood islands must be planned and developed as part of the stand over the long term within the framework of forest management.

Frequency Recurring: Requires regular care or adaptation and careful management.

Economic and legal aspects

Costs Very low (less than 1'000 EUR): No costs. In some regions, financial support is provided for the conservation of old-growth and deadwood.

Socio-economic impacts	Low: Income loss due to delayed use or non-use of the affected trees.
Sources of financing	Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	As a rule, these are voluntary measures but may be mandatory in some certified forests.
Further information	
Evaluation	In order to achieve a good impact as part of a biotope networking project, the measure must be implemented across a relatively large area with equal distribution of "island" spaces.
Information	Other: A wealth of information is available on the Internet site: http://www.waldwissen.net/ , which covers a range of forest-related topics.

Structurally rich forest edges



Structured forest edges have hedges and other structural elements. © B. Stolze/ pixelio.de

Involved sectors

Agriculture, Forestry, Hunting, Nature protection, Other: Schools

Affected habitats

Forest

Description

The edges of forests and woodland are often located next to agricultural areas, lakes or rivers, open meadows, pasturage or roads and railways. Together with other structural elements such as hedges, forest strips or riparian strips, they are an important element of a biotope network. Due to their function as transitional zones, they provide a place of refuge and particularly valuable habitats (e.g. for rarer species of deciduous tree or shrubs). They are also important as stepping stone biotopes, e.g. for wild bees, beetles, bats, birds and hedgehogs. Valuable forest edges comprise a shelterbelt, shrub belt and herbaceous fringe. These three components vary in age and are layered and irregular in structure. They require regular management measures.

Impact

Impact in particular on Small mammals, Big mammals, Birds, Insects

Ecological impact

Improvement or preservation of habitats	Layered and structurally rich forest edges are valuable biotopes which provide a habitat for many rare species. They enhance the habitat of wild animals in particular.
Element of ecological network	Forest edges are an important element of the cultural landscape and due to their linear structure in transitional zones are important for networks of interlinked biotopes. They can also be enriched with dry stone walls.
Other	Stabilising impact on tree stands.

Time of realisation for measure	Years: The desired structure will not develop until 5-10 years after the first targeted management measures to create a structurally rich forest margin.
Impact scope	Local (municipality): Relevant measures may also have an impact beyond the immediate locality.
Implementation	
Implementation period	Weeks: The duration of measures depends on the type and intensity of intervention.
Frequency	Recurring: The typical structure can only be developed through regular maintenance.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Subsidies are available for this type of forest management measure. The costs of managing forest margins amount to approx. € 2000/100 m (width 30 m).
Socio-economic impacts	Low: An intact forest margin has positive impacts on forestry, as it reduces the risk of windthrow or breakage. Material resulting from management measures can be used for heat energy.
Sources of financing	Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	Enhancement of forest margins can be integrated into management planning by local forest enterprises and at higher level and take place within the framework of forest management. It can also be included in landscape planning and management.
Further information	
Evaluation	The importance of structurally rich forest margins for flora and fauna and as an element of the biotope network is substantiated and in some cases is already included in framework strategies for nature conservation in forests. Relevant examples can be provided by forestry agencies and enterprises and nature conservation organisations.
Information	Switzerland: e.g. Amt für Wald (Forestry Office) Graubünden, Switzerland http://www.wald.gr.ch/download/waldrand.pdf

Transport

Measures for seasonal amphibian migration



Every year millions of amphibians get run over by cars. © Michael Wittstock/pixelio.de

Involved sectors

Agriculture, Water management, Tourism and leisure, Nature protection, Transport, Local population/citizens, Municipalities

Affected habitats

Areas for settlements and transport

Description

Most amphibians in Central Europe undertake various migrations during their lives, including the seasonal spring migrations to their spawning grounds. They invariably encounter numerous barriers which they must overcome, especially the dense transport network where millions of amphibians are killed by vehicles every year. There are many measures which could be taken to protect amphibians during migration and to help reduce the barrier effects; these include warning signs for drivers; mobile seasonal fences for amphibians; substitute spawning grounds; temporary road closures; and permanent protection systems (amphibian tunnels), etc.

Impact

Impact in particular on Amphibians

Ecological impact

Reduction of fragmentation or creation of new valuable habitats	The purpose of the measures is to reduce the fragmentation effects for amphibians during migration and facilitate habitat access.
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Improvement or preservation of habitats	Amphibians prefer suitable habitats for their migrations. Habitat improvement measures should therefore be carried out in parallel.
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Element of ecological network	Most of the actions carried out are "short-term" elements of a biotope network, with human intervention substituting for a corridor. In most cases, however, the measures are simply a response to an acute danger, not a permanent solution.
Time of realisation for measure	Immediate: The actions last for the duration of the spring migrations. They must have immediate impact and mitigate the acute danger.
Impact scope	Very localised (plot): Amphibians do not have very large ranges. The measures are generally carried out at local/municipal level.
Implementation	
Implementation period	Weeks: Speed limits, mobile fences, warning signs etc. are used for several weeks during the peak of the migration (usually 6 weeks).
Frequency	Non-recurring, Recurring: Permanently installed crossings for amphibians plus mobile facilities to be set up and managed during migrations of amphibians.
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): Vary widely depending on the measure. Work is often carried out by volunteers.
Socio-economic impacts	No direct impact: Possible prevention of traffic accidents. Often, sensitisation of the general public.
Sources of financing	Private sponsor, Other private sources, Public: local, Public: regional
Legal situation	These are voluntary actions which must, however, respect general traffic safety provisions.
Further information	
Evaluation	The measures described are generally not a permanent solution for improving connectivity. More permanent solutions are removal of trunk status from roads, decommissioning of roads, possible night-time road closures in spring and autumn or year round, or permanent protection systems such as underpasses for small animals.
Information	Switzerland: e.g. Swiss Centre for Amphibian and Reptile Conservation (KARCH)
Contact	Other: Various nature conservation organisations.

Corridors for small animals



While building streets one has to think of amphibians and small animals.

© Conseil Général Isère

Involved sectors

Forestry, Hunting, Nature protection, Transport, Local population/citizens

Affected habitats

Areas for settlements and transport

Description

Underpasses for small animals are pipes made from concrete or steel which are incorporated into the road-body crossways or at angles as crossing aids for small mammals, amphibians, reptiles and invertebrates. Conduits obstruct animals' free access to the road and lead them to the underpasses. An uninterrupted link between the conduits and the underpasses is essential. The conduits should run parallel to the road, and should if possible be supplemented with guide structures placed at right-angles to the tunnel openings. These crossing aids for amphibians and small animals should be incorporated at an early stage during road-building and should be ready for operation before traffic is permitted to use the road. Retrofitting of these systems is rarely possible due to the high costs involved. The advantage of these permanent protection systems is that they work all year round and require very little management.

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Insects

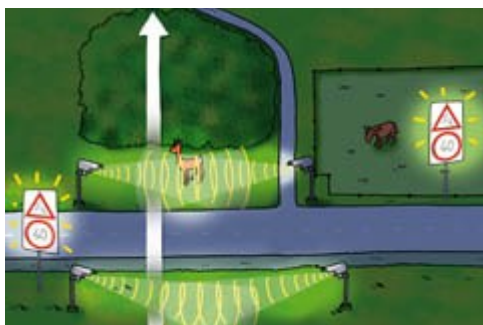
Ecological impact

Reduction of fragmentation or creation of new valuable habitats If properly planned and implemented, underpasses for small animals can greatly reduce the fragmentation effects of linear infrastructure systems.

Other The installations can greatly reduce the number of animals killed on the roads, especially during seasonal amphibian migrations, and thus have positive impacts on populations.

Time of realisation for measure	Immediate: As soon as the system is installed on the affected section of road, guide structures lead the animals to the underpasses.
Impact scope	Local (municipality): As most of the target species have relatively small ranges, the impact is generally fairly localised.
Implementation	
Implementation period	Weeks: Particularly sensitive sections of existing roads are generally well-known. When installing new systems, studies are required. Installation can take place fairly rapidly.
Frequency	Non-recurring: Installation a single activity, but regular care and checks are essential.
Economic and legal aspects	
Costs	Medium (10'000-100'000 EUR): Relatively low costs if installed during road-building; retrofitting is very complex and expensive.
Socio-economic impacts	No direct impact
Sources of financing	Public: local, Public: regional, Public: European
Further information	
Evaluation	Thanks to the conduits and guide structures, the underpasses are generally very effective and are used by a wide variety of animal species.
Information	Other: Nature conservation associations, especially those working with amphibians and involved in the seasonal amphibian migrations.
Contact	Other: e.g. NABU, WWF, Pro Natura.

Wildlife warning systems to avoid wildlife collisions



Installation of warning systems for the prevention of accidents involving deer at known deer crossing points. © Conseil d'Isère

Involved sectors

Forestry, Hunting, Spatial planning, Nature protection, Transport

Affected habitats

Areas for settlements and transport

Description

This involves the installation of warning systems for the prevention of accidents involving deer at known deer crossing points. A network of infrared sensors covers both sides of the road to a distance of around 300 m. If an animal enters this area, it is detected by the sensors. These send an impulse to a traffic warning signal which lights up and warns approaching drivers of the immediate danger.

Impact

Impact in particular on Big mammals

Ecological impact

Reduction of fragmentation or creation of new valuable habitats	Does not mitigate the barrier effect of a road. However, it is a very effective method of reducing the number of accidents involving deer at hazard hot-spots.
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Other	The system aims to change the behaviour of car-drivers, not deer. Drivers are alerted to an acute, rather than a potential, hazard.
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Time of realisation for measure	Immediate: Impact starts as soon as the system comes into operation.
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Impact scope	Very localised (plot): This measure has a very localised impact on both sides of a section of road to a distance of around 300 m. If integrated into regionally significant wildlife corridors, however, it can also have impacts beyond the immediate locality.
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Implementation

Implementation period Days: The system can be installed quickly once a decision has been taken on where it should be located (in consultation with hunters).

Frequency Recurring: Long-term measures, to be adapted as required.

Economic and legal aspects

Costs Medium (10'000-100'000 EUR): Costs of this type of system amount to approx. € 60,000-100,000. More compact and flexible solutions are also available (e.g. mobile systems).

Socio-economic impacts Medium: Prevents damage to vehicles, physical injury to individuals and loss of game animals.

Sources of financing Other private sources, Public: local, Public: regional, Public: national, Public: European

Legal situation Voluntary cooperation among stakeholders.

Further information

Evaluation A pilot project involving Calstrom-type warning systems carried out from 1995-1997 in Switzerland had very positive effects.

Information Switzerland: Wildtier Schweiz <http://www.wild.uzh.ch/>

Contact Switzerland: Expert: Roman Kistler, Fishing and Hunting Administration of Thurgau Canton (CH) Expert: Paul Marchesi, DROSERA - écologie appliquée SA, Sion (CH)

Green bridges/ wildlife crossings



Wildlife crossings should be located at known animal crossing points or specific “conflict points” in the transregional transport network. © Sina Hölscher

Involved sectors

Forestry, Hunting, Spatial planning, Nature protection, Transport, Other: NGO, Districts

Affected habitats

Areas for settlements and transport

Description

A wildlife crossing, or green bridge, is intended to serve as an aid to wild animals, enabling them to cross busy transport routes such as motorways, highways and even railway lines safely and thus mitigating the impacts of increasing landscape fragmentation. The position of these crossings is particularly important: wildlife crossings should be located at known animal crossing points or specific “conflict points” in the transregional transport network. In order to screen the view of the transport routes to be crossed, the edges of the bridge are often planted with hedgerows, with much of the rest of the surface of the bridge being covered in vegetation as well. There are now numerous studies which provide information about required dimensions, vegetation, technical construction details etc.

Impact

Impact in particular on

Small mammals, Big mammals, Reptiles, Amphibians, Insects

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

Green bridges are a suitable method of mitigating the fragmentation effects of roads, connecting habitats across roads and safeguarding regional and transregional migration routes.

Improvement or preservation of habitats

The bridges are particularly effective if they do not appear to be foreign bodies or separate biotopes but are designed as habitats and thus meet the habitat requirements of smaller vertebrate or invertebrate species as well.

Element of ecological network	If integrated into a biotope networking strategy, the crossing aids become important sections of corridors.
Other	From a nature conservation perspective, key aspects such as fragmentation of species' partial habitats, impediments to large-scale annual migrations, impediments to the (re-) dispersion of animal species and thus the new colonisation or recolonisation of habitats by species which had previously been eliminated or had died out should also be taken into consideration during planning.
Time of realisation for measure	Months: Once built, the bridge can be used immediately. Guide structures leading to it facilitate animals' acceptance.
Impact scope	Local (municipality): Depending on the species and the importance of the crossing point, the impact can range from local to transregional.
Implementation	
Implementation period	Months: Planning and construction of these crossing aids are very costly and time-consuming.
Frequency	Non-recurring: Should be accompanied by monitoring of effectiveness.
Economic and legal aspects	
Costs	Very high (>1 Mio. EUR): Building costs of a green bridge amount to € 1-5 million. Ongoing maintenance costs must also be considered.
Socio-economic impacts	Low: Reduction in number of accidents involving deer (physical damage, loss of game, personal injury ...)
Sources of financing	Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	Legal provisions exist indirectly via the European and national level relating to the spatial linkage of protected areas.
Further information	
Evaluation	Studies on the biological effectiveness of green bridges have shown that they make a major contribution to habitat connectivity. They are not only used by large animals but also by invertebrates such as butterflies, spiders and beetles. Green bridges do not only have a connecting function, they also help to reduce the number of accidents involving deer.

Information	Austria: Detailed recommendations in core study: VÖLK, F.; GLITZNER, I. & WÖSS, M. (2001): Kostenreduktion bei Grünbrücken durch deren rationellen Einsatz. Kriterien – Indikatoren – Mindeststandards. Straßenforschung, Heft 513. Bundesministerium für Verkehr, Innovation und Technologie, Wien. » http://www.fsv.at/
Contact	Austria: A wealth of key information, literature, links and case studies is available from Austrian Federal Environment Agency (http://www.umweltbundesamt.at/)

Use of indigenous seeds and plants



Meadow from the Swabian mountains, which is cut twice a year. © Dr. Gottfried Briemle, Aulendorf

Involved sectors

Agriculture, Water management, Spatial planning, Nature protection, Transport

Affected habitats

Areas for settlements and transport

Description

During renaturation measures and other construction projects (construction of roads, railways and watercourses, and landscaping), but also in gardens and city parks, it is important not only to select site-appropriate species but also to use indigenous seeds and plants of local origin. The use of non-local seed may result in locally specific adaptations and regional biotopes being squeezed out or impaired, which may have a negative impact on other organisms, such as nectar-collecting and pollinating insects. Furthermore, some individual species may behave in an invasive manner. The use of indigenous seeds also helps to safeguard biotope-specific species diversity and promote native wild plants, thus contributing to the biotope network and the preservation of genetic diversity in line with the Convention on Biological Diversity (CBD).

Impact

Impact in particular on

Insects

Ecological impact

Improvement or preservation of habitats	Some insect species depend on native species of plant. By using specific species and with appropriate management, the habitat is enhanced, especially on spaces along transport routes.
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Element of ecological network	Species-rich areas along transport routes can act as stepping stone biotopes in the biotope network. Indigenous species are particularly valuable.
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Other	Preservation of genetic diversity (Convention on Biological Diversity).
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Time of realisation for measure	Months: Some months will elapse from the time of the preparatory measures to the development of the full impact during the vegetation period.
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Impact scope	Local (municipality): The use of indigenous seeds should be promoted transregionally in order to increase the impact of individual measures.
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Implementation

Implementation period	Days: Can be well-integrated into conventional landscaping measures. In "greening" measures, appropriate seeds must be used.
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Frequency	Recurring: This requires the implementation of a long-term strategy.
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Economic and legal aspects

Costs	Very low (less than 1'000 EUR): The use of indigenous seeds and plants may result in higher costs in some cases.
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Socio-economic impacts	Low: Seed production of indigenous wild species can offer alternative income generation opportunities for farmers in the region (domestic value-added instead of seed imports).
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	According to the Nature Conservation Act, the use of alien plants may be prohibited, so the use of indigenous plants and seed should be appropriately regulated by the relevant nature conservation authorities.
Further information	
Evaluation	In Bavaria, technical recommendations have been developed on the use of indigenous plants and seeds, which should serve as guidelines for nature conservation authorities. As EU rules on the marketing of seeds and seed mixtures exist, amendment of national legislation may be required.
Information	Germany: Further information at: http://www.stmug.bayern.de/umwelt/-naturschutz/autochthon/index.htm

Site-appropriate “greening” in road and watercourse construction and landscaping



When creating green areas during the construction of roads one has to regard the fitting seed assortments. © Rike/ pixelio.de

Involved sectors

Agriculture, Water management, Spatial planning, Transport

Affected habitats

Areas for settlements and transport

Description

When creating green areas during the construction of roads, railways and watercourses and landscaping projects, seed assortments are often used which, due to their species poverty, are not suitable for ecologically valuable “greening” or are not site-appropriate and therefore result in biologically impoverished landscape areas. The result is a large number of seriously eroded sites at higher altitudes, vegetation-free embankments, and river banks which are far from being in a natural state. If, on the other hand, site-appropriate seed mixtures are used, with adapted species which are suitable for elevated sites, for example, the green spaces can become valuable elements of a biotope network.

Impact

Impact in particular on	Small mammals, Birds, Insects
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Ecological impact

Improvement or preservation of habitats	Embankments which are designed to be as near-natural as possible and spaces adjacent to infrastructure can provide habitats for rare species.
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Element of ecological network	These spaces can form stepping stones in the biotope network. The impact can be increased through integration into a broader strategy.
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Other	Spaces with near-natural growth contribute to soil protection and guard against erosion.
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Time of realisation for measure	Months: Some months elapse from the time the preparatory measures are carried out until the full impact occurs during the vegetation period.
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Impact scope	Local (municipality): If linked with broader biotope network planning (e.g. linkage with fallow areas with scrub, extensive grassland, hedges, oligotrophic grasslands, edges), the impact is increased.
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Implementation

Implementation period	Days: "Greening" measures do not take much time and can be well-integrated into conventional landscaping schemes.
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Frequency	Recurring: This requires the implementation of a long-term strategy.
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Economic and legal aspects

Costs	Very low (less than 1'000 EUR): The additional costs which may be associated with the measure can be set against improved economic viability as there is no longer any need to bring in topsoil, costs of remediation are also reduced, and less maintenance is involved.
Socio-economic impacts	Low: Production of seed of site-appropriate species can offer alternative income generation opportunities for farmers in the region (domestic value-added instead of seed imports).
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	In Upper Austria, framework guidelines have been developed for the performance, ecological supervision and approval of site-appropriate "greening" schemes.
Further information	
Evaluation	The Austrian Grassland Federation (ÖAG) has developed guidelines on site-appropriate greening which can provide guidance. Various seed mixtures have also been developed ("natural meadow seed" project).
Information	Austria: Further information on seed mixtures: http://www.wildblumensaatgut.at/Resources/Regelwerk.pdf , http://www.saatbau.at/deutsch/saatgut/renatura/-produktvorstellung/begrueunungsmischungen.html
Contact	Austria: Working Group on Site-Appropriate Greening: Head - Dr. Bernhard Krautzer

Roadverge management to encourage species diversity



Green strips along roadsides. © Rainer Sturm / pixelio.de

Involved sectors

Nature protection, Transport

Affected habitats

Areas for settlements and transport

Description

Delaying mowing gives plants the opportunity to bloom and form fruits and seeds. In this way, they can provide food and cover for insects and other small animals. The habitat quality of green strips and roadside verges depends on various factors, and mowing is one of the factors which are easiest to influence. By delaying mowing of verges until late summer, or by using mosaic-type mowing techniques, which involves mowing only a small area at a time, habitat conditions can be improved, e.g. for butterflies and various other species.

Impact

Impact in particular on Insects

Ecological impact

Reduction of fragmentation or creation of new valuable habitats	As these are roadside verges, they form a network of green spaces which can facilitate migration of plants and animals and, if structured in an environmentally compatible way, can help to mitigate fragmentation.
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Improvement or preservation of habitats	Delaying mowing gives plants the opportunity to bloom and form fruits and seeds and thus provide habitats for more fauna, especially insects.
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Element of ecological network	If the managed spaces are integrated into a broader biotope networking strategy, they can act as corridors along roads between core areas. However, it is important to consider the potential risk of neophyte encroachment.
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Time of realisation for measure	Months: The impact develops mainly during the vegetation period.
Impact scope	Very localised (plot): The measure mainly benefits insects and plants and so its impact is mainly local.
Implementation	
Implementation period	Months: Ideally, this measure should be implemented at municipal or even at regional level so that it can develop its full impact, especially in terms of ecoconnectivity.
Frequency	Recurring: Ideally, mowing should be managed over a number of years.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): No additional costs arise as a result of the measure compared with conventional mowing management.
Socio-economic impacts	Medium: Better planning of working time and use of resources and a reduced workload can all help to cut costs.
Sources of financing	Public: local, Public: regional, Public: national
Legal situation	Traffic safety prescribed by law must be adhered to.
Further information	
Evaluation	<p>In the Département Isère, the highways department and the administration of the Département (Conseil Général), in partnership with the nature conservation organisation GENTIANA, have been running a project since 2004 entitled "Managed mowing of roadside verges: protecting nature", which focusses on the roadside verges and green strips in the road network. Signs at strategically and ecologically important sections of the highway network draw attention to the scheme and inform the public. The project's positive impacts on flora and fauna have already been demonstrated.</p>
Information	<p>Other: Information on "managed mowing", together with checklists and examples, are available on the GENTIANA website: http://www.gentiana.org/</p>
Contact	<p>Other: Contact person for these projects at Gentiana: Pierre Salen</p>
Good Practice	<p>Managed mowing of roadside verges, Isère, France Gestion raisonnable du fauchage des bords des routes Gestione ottimizzata degli sfalci ai margini delle carreggiate</p>

Water resources management

Revitalisation of flowing waters



Flowing water systems form important corridors for the migration and dispersion of flora and fauna. © Olga Meier-Sander/ pixelio.de

Involved sectors

Water management, Fishery, Spatial planning, Tourism and leisure, Nature protection

Affected habitats

Waterbodies

Description

Flowing water systems, from source to mouth, form linear connecting elements and, together with their associated ecosystems (riparian forests, woodland), form important corridors for the migration and dispersion of flora and fauna. Very often, the space and dynamics left to most of the rivers in the Alpine region are severely limited. At the same time, flowing waters are highly conducive to cross-border cooperation as they generally flow through several countries and often form natural boundaries which may also constitute national borders. To improve flowing water functions, a range of measures can be adopted to return flowing waters to a natural unimpeded state, at least in part, thus enabling them to develop in a near-natural manner (restoration or revitalisation measures). Possible measures range from the introduction of deadwood to comprehensive rehabilitation measures and expansion.

Impact

Impact in particular on Reptiles, Amphibians, Birds, Fish

Ecological impact

Other

The restoration of the continuity of watercourses is an integral element of the EU Water Framework Directive (WFD) and therefore a mandatory task in terms of water resources management. Flood protection.

Time of realisation for measure	Years: The scope of impact achieved depends on the type and scope of the measures and the state of the section of the watercourse at the outset.
Impact scope	Regional: The flowing waters contained in the catchment area, adjacent biotopes and the entire flood plain must be included.
Implementation	
Implementation period	Long term: Dependent on the type and scope of the measures and the state of the section of the watercourse at the outset.
Frequency	Non-recurring: Should be accompanied by monitoring of effectiveness.
Economic and legal aspects	
Costs	Very high (>1 Mio. EUR): The costs depend on the type and scope of the measures to be implemented and range from around €2000 up to > €150,000 per 100 m of watercourse.
Socio-economic impacts	Medium: Revitalisation measures, by means of effective flood protection, can have positive economic effects despite the high costs.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	River restoration and revitalisation measures are part of landscape planning, but can, on a smaller scale, also be carried out by voluntary nature conservation.
Further information	
Evaluation	Numerous river revitalisation measures have already been carried out successfully, and the importance of intact and natural river systems has been proven by several studies. Near-natural flowing waters are also of relevance to tourism and flood protection and are helping to implement the EU Water Framework Directive.
Information	Other: Projects from various initiatives have been implemented: e.g. Wild River Landscape of the Tyrolean Lech, Lifeline Upper Drava, rehabilitation of the lower Salzach, Donau-Auen national park, RECORD at the Swiss Federal Institute of Technology.
Contact	Other: http://www.tiroler-lech.at , http://www.life-drau.at , http://www.sanierung-salzach.info , http://www.swiss-experiment.ch/images/6/6f/RECORD_Beschreibung_deutsch.pdf , http://www.donauauen.at

Good Practice

[LIFE Project: Wild River Landscape of the Tyrolean Lech, Austria](#)
[Projet LIFE – Paysage de rivière torrentielle du Lech, Tyrol, Autriche](#)
[Progetto LIFE Paesaggio torrentizio Tirolo Lech, Austria](#)

Management and maintenance of flowing waters



An individual management plan should be produced for each body of water. © Carolin Begle/ CIPRA International

Involved sectors

Agriculture, Water management, Fishery, Nature protection

Affected habitats

Waterbodies

Description

Near-natural flowing water systems are important connecting elements which make a substantial contribution to reducing fragmentation. In many cases, however, the space and financial resources required for the comprehensive revitalisation of obstructed rivers are not available. However, upgrading can be achieved with near-natural, differentiated management concepts which can be integrated into the legally prescribed management work along water bodies (flood protection). As part of this process, a holistic view should be taken of the embankments, riparian zones and water bodies, and adjacent green spaces (biotope network) should also be included. Appropriate maintenance measures include management of meadows, woodland (bank stabilisation), and regeneration in the areas of erosion. An individual management plan should be produced for each body of water, clearly defining the development goals.

Impact**Impact in particular on**

Reptiles, Amphibians, Birds, Fish

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

Richly structured near-natural flowing waters are important landscape elements with a high connectivity potential.

Improvement or preservation of habitats

Appropriate maintenance measures improve the habitat quality of various species of flora and fauna, diverse structures are created and the dynamics of the watercourses increase.

Element of ecological network

Near-natural flowing water systems with a high degree of structural diversity form valuable elements of a biotope network and provide corridors for the migration and dispersion of flora and fauna.

Other

The increase in natural habitats by flowing waters, achieved through revitalisation measures, promotes the attainment of 'good ecological status' for the bodies of water as defined in the EU Water Framework Directive.

Time of realisation for measure

Immediate: The impact either becomes apparent immediately or only appears after a few years, depending on the measure.

Impact scope

Regional: Watercourse management measures are carried out locally but can be of importance at regional level.

Implementation**Implementation period**

Days: Maintenance measures should be planned in advance and take place in partial interventions throughout the whole year, however only in riparian zone sections that are actually in need of maintenance.

Frequency

Recurring: Should be regular.

Economic and legal aspects**Costs**

Low (1'000-10'000 EUR): The costs are dependent on the type and scope of the measures to be implemented and, depending on the measure, can be financed through countryside management programmes.

Socio-economic impacts

Medium: Flood protection measures can have positive economic effects.

Sources of financing

Public: local, Public: regional, Public: national, Public: European

Legal situation

Maintenance measures on bodies of water can form part of flood protection measures but, on a smaller scale, can be implemented by voluntary nature conservation or the local population.

Further information

Evaluation

Watercourse management measures are being implemented everywhere and form part of flood protection measures. In addition, an example of an initiative to involve local municipalities and organisations exists in Switzerland in the form of an action day to maintain and upgrade water bodies. Maintenance and management measures on flowing waters are also implemented by nature conservation organisations.

Information

Other: From the relevant water management authorities and voluntary nature conservation organisations.

Contact

Switzerland: e.g.

<http://www.umweltschutz.ch/index.php?p=shop&id=68&cat=&backlink>

Establishment of riverside margins with site-specific/typical riparian vegetation



Riparian strips, at least 3-5 m wide, along flowing waters act as buffers and form linear connecting elements © Yann Kohler

Involved sectors

Agriculture, Fishery, Spatial planning, Nature protection

Affected habitats

Waterbodies

Description

Riparian strips, as the transition between water surfaces and land, are of particular ecological significance for water quality and are an important connecting element in the biotope network. These riparian strips play a key role in intensively used landscapes in terms of maintaining water functions (filter/buffer functions, protection of embankments, prevention of erosion). The restoration, or the development and maintenance, of existing riparian strips is thus a key priority in the active protection of the aquatic environment. The riparian zone also creates habitats, provides food and serves as a protective and resting space, and also provides nesting and breeding places. Riparian strips should therefore be equipped with site-appropriate near-natural vegetation and typical tree species, and, depending on the body of water, be at least 5-15 m wide.

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Reduction of

fragmentation or

creation of new valuable
habitats

Richly structured near-natural flowing waters are important landscape elements with a high connectivity potential.

Improvement or

preservation of habitats

The habitat quality for various species of flora and fauna is improved and diverse structures are created along the watercourse.

Element of ecological network	Near-natural flowing water systems form valuable elements of a biotope network and provide important corridors for the migration and dispersion of flora and fauna.
Other	Typical tree species for the area can help protect against floods. The increase in natural habitats by flowing waters also helps to increase the quality of the water, and thus to achieve a 'good ecological status' for the body of water as defined in the EU Water Framework Directive.
Time of realisation for measure	Months: Riparian strips created in a near-natural way develop their positive impacts after a few months (first vegetation period).
Impact scope	Very localised (plot), Local (municipality): Comments: Comprehensive planning increases the degree of impact. Ideally, in addition to the riparian zones, structures typical for river meadows such as backwaters, wetlands and meanders should be included.
Implementation	
Implementation period	Weeks, Months: Depending on the condition at the outset, the planning process takes a long period of time; in most cases individual measures can be implemented within a short period of time.
Frequency	Recurring: While planting is a single operation, it has to be followed by regular maintenance.
Economic and legal aspects	
Costs	High (100'000-1 Mio EUR): Renunciation of use in the case of extensive use of riparian strips, compensation payments by countryside management programmes of between €289/ha per year and €715/ha per year.
Socio-economic impacts	No direct impact: Expenditure can be reduced through the development of watercourses through their own dynamics. The appearance of the landscape is enhanced.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Funding opportunities	Austria: Information will be available soon.
Legal situation	In most cases, statutory regulations govern the establishment of riparian strips (around 10 m), but their design is not established precisely. Some standards can be drawn from the EU Water Framework Directive (WFD).
Further information	

Evaluation	<p>The positive impact of riparian strips and, due to their linear structure, their substantial importance for the biotope network, have already been recognised. To date there have only been a few examples in which riparian strips and woodland have been specifically included in the planning of biotope networks.</p>
Information	<p>Other: Further information on the relevant terms and conditions governing support for riparian strips and woodland can be obtained from the nature conservation authorities concerned, the countryside management programmes and the water resources management authorities.</p>

Maintenance of alluvial forests



Riparian forests are the natural type of vegetation along streams and rivers. © Ich-und-Du/pixelio.de

Involved sectors

Agriculture, Forestry, Water management, Nature protection

Affected habitats

Forest, Waterbodies

Description

Riparian forests are the natural type of vegetation along streams and rivers, and are strongly influenced by flooding and high groundwater levels. Due to their small-scale mosaic of different site conditions, riparian forests count among Europe's most species-rich habitats. Due to their preference for river meadows as their habitat, near-natural riparian forests have virtually disappeared from Central Europe, however, as many riparian forests have been cleared and transformed into pasturage. Riparian forests have high recreational value, store water and improve groundwater quality. Depending on their size and condition, they can also contribute to flood protection. As ecosystems associated with flowing waters, they are extremely important for ecological connectivity. Measures to maintain and develop the riparian forests may include, for example, planting of typical tree species, near-natural management, securing of existing areas and maintaining structures associated with the riparian forests (e.g. small water bodies).

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Birds

Ecological impact

Improvement or preservation of habitats	Riparian forests constitute valuable habitats for many rare species, including white dryas (<i>Dryas octopetala</i>), the European tree-frog (<i>Hyla arborea</i>), the natterjack toad (<i>Bufo calamita</i>) and the Lady's Slipper.
Element of ecological network	Near-natural flowing water systems with their associated structures constitute valuable elements of a biotope network. They provide corridors for the migration and dispersion of many flora and fauna.
Other	Intact riparian forests help to improve surface water, stabilise the hydrological regime (EU-WFD) and protect against floods.
Time of realisation for measure	Months: Depending on the situation at the outset and the measures required, the impact is either immediate, is revealed after some months or only appears over the long term.
Impact scope	Local (municipality): To increase the impact, other accompanying structures should also be included in an appropriate strategy (such as, inter alia, standing water bodies, humid forests, headwaters).

Implementation

Implementation period	Months: The duration of the measures depends, in particular, on the situation at the outset. Comprehensive planning is required in the case of large-scale strategies that take account of the numerous interactions between the river meadows and the flowing waters.
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Frequency	Non-recurring: Regular support measures to help create a typical structure, in accordance with the local situation.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Costs vary greatly depending on the measure. In most cases, conservation does not require comprehensive maintenance measures; renunciations of use can incur costs.
Socio-economic impacts	Low: Subsidies for the protection of the aquatic environment and for flood protection (e.g. cultural landscape programme) are possible.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Legal situation	Conflicts of objectives regarding other functions may occur. Riparian forests in Europe have a special protected status, inter alia, through the Habitats Directive.
Further information	
Evaluation	The significant importance, in nature conservation terms, of riparian forests is demonstrated, inter alia, by their high protected status. Information on suitable measures and subsidies can be obtained from the nature conservation authority concerned.
Information	Other: From the relevant nature conservation authorities and organisations. Further information also available under: www.waldwissen.net

Creation of fish passes and other fish migration aids



Numerous versions of fish migration aids exist. In the picture: fish pass. © Umweltbundesamt

Involved sectors

Water management, Fishery, Nature protection, Other: Energy

Affected habitats

Waterbodies

Description

Obstructions such as river bottom steps, weirs, retention basins etc. can be found along many Alpine streams and rivers. These constitute insurmountable obstacles to the migration of fish and other organisms in flowing waters. Fish migration aids (also known as fish ladders or fish passes) are installed in flowing waters in order to give fish, in particular, the opportunity to overcome these artificial obstacles. There are numerous versions of these aids (river bottom slides, fish ramps, fish passes, bypass flume(s) ...), which can be deployed to suit the target species, the obstacle to be overcome, and local conditions.

Impact

Impact in particular on Insects, Fish

Ecological impact

Reduction of fragmentation or creation of new valuable habitats	Weirs and other installations in streams constitute insurmountable obstacles to almost all organisms living in water, and divide streams into many small sections. Fish passes provide a connection between the sections.
Element of ecological network	Should acidification or water pollution cause a species of fish to die out in one section, an isolated section cannot be repopulated. Fish ladders take over the role of corridors here.

Other	The migration aids can lessen the impact of the changed ecological conditions (silt and sludge deposits, higher temperatures, lower oxygen concentrations) caused by the alternation between fast-flowing areas to practically stagnant stretches of water at weirs and similar installations.
Time of realisation for measure	Immediate: The migration aids can be used by fish and other living organisms in flowing waters as soon as they have been installed.
Impact scope	Local (municipality): The impact is primarily of importance in the flowing waters in question and, in this case, in the affected section in particular. However, in larger bodies of water or on major fish migration routes, the measure can gain regional importance.
Implementation	
Implementation period	Weeks: Many of the migration aids addressed are complex structures which, on top of the planning process, also take some time to build.
Frequency	Non-recurring: Should be accompanied by monitoring of effectiveness.
Economic and legal aspects	
Costs	High (100'000-1 Mio EUR): Fish migration aids are very expensive installations. Depending on the structure, the costs can range from 100,000 to several millions of euros.
Socio-economic impacts	Low: Increased fish stocks, improved water quality in the flowing waters.
Sources of financing	Private sponsor, Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	The need for fish migration aids is regulated by law throughout Europe by, inter alia, the EU Water Framework Directive.
Further information	
Evaluation	The technical know-how for the construction of fish migration aids has improved significantly and the new opportunities and variants enable suitable solutions to be proposed for every obstacle or situation. The ecological importance and impact of the migration aids have been shown in numerous scientific studies.
Information	Other: e.g.: Salzburger Fischpass-Fibel: Erfahrungen zu Bau und Betrieb von Fischaufstiegshilfen (2002). Land Salzburg, Abt. Naturschutz, Referat Gewässerschutz. 152 S.

Public relations work and sensitisation

Sports competitions



Sports competitions can help raise public awareness of biotope networks. © rheinerftkreis/flickr.com

Involved sectors

Agriculture, Forestry, Hunting, Tourism and leisure, Nature protection, Local population/citizens, Public relations and environmental education, Other: Sports Associations

Affected habitats

Measure independent of habitat

Description

Sports competitions can help raise public awareness of biotope networks. In particular, the importance of wildlife corridors can be conveyed very effectively through the selection of a high-profile species of fauna. Organising races at local level (e.g. wildcat runs in Thuringia, Bavaria and Hesse) can encourage hikers, walkers and runners and draw attention to the need to network habitats of specific species. Besides the sports competition, information can be provided, e.g. through an appropriate flanking programme and exhibitions which raise awareness of how the animals live and the obstacles to their migration. Additional funds (e.g. for the purchase of areas to create a biotope network) can also be sought in this way. This raises awareness of rare species of fauna and sensitises the public to the issue of landscape fragmentation.

Impact

Impact in particular on	Big mammals
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Ecological impact

Other	A direct ecological impact can only be achieved through embedding in an overall concept, e.g. through donations at the event for the purchase or exchange of areas.
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Time of realisation for measure Immediate: Public awareness is raised immediately, but direct ecological impacts only arise after some years with adoption of more comprehensive measures (see above).

Impact scope Transregional: Events can be organised at various levels, but individual events should be embedded in a transregional concept.

Implementation

Implementation period Months: Organising an event is very time-consuming if it is to appeal to the general public and generate effective publicity.

Frequency Non-recurring, Recurring: Can be a single, annual action.

Economic and legal aspects

Costs Low (1'000-10'000 EUR): Depending on the size of the event and accompanying actions, at least € 2000 will be required.

Socio-economic impacts No direct impact: By increasing public awareness, positive impacts (donations, volunteers) can be expected. The events may also be of interest to the tourism sector.

Sources of financing Private sponsor, Public: local, Public: regional, Public: national

Further information

Evaluation The "Running Wild" - "race for life" for the European wildcat (*Felis silvestris silvestris*) has already taken place three times (2006, twice in 2008) at the initiative of BUND Deutschland (Friends of the Earth Germany) to publicise the planned migration corridor for wildcats between Hainich National Park and the Thuringian Forest (Thüringer Wald) (Hesse, Bavaria, Thuringia in Germany).

Information Other: Further information about the "race for life" for the European wildcat is available at: <http://wildkatzet3.bund.net/index.php?id=79>

Good Practice ["Running Wild" – the wildcat run, Germany](#)
[Exemple « Running Wild – Courir pour le chat sauvage »](#)
[Esempio "Running Wild – Corsa per il gatto selvatico"](#)

Information campaigns in towns and municipalities



Settlements contribute to the fragmentation of the landscape. © Zeiteinspiegel/ Frank Schultze

Involved sectors

Nature protection, Local population/citizens, Municipalities

Affected habitats

Measure independent of habitat

Description

Settlements are among those areas which may contribute to the fragmentation of the landscape and whose development may contribute to habitat decline. However, it may be possible to mitigate these effects with measures adopted in the gardens and green spaces of towns and villages. The permeability of the areas and, above all, of the spatial restrictions can be increased, habitats can be created or made more environmentally compatible, and the use of pesticides and herbicides can be dispensed with, etc. By means of information campaigns and brochures sent out along with building permits, for example, the public can be encouraged to adopt these measures. Possible measures include: creation of near-natural hedges from local timber, permeability of fencing around properties, "insect hotels", bee forage etc.

Impact

Impact in particular on

Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

Simple methods such as small recesses in walls, wider meshes in fences, etc. can greatly increase the mobility of insects, small mammals, amphibians, etc. in residential areas.

Improvement or preservation of habitats

Insect hotels, near-natural hedges, nesting boxes, dead branches and piles of leaves, stones and "wild corners" in gardens increase the diversity, quality and supply of habitats in settlements.

Element of ecological network	Appropriately designed and managed parks and gardens can form significant stepping stone biotopes.
Other	More nature in settlements has positive effects on the hydrological regime, climate and human health.
Time of realisation for measure	Years: Depending on the measure, the impact may commence immediately (e.g. creation of an opening in a boundary wall) or only after several years (creation of hedges, tree-planting, restoration of water bodies).
Impact scope	Local (municipality): In order to achieve a good impact, it is important to work at community level and involve as many local residents as possible!
Implementation	
Implementation period	Long term: Most of the measures listed can be implemented relatively quickly and with little expense or work.
Frequency	Non-recurring, Recurring: Long-term awareness building is needed for optimal effect. Individual measures can be implemented with limited resources.
Economic and legal aspects	
Costs	Medium (10'000-100'000 EUR): Most of the examples listed are not very cost-intensive. The work can be carried out as part of local projects, often with volunteers.
Socio-economic impacts	Low: More attractive living environment, more "nature" in settlements.
Sources of financing	Private sponsor, Other private sources, Public: local, Public: regional
Legal situation	Implementation of the measures takes place on a voluntary basis.
Further information	
Evaluation	Experience has shown that citizens are often unaware or have little information about these issues and respond very positively to ideas and suggestions. If the municipalities contribute to the costs of a new near-natural hedge, for example, a great many volunteers can be recruited very quickly.
Information	France: Département Isère has published numerous brochures on this theme and runs regular information campaigns: http://www.isere-environnement.fr/pages/index/id/6416/
Contact	France: Conseil général de l'Isère (http://www.cg38.fr/)

Guided tours and information events



Local information events and guided tours are important measures. © WWF/ L.Umek

Involved sectors

Agriculture, Spatial planning, Nature protection, Municipalities

Affected habitats

Measure independent of habitat

Description

In the implementation of measures and thus the realisation of biotope network projects at local level, spatial and landscape planners and municipal administrations have a role to play as key actors alongside the nature conservation organisations, which are often the driving forces behind biotope network projects. Local information events and guided tours are a good way of informing these actors (as well as other stakeholders such as farmers, hunters etc.) about the issue of biotope networks and ecological connectivity and ways of realising them in practice. What is important, to ensure the success of these initiatives, is to prepare summary documentation (e.g. a manual with decision-making aids) and to present the benefits and value-added which such projects can generate at local level (multifunctionality of corridors which are significant not only in ecological terms but also perform key social functions as spaces for leisure and recreation as well as economic functions, e.g. through the sustainable management of roadside grass verges).

Impact

Ecological impact

Other	Indirect through training and sensitisation of decision-makers and local stakeholders.
Time of realisation for measure	Immediate: Participants must be motivated to take account of connectivity issues in their decisions, ideally starting straight away. Results can be expected in the long term.
Impact scope	Local (municipality): Depends on audience. Cooperation between municipalities at regional level should be proposed.

Implementation

Implementation period Weeks: Training and guided tours take some time to prepare, but delivery can take place in a standardised format.

Frequency Recurring: Long-term awareness building is needed for optimal effect.

Economic and legal aspects

Costs Very low (less than 1'000 EUR): Cost are incurred due to the working time taken in preparing and delivering training and preparing information material.

Socio-economic impacts Low: Sensitisation of the public.

Sources of financing Other private sources, Public: local, Public: regional

Legal situation Voluntary information events.

Further information

Evaluation This measure cannot be expected to produce direct ecological impacts. However, the good cooperation and extremely high level of interest shown at the well-attended daytime and evening events for decision-makers in the municipalities and administrations, such as those held by nature conservation association FRAPNA, demonstrate the high level of interest in these measures and are thus likely to have an indirect positive ecological impact.

Information Other: Experience already gained in some pilot regions in the Alps (Engadine, Gesäuse, Isère).

Contact France: e.g. Arnaud Callec, Conseil général de l'Isère

Coordination of cultivation competition



A particular commitment to nature and species conservation and the preservation of cultural landscapes can be rewarded through competitions. © Hermann/ pixelio.de

Involved sectors

Agriculture, Forestry, Tourism and leisure, Nature protection, Local population/citizens, Public relations and environmental education

Affected habitats

Forest, Bogs and fens, wetlands, Grassland, Arable land

Description

A particular commitment to nature and species conservation and the preservation of valuable regional cultural landscapes, also within the framework of biotope network initiatives, can be rewarded through competitions. At the same time, the public can be informed about farmers' commitment, thus increasing the acceptance of biotope networking measures. In this way, the services provided by agriculture for the preservation of the cultural landscape or networks of interlinked biotopes can be rewarded, while raising awareness of measures adopted within the framework of regional cultural landscape programmes. For farmers, the provision of public information and the ensuing recognition of their work create incentives to manage their areas in a manner conducive to biotope connectivity.

Impact

Ecological impact

Improvement or preservation of habitats	Competitions can offer incentives for habitat improvement, thus creating habitats for rare species of animal and plant (e.g. extensive grassland).
Element of ecological network	Appropriate competition design facilitates a focus on aspects of ecological connectivity.
Other	Overall concepts (e.g. for a local biotope network) can be planned and implemented as part of a competition.

Time of realisation for measure Months: The impact depends on the focus of the competition but manageable time frames should be aimed for.

Impact scope Local (municipality): The impact can be enhanced with comprehensive planning and embedding in an overall concept.

Implementation

Implementation period Weeks: Competitions can be implemented within very short periods of time.

Frequency Non-recurring, Recurring: Can be a single or annual action.

Economic and legal aspects

Costs Low (1'000-10'000 EUR): Costs are associated with the prizes awarded, the inspection of sites, PR work, and organisation. Depending on size, at least €2000 will be required.

Socio-economic impacts Low: If marketed appropriately, competitions can serve to attract tourists.

Sources of financing Private sponsor, Public: local, Public: regional

Further information

Evaluation In the Eifel, Germany, a meadow management competition took place in 2007 in which dry, fertilised and wet meadows were scored according to nature conservation criteria, management method, status from an agricultural perspective, and the farmer's publicity work.

Information Germany: e.g. <http://www.wiesenmeisterschaft.de/>

Educational pathways



Increase knowledge while offering an experience of nature. © froutes/ flickr.com

Involved sectors

Tourism and leisure, Nature protection, Public relations and environmental education, Other: Schools

Affected habitats

Measure independent of habitat

Description

The purpose of an educational pathway is to impart and increase knowledge while offering an experience of nature, recreation and raising environmental awareness. Pathways also offer a good opportunity to bring the issue of biotope networks closer to the public and thus publicise a local or regional project. The “Green Light for Ecological Corridors” educational pathway, for example, was developed as part of a transnational Interreg III A project by three nature conservation organisations: Pro Natura Genève, Appollon 74 and FRAPNA Haute-Savoie. Along the pathway, there are numerous information boards which explain the significance of ecological corridors. The boards were designed in conjunction with school classes from the local area. As part of this collaboration, teachers and students explored the topic of habitat connectivity in great detail. 20 classes were involved in total. In addition, various other educational tools, such as a brochure and a touring exhibition, were developed as part of the project.

Impact

Ecological impact

Other	Indirect ecological impact via environmental education and public information.
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Time of realisation for measure

Immediate: In view of the costs, an educational pathway should be long-term in focus. In this way, it can also demonstrate the effect of a variety of measures to promote connectivity.

Impact scope	Regional: Depending on the location of the educational pathway, it may also attract tourists and visitors from other areas.
Implementation	
Implementation period	Months: If properly thought out, the planning, development and implementation of an educational pathway can involve quite a considerable workload.
Frequency	Non-recurring: Requires permanent maintenance of info boards.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Depending on scope (length of educational pathway, terrain, use of existing pathways, number of stops) an educational pathway may entail costs running into several tens of thousands of euros.
Socio-economic impacts	Low: May attract visitors. Environmental education.
Sources of financing	Private sponsor, Other private sources, Public: local, Public: regional, Public: European
Further information	
Evaluation	This measure cannot be expected to produce direct ecological impacts. However, the good cooperation and extremely high level of interest on the part of the many school classes participating in the above-mentioned project demonstrate the effect of these measures and are thus likely to have an indirect positive ecological impact.
Information	Other: Brochure on the project and further details: http://www.pronatura.ch/ge/index.php?lang=3&mz=5 / http://www.frapna-haute-savoie.org/
Contact	France: Contact at FRAPNA Haute-Savoie: Damien Hiribarrondo "Grünes Licht für ökologische Korridore" (Green Light for ecological corridors), French-Swiss border in the Geneva Basin area
Good Practice	Exemple de la région frontalière franco-suisse du bassin lémanique Esempio del confine franco-svizzero del bacino del Lago di Lemano

Development and provision of educational materials on biotope networks and ecological connectivity



Children are the adults of tomorrow. © IRKA

Involved sectors

Nature protection, Public relations and environmental education, Other: Schools, Kindergarden

Affected habitats

Measure independent of habitat

Description

The description of this measure is based on the “Nature sans frontières” (Nature without Frontiers) games kit from the French nature conservation organisation FRAPNA. Children are the adults of tomorrow – and will be responsible for decision-making and action. For that reason, it is important to teach them about ecological relationships and the key functions of natural systems. This can be achieved simply and effectively through play. That is the aim of this educational games kit. It is a practical tool which enables children and young people to learn about the mobility needs of various sample species, recognise possible barriers and identify simple solutions to overcome them. The easily accessible games are ideally suited to the classroom and excursions into the local environment. The kit comprises a theoretical guide with explanations of the issues, suggested action and solutions (80 pages); an activity book with instructions for observations, 12 experiments and various activities (60 pages), and several games (card games, board games, identification sets etc.).

Impact

Ecological impact

Other Indirectly through environmental education.

Time of realisation for measure

Immediate: Sensitising children to this issue is an important aspect of publicity work. As a rule, children are very receptive to the topic and are keen to take action immediately. To ensure a more lasting sensitisation impact, however, the issue must be addressed in detail over a longer period.

Impact scope	Local (municipality): The educational tool is being distributed throughout the region and presented to classes in schools.
Implementation	
Implementation period	Weeks: The longer the sensitisation period and the greater the detail, the more effective the message. This also allows specific activities and projects to be carried out with children, including in the field.
Frequency	Non-recurring
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): Presentation of the games in the classes and facilitation are undertaken by volunteers. The games kit itself costs € 40.
Socio-economic impacts	Low
Sources of financing	Private sponsor, Other private sources, Public: local, Public: regional
Legal situation	Voluntary education offer.
Further information	
Evaluation	The kit is proving very popular with children and the experience reported by volunteers and staff from the nature conservation organisation is very positive. No data are available on the long-term impacts on the current and future behaviour of the children.
Information	Other: The games kit was developed in 2005-2008 as part of an environmental education campaign on ecological corridors: http://www.frapna-haute-savoie.org/
Contact	Other: http://www.frapna.org/
Good Practice	<u>"Nature sans frontières" (Nature without Frontiers) games kit from the French nature conservation organisational FRAPNA</u> <u>Exemple de l'association française de défense de l'environnement FRAPNA : le kit de jeux « Nature sans frontières »</u> <u>L'esempio dell'Associazione ambientalista francese FRAPNA: Il kit di giochi "Natura senza frontiere"</u>

Visitor information



Signage, information boards and waymarking can channel visitors in sensitive areas.

© Yann Kohler

Involved sectors

Agriculture, Forestry, Tourism and leisure, Nature protection, Local population/citizens, Public relations and environmental education

Affected habitats

Measure independent of habitat

Description

Information boards can be used to sensitise the public to the issue of biotope networks and inform them about relevant measures, e.g. in a nature conservation area. Visitors can also be channelled through a specific area by the information boards. In this way, usage can be shifted towards less sensitive areas, while efforts are made to preserve the tranquillity of, and reduce the burden on, areas in special need of protection and quiet zones. Information points are a good way of providing information and supporting active learning processes and “light-footprint” observation opportunities. Depending on the area, cultural and historical information can also form part of the pathway.

Impact

Ecological impact

Improvement or preservation of habitats	In combination with strategies to channel visitors, habitat improvements can be achieved (e.g. by creating a quieter environment in some areas).
Other	Information systems cannot be expected to produce direct ecological impacts, but in the long term, public awareness is increased and there is greater acceptance of the relevant measures.

Time of realisation for measure	Immediate: Visitor information boards can start to have an impact as soon as they are in place. During the planning process, however, it is important to ensure that no additional disturbance will be caused.
Impact scope	Local (municipality): Educational pathways and information strategies can also be implemented on a larger scale. In general, however, they should only be considered for habitats which will not suffer any impairment as a result of the placement of information boards.
Implementation	
Implementation period	Months: Planning and implementation of information strategies take time, depending on the size of the area.
Frequency	Non-recurring: Info boards require permanent care.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Costs can vary considerably depending on the materials used, scale and design. At least € 1000 in material costs must be assumed for each information board.
Socio-economic impacts	No direct impact: Attractive information offers may be beneficial to tourism.
Sources of financing	Other private sources, Public: local
Further information	
Evaluation	A wealth of information offers is available, which often also serve to channel visitors. In Switzerland, since 1996, near-natural areas and a networked system of natural habitats for flora and fauna have been developed in the Grosses Moos biotope network. In this context, an information strategy was developed with interactive elements, explaining the individual elements of the biotope network.
Information	Switzerland: Information programme in Grosses Moos (Switzerland): http://www.echanges.ch/exchange02/pdf/atelier_moos.pdf

Volunteer programmes



Some providers offer the opportunity to undertake voluntary work in the ecological sphere.
© lia.la/ pixelio.de

Involved sectors

Agriculture, Forestry, Fishery, Tourism and leisure, Nature protection, Other: Private people, NGO, Companies

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Some providers offer various target groups, e.g. families, companies, schools and private individuals, the opportunity to undertake voluntary work in the ecological sphere (e.g. in woodlands). Participants thus make an active contribution to forest, climate and species protection while gaining a very intensive experience of the ecosystem at the same time. The purpose of the volunteering is to improve habitat quality at specific project sites. Relevant programmes also inform the volunteers about connections within the various habitats and make a contribution to sensitisation and awareness-raising. Focussing measures on the creation of a biotope network is an option in this context. Cooperation through current "corporate social responsibility" initiatives also helps to raise environmental awareness and increase knowledge of the importance of connectivity measures in an up-to-date way while drawing attention to the problems arising in this context.

Impact

Ecological impact

Improvement or preservation of habitats

As a result of the volunteer work, and depending on the location and the measures undertaken, habitat quality can be improved.

Element of ecological network	By gearing projects towards ecological connectivity, activities focus on relevant elements.
Other	Volunteering raises awareness of nature conservation and, depending on the thematic focus, of the importance of connectivity measures.
Time of realisation for measure	Weeks: Depends on the specific measures being carried out. To increase participants' motivation, it is beneficial to achieve rapidly visible results.
Impact scope	Local (municipality): Assignments are carried out at local level. The impact increases with appropriate large-scale planning.
Implementation	
Implementation period	Weeks: Often, assignments last one week, but may only last for a few days. Several groups may contribute to the implementation of Individual measures.
Frequency	Non-recurring, Recurring: Single or repeated action, depending on type of measure.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Tools and vehicles must be available, as well as experts to explain and manage the projects; publicity work.
Socio-economic impacts	No direct impact: Relevant initiatives may also be attractive to tourists, and positive regional economic effects can be achieved.
Sources of financing	Private sponsor
Legal situation	Relevant organisations cooperate closely with forestry or nature conservation.
Further information	
Evaluation	The Bergwald Project has worked since 1987 to preserve the mountain forest with a main focus on Austria, Switzerland and Germany and, since 2006/7, Ukraine and Catalonia. WWF Switzerland also offers volunteering opportunities for companies with a focus on dry meadows in Lower Engadine (ECONNECT pilot region Inn-Etsch).

Information

Switzerland: <http://www.bergwaldprojekt.ch>
<http://www.bergwaldprojekt.de>
<http://www.wwf.ch/de/aktiv/engagement/freiwilligenarbeit/>

Landscape preservation days



Countryside management measures can involve joint action between various stakeholders and the local community. © Barbara Breyer/ Zeiteinspiegel

Involved sectors

Agriculture, Forestry, Fishery, Hunting, Nature protection, Local population/citizens, Municipalities

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Countryside management measures can involve joint action between various stakeholders (nature conservation bodies, hunters, fishermen, farmers etc.) and the local community. Within the framework of these events, measures of relevance to ecological connectivity can also be implemented. They include, for example, maintaining richly structured, semi-open areas through the removal of wood, meadow management, or promotion of near-natural structures along watercourses. Activities can be undertaken at local or regional level at various intervals. The implementation of measures also increases the acceptance of the biotope network and raises public awareness at the same time.

Impact

Ecological impact

Improvement or preservation of habitats	As a result of the activities carried out as part of "countryside management days", and depending on the location and the measures undertaken, habitat quality can be improved.
Element of ecological network	By gearing projects towards ecological connectivity, activities focus on relevant elements.
Other	Acceptance in the local community is increased, perhaps leading to more measures to promote ecological connectivity.

Time of realisation for measure

Immediate: The impact depends on the measures carried out.

Impact scope

Very localised (plot): Implementation of the measures is generally localised.

Implementation

Implementation period Days: For smaller-scale activities, 1-day assignments are generally sufficient; several actions can also take place consecutively.

Frequency Non-recurring, Recurring: Single or repeated action, depending on type of measure.

Economic and legal aspects

Costs Very low (less than 1'000 EUR): The requisite tools must be available, and it is customary to provide food for the helpers; costs can generally be kept low.

Socio-economic impacts No direct impact: Important tasks can be undertaken, reducing the overall costs of biotope networking measures.

Sources of financing Private sponsor, Public: local

Further information

Evaluation There are numerous initiatives, albeit without a specific focus on biotope connectivity so far. Often, nature conservation organisations initiate countryside management days and can provide further information.

Information Other: Information about existing initiatives is available, for example, at: <http://rohrhardsberg-life.de/artikel/landschaftspflege>

Monitoring by farmers



Farmers are important partners in the implementation of relevant measures. © Uwe Steinbrich/pixelio.de

Involved sectors

Forestry, Nature protection

Affected habitats

Grassland, Arable land

Description

Farmers, with their areas distributed through the landscape, are key elements of transregional networks of interlinked biotopes and are therefore important partners in the implementation of relevant measures. They also possess extensive knowledge and many years of experience which they can contribute to the planning and implementation of biotope networking measures. It is therefore extremely important to involve farmers as stakeholders. They can also perform a key function by monitoring the development of endangered and/or rare species on their own farmland. This observation process raises awareness and also improves their understanding of the purpose of certain management requirements (e.g. areas of extensive use, set-aside etc.). For the monitoring of the biotope network, appropriate and effective indicator systems must be defined.

Impact

Ecological impact

Other	Direct ecological impacts only arise as a result of the measures which are the focus of monitoring. Monitoring systems are appropriate, for example, to measure the impact of actions for the extensivisation of agriculture. Indicators can include the presence of specific rare plant species, for example.
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Time of realisation for measure

Months: Biotope networking measures must be carried out before monitoring takes place.

Impact scope Very localised (plot): Monitoring takes place on individual plots. The impact can be increased if entire regions participate in relevant programmes.

Implementation

Implementation period Months: Appropriate training must be provided for farmers before monitoring commences.

Frequency Recurring: Because of the high conceptual preparation and management cost this requires long-term implementation.

Economic and legal aspects

Costs Very low (less than 1'000 EUR): Preparation, training for participants, processing of results. A monitoring subsidy could also be paid to participants.

Socio-economic impacts No direct impact: Compensation (payment of a subsidy) is possible to offset the moderate additional expenses incurred by farmers in conjunction with monitoring.

Sources of financing Private sponsor, Public: local, Public: regional

Further information

Evaluation In Vorarlberg, experience has been gathered with a programme to involve farmers in biodiversity monitoring ("Biodiversity Monitoring with Farmers" (BDMWF)). Similar approaches are being pursued in the Species-Rich Grassland Programme.

Information Austria: Information is available, for example, at:
http://www.vorarlberg.at/vorarlberg/umwelt_zukunft/umwelt/natur-undumweltschutz/foerderungen/oepul2007/naturschutzmassnahmenimoe.htm
[http://www.oekl.at/stories/storyReader\\$698](http://www.oekl.at/stories/storyReader$698)

Hunting

Hunting ban areas, game protection areas, quiet zones, game reserves



In French game reserves, hunting is strictly prohibited. Habitat improvements should.
© Yann Kohler

Involved sectors

Agriculture, Forestry, Hunting, Nature protection, Municipalities

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

These various types of areas are intended to protect flora and fauna from disturbance or pressure from hunting. They are subject to different regulations, depending on the country or region: in Switzerland's "quiet zones" for game, for example, tourists, sportspersons and visitors may not leave the paths at specific times or enter the habitats of sensitive and rare species of fauna. Other activities such as skiing, snowshoeing, camping or organised sports events are also governed by specific rules. Alpine farming and agricultural/forest management are not affected by restrictions in the quiet zones, and hunting is also permitted. In France, on the other hand, hunting is strictly prohibited in the game reserves, as it is in Switzerland's hunting ban areas and game protection areas.

Impact in particular on Big mammals

Ecological impact

Improvement or preservation of habitats	Designation of these areas is often accompanied by habitat improvement measures (in France, this is mandatory for game reserves under hunting legislation).
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Element of ecological network	Depending on the size of the designated spaces, these areas can act as core zones or stepping stone biotopes in a biotope network, especially for sensitive species of bird and ungulates.
Time of realisation for measure	Immediate: A change in the behaviour of red deer, for example, in quiet zones can be observed within a short period (diurnal activity, confidence).
Impact scope	Local (municipality): Depending on species, the measure can have substantial local and regional impacts by reducing damage to agriculture and forestry; this is mainly dependent on the size of the designated zone.
Implementation	
Implementation period	Weeks: The administrative process involved in designation of a new area may take some time. In France, for example, the reserves are confirmed by the prefect by decree.
Frequency	Non-recurring
Economic and legal aspects	
Costs	Very low (less than 1'000 EUR): Costs arise solely in relation to the administrative process (planning, designation) and possibly publicity/signage.
Socio-economic impacts	Low: May help to prevent damage to agriculture and forestry in some regions.
Sources of financing	Other private sources, Public: local, Public: regional, Public: national
Legal situation	The establishment of these areas is regulated by national and regional forest and hunting legislation. In France, 10% of the area of a communal hunting association (ACCA) must be designated a game reserve.
Further information	
Evaluation	Experience in Switzerland has shown that the game reserves enjoy wide acceptance among the local communities and sportspersons if appropriate information is provided. Hunters generally also respect the hunting bans in these areas.
Information	Other: Association of French Hunters: http://www.chasseurdefrance.com/ Swiss cantonal administrations (hunting departments), e.g. Obwalden Canton

Spatial planning

Taking account of the elements of ecological networks in planning tools (land-use plans, landscape development strategies etc.)



The dynamic character of the biotope network has to be maintained. © Rainer Sturm/pixelio.de

Involved sectors

Agriculture, Forestry, Water management, Hunting, Spatial planning, Tourism and leisure, Nature protection, Local population/citizens, Municipalities

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

The consideration of central elements of a biotope network in spatial planning is extremely important for the long-term and sustainable creation of a biotope network. This is the only way to ensure long-term connectivity. Planning must, however, be flexible enough to take account of the dynamic character of the biotope network. Depending on the type and significance of the elements, they should be taken into account in different tools and at different levels (at local level, areas for a small-scale network; at regional level, key migration corridors and solutions for major conflict points). There are already a number of examples in existence, notably in Switzerland with the creation of the REN in guidance planning (Richtplanung) or in France, where individual municipalities have incorporated elements of the local biotope network in their land-use planning.

Impact

Impact in particular on Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects, Fish

Ecological impact

Reduction of fragmentation or creation of new valuable habitats The consideration of the biotope network in spatial planning helps to avoid fragmentation in future.

Element of ecological network The key elements of the biotope network are safeguarded for the long term.

Time of realisation for measure Immediate: Spatial planning of key sites and structures avoids incorrect use and safeguards the long-term functionality of the network.

Impact scope Local (municipality): Depending on the planning tool and the biotope network plan, may vary widely.

Implementation

Implementation period Months: Consideration in planning tools requires a very precise concept of the biotope network, mapping and coordination with other stakeholders - a lengthy process.

Frequency Non-recurring, Recurring: Can only be effective as part of a long-term concept. Specific single actions can be implemented to preserve specific areas as part of that concept.

Economic and legal aspects

Costs Medium (10'000-100'000 EUR): Cannot be specified precisely. Planning is, however, very time-consuming and labour-intensive.

Socio-economic impacts High: Numerous and diverse impacts on all stakeholders affected by the biotope network.

Sources of financing Public: local, Public: regional, Public: national

Legal situation Local, regional, state planning instruments.

Further information

Evaluation Inclusion of the elements of a biotope network in land-use planning is relatively new and much experimentation is under way. Questions about the best approach are still unresolved, especially as the network elements should have a dynamic character and no new "strictly protected areas" should be created.

Information Other: e.g. in the French Region Rhône-Alpes, municipality of St. Martin d'Uriage, or Fribourg Canton in Switzerland.

Wildlife/ ecological spatial planning



Wild animals often cause damage in cultural landscapes. © Carsten Przygoda/ pixelio.de

Involved sectors

Agriculture, Forestry, Water management, Hunting, Spatial planning, Tourism and leisure, Nature protection, Municipalities

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Wildlife/ecological spatial planning (WÖRP) is an instrument developed in Austria and is used in a number of Austrian states, as well as the canton of Graubünden in Switzerland and Liechtenstein. The aim of this concept is better long-term incorporation of native species of wildlife into the cultural landscape. In this context, the protection and sustainable use of wildlife populations and the avoidance of damage to wildlife in agriculture and forestry are of key importance. An integrated planning approach aims to harmonise the creation of biotope networks with studies on game stocks and the carrying capacity of biotopes. WÖRP can be applied, in principle, to all wildlife species. It includes large-scale spatial planning (nationwide basic planning) related to the spatial distribution of wildlife populations and detailed regional planning.

Impact

Impact in particular on Big mammals, Birds

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

The aim of WÖRP is the conservation of species-appropriate coherent habitats for wildlife. Habitat connectivity is an essential part of habitat conservation.

Improvement or preservation of habitats

It includes habitat conservation and improvement measures, overwintering concepts for hoofed game, and minimisation of use-related conflicts.

Element of ecological network	Building on the results of WÖRP, appropriate connectivity measures are adopted, including the construction of green bridges.
Other	In infrastructural projects, WÖRP helps to provide an initial pointer to the significance of the habitat for wildlife, which can then be taken into account during planning.
Time of realisation for measure	Long term: Implementation of WÖRP is a long-term process which must constantly be adapted to changing conditions.
Impact scope	Regional: The regulations governing WÖRP divide the countryside into wildlife spaces, wildlife regions and wildlife zones. It involves regional planning across a wide area, which is intended to provide a basis for detailed local plans.
Implementation	
Implementation period	Months: As WÖRP is a complex planning tool requiring substantial information, the process takes time.
Frequency	Non-recurring: Single though long-term process; may require subsequent complementation or adaptation.
Economic and legal aspects	
Costs	High (100'000-1 Mio EUR): Dependent on many different factors (size of area, detail of plans, etc.) so varies widely from case to case.
Socio-economic impacts	High: May have considerable impacts on spatial planning, farming, hunting etc.
Sources of financing	Other private sources, Public: local, Public: regional, Public: national, Public: European
Legal situation	In Austria, specific regulations (WÖRP-Verordnung) governing WÖRP are in place. In some federal states in Austria, WÖRP is established in hunting legislation.
Further information	
Evaluation	Complex but successful planning tool which has also proved its worth in an international context (along the tri-border area between Austria, Switzerland and Liechtenstein). At international level, in conjunction with Natura 2000 and protected areas, WÖRP has found solutions to problems arising between protected and non-protected areas.

Information	Other: The Austrian states of Vorarlberg, Salzburg, Carinthia, and Liechtenstein, Graubünden (CH), and Austria's National Parks (Kalkalpen, Donau-Auen).
Contact	Austria: Salzburg federal state: Dipl.-Ing. Rupert Haupolter; Research Institute of Wildlife Ecology, University of Veterinary Medicine, Vienna: Prof. Dr. Friedrich Reimoser

Tourism and leisure

Tourist marketing of the biotope network



A focused marketing enhances a regional ceation of value. © CIPRA International

Involved sectors

Agriculture, Forestry, Spatial planning, Tourism and leisure, Nature protection, Local population/citizens, Municipalities

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Valuable habitats of different species of fauna and flora also have high recreational value which, with appropriate sustainability strategies, can generate synergies between nature conservation and tourism strategies. On the one hand, appropriate tourist offers can inform visitors and guests about the biotope network. On the other, tourism can contribute to the conservation and protection of habitats. Corresponding effects can be achieved through an integrated marketing strategy in which the biotope network is actively promoted via the marketing and imparted through appropriate guided tours, for example. The focus should be on particularly attractive biotopes which also increase regional value-added (e.g. mixed orchards). In this way, sustainable agriculture, crafts and commerce in the region can be promoted and the biotope network will be increasingly appreciated in the long term by locals and visitors alike due to its positive economic effects.

Impact

Ecological impact

Other The increased acceptance of biotope network measures is expected to create positive ecological impacts over the long term and more measures may be implemented on this basis.

Time of realisation for measure Years: A long period of time is required to develop and implement suitable strategies and, similarly, it takes a long time for the impact to appear. However, acceptance can already be increased during the planning phase.

Impact scope **Regional: Marketing strategies should preferably be implemented at regional level but a biotope network can be promoted at local level.**

Implementation

Implementation period Years: It can be assumed that the implementation of the strategies will take a long time.

Frequency Recurring: Realization is a long-term activity.

Economic and legal aspects

Costs Medium (10'000-100'000 EUR): The costs for the planning process and for creating the appropriate structures are expected to be high, but can be integrated into existing planning processes.

Socio-economic impacts Medium: Positive economic effects should be achieved if sound marketing strategies are developed.

Sources of financing Private sponsor, Other private sources, Public: regional, Public: national

Further information

Evaluation

The "Experience the Green Belt" project in Germany is promoting the former inner-German border for tourism. It is combining nature conservation with 'soft' tourism to publicise this unique biotope network and draw attention to its importance for nature conservation.

Information

Germany: Information from the Federal Agency for Nature Conservation: http://www.bfn.de/0310_steckbrief_gruenesband+M52087573ab0.html Project website: <http://www.erlebnisgruenesband.de/>

Good Practice

[“Experience the Green Belt”, Germany](#)
[Exemple « Erlebnis Grünes Band » \(À la découverte de la Trame verte\), Allemagne](#)
[Esempio “Esperienza nastro verde” in Germania](#)

Trails to connect protected areas



Trails can draw attention to aspects of ecological connectivity. © Bollinger Hanspeter/pixelio.de

Involved sectors

Spatial planning, Tourism and leisure, Nature protection, Local population/citizens, Municipalities

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

In Switzerland (Haute-Engadine, Haut-Valais, southern Tessin), the WWF, together with regional tourism offices, has created three transboundary Emerald Trails with a total of 50 stages. The stages and their attractions, as well as accommodation options, are described in detail on the Internet. The trails link various protected areas, Natura 2000 sites and emerald areas and can thus draw attention to aspects of ecological connectivity.

Impact

Ecological impact

Other	No direct ecological impacts are achieved, but information placed along the trails can raise awareness. Acceptance of biotope network measures is also increased in the long term.
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Time of realisation for measure	Years: The use of good communication methods increases awareness of the issue immediately; acceptance within the general public only emerges after visible positive results.
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Impact scope	Regional: The scope of implementation and impact are heavily dependent on the conditions in the regions and habitats concerned.
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Implementation

Implementation period	Months: The development and promotion of the trails require a long planning phase.
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Frequency	Non-recurring: Regular maintenance of, e.g., info boards.
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Economic and legal aspects

Costs	Medium (10'000-100'000 EUR): The costs for planning, signage and advertising are expected to be high and will depend on the situation at the outset.
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Socio-economic impacts	Medium: On the basis that the region is being made more attractive, positive economic impacts are expected.
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Sources of financing	Private sponsor, Other private sources, Public: regional, Public: national
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Further information

Evaluation	Tourist marketing initiatives can be combined with other measures (e.g. publicity events, volunteer programmes). In addition to the example in Switzerland, Germany and Austria also have similar initiatives relating to Natura 2000 sites (NaturaTrails of the Friends of Nature).
Information	Other: http://www.wwf.ch/de/derwwf/themen/alpen/wanderwege/index.cfm , http://www.naturfreunde-natura2000.de/ , http://www.naturatrails.at

Trail concepts and visitor guidance for winter sports



In Vorarlberg/A and Switzerland the cross-national campaign "Respektiere deine Grenzen" supports the creation of leisure areas for wild animals. © Thommy Weiss/pixelio.de

Involved sectors

Forestry, Hunting, Tourism and leisure, Nature protection, Other: Sports Associations

Affected habitats

Forest, Alpine habitats, Grassland

Description

Ski touring and snowshoeing have become increasingly popular winter sports in recent years, offering an experience of the winter landscape off the pathways and pistes. However, they take sportspersons into the refuge areas of wild animals, which are highly sensitive to disturbance in winter. For critically sensitive zones, the German Alpine Association (DAV) publishes information for touring skiers regarding recommended routes (this includes demarcation of sensitive areas, waymarking, and information boards and maps at car parks). Efforts are also being made to promote cooperation with the authors and publishers of guidebooks.

Impact

Impact in particular on Big mammals, Birds

Ecological impact

Improvement or preservation of habitats	Disturbance in sensitive areas is avoided during the winter.
Element of ecological network	Demarcating quiet zones for game in winter creates important refuge areas which thus become winter core zones in a biotope network.
Other	In areas with emerging young forest stands, this measure can also help protect the young trees.
Time of realisation for measure	Immediate: Disturbance created by just a single winter sportsperson can have fatal consequences for sensitive species. Marking alternative routes prevents the animals from being disturbed.
Impact scope	Local (municipality): In the case of a regional or national initiative (e.g. by the German Alpine Association - DAV), or when a rare species of animal is involved (e.g. wood grouse - capercaillie), the impact can have a regional or even a national significance.

Implementation

Implementation period	Months: Determining the sensitive routes or sections of routes, formulating alternatives, preparing the information campaigns and signage along the new routes require some preparatory work.
Frequency	Recurring: Time-consuming and costly preparation of measures needed. Their implementation requires optimal care and continuous adaptation.

Economic and legal aspects

Costs	Low (1'000-10'000 EUR): Costs vary greatly depending on the project; besides labour, the main expenditure relates to publicity materials.
Socio-economic impacts	Low
Sources of financing	Private sponsor, Other private sources, Public: local, Public: regional
Legal situation	Voluntary collaboration of stakeholders.

Further information

Evaluation	There has been a very positive response and acceptance of the measures among ski tourers. Positive impacts, especially on grouse populations, have been demonstrated in various areas, including the German uplands. Information campaigns have been carried out in many different regions (especially protected areas); however, actual demarcation of alternative routes is less common.
Information	Germany: Information on the "Environment-friendly Ski Touring" project is available from the German Alpine Association at: http://www.alpenverein.de/ (keyword Environment-friendly ski touring)
Contact	Germany: Information on the projects in Berchtesgaden National Park: http://www.nationalpark-berchtesgaden.bayern.de-/01_nationalpark/01_aufgaben/09_management/-06_skibergsteigen/index.htm
Good Practice	Environment-friendly ski touring, Berchtesgaden, Germany Le ski de randonnée respectueux de l'environnement Sci alpinismo compatibile con la natura

Agreements on environmentally compatible practice of sports with sportspersons and associations



Agreements with sportspeople can prevent disturbances in sensitive areas, e.g. on crags.
© Yann Kohler

Involved sectors

Other: Sports Associations

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Many of the sports carried out in the natural environment can cause major disturbance and even the destruction of habitats. Mountain biking, paragliding, canyoning and climbing are just a few examples. In order to guarantee that sports are practised in a more environmentally compatible manner, agreements for sensitive areas can be reached with sports groups and associations. One example is the climbing strategy adopted by the German Alpine Association (DAV). Many rocky crags and rockfaces provide refuge for rare and protected species of flora and fauna. To ensure that these unique biotopes are not damaged by climbers, strategies for environmentally compatible climbing are both useful and necessary. The package of measures adopted by the German Alpine Association (DAV) on eco-friendly climbing involves working with public authorities and nature conservation organisations to develop climbing strategies. The DAV is relying on a wide variety of solutions to identify, at micro level, those areas where environmentally compatible climbing is possible and those where no climbing should take place in the interests of nature conservation. Uniform marking of crags, temporary closure of crags or sections of them, and local wardens with responsibility for crags are just some of the key elements of these strategies.

Impact

Impact in particular on	Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects, Fish
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Ecological impact

Improvement or preservation of habitats Many different plants and animals find their niche at close quarters between the foot of the rock walls and the top of the crags (lichens, peregrine falcon (*Falco peregrinus*), Eurasian Eagle Owl (*Bubo bubo*) and many types of insects). The temporary closure of crags or sections of them will prevent damage and disturbance.

Element of ecological network In areas with few key crags or on those which are used widely for tourism, the implementation of this measure plays a key role, particularly within a biotope network.

Time of realisation for measure Immediate: To protect rocky crags and rockfaces which are breeding places, it is particularly important that the impact is immediate and that no disturbance occurs. Gaining the long-term acceptance of sportspersons and implementing a broad-based standard procedure will take longer.

Impact scope Local (municipality): The impact occurs directly on the rocky crags and rockfaces concerned. However it can have a regional or transregional significance, such as in the case of the successful breeding of a rare and sensitive species.

Implementation

Implementation period Weeks: Signage and closures can be set up quickly. Training and 'educating' the sportspersons, establishing a standard marking system etc. are long-term goals.

Frequency Non-recurring: Time-consuming and costly preparation of measures needed. Their implementation requires optimal management and continuous adaptation.

Economic and legal aspects

Costs Medium (10'000-100'000 EUR): The work involved in implementing this strategy is mainly carried out by volunteers (local wardens with responsibility for crags). Costs for information materials and signage are incurred.

Socio-economic impacts No direct impact

Sources of financing Public: local, Public: regional, Public: European

Legal situation Voluntary collaboration with sportspersons and sports associations.

Further information

Evaluation

Through a contractual (voluntary) agreement, acceptance of the requisite measures among stakeholders is very high. The easing of burdens on the authorities and the ensuing cost savings, as well as the high degree of flexibility, also testifies to the usefulness of this approach. If monitoring of the scheme's success brings new scientific knowledge to light, the arrangements can be adapted without major organisational or financial effort.

Information

Germany: Comprehensive information about the climbing strategies and environmentally compatible climbing is available from the rock information system: www.dav-felsinfo.de (de)

Contact

Germany: DAV contact person on the subject of climbing and nature conservation: Jörg Ruckriegel.

Good Practice

[Climbing strategies: an environmentally friendly approach to climbing, Germany](#)
[Programmes d'escalade – L'escalade respectueuse de la nature](#)
[Alpinismo – Arrampicate compatibili con la natura](#)

Flight bans over sensitive areas



Various types of sport may also have a negative impact. © Manfred Schimmel/ pixelio.de

Involved sectors

Tourism and leisure, Nature protection, Local population/citizens, Other: Sports Associations

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Many near-natural landscapes and landscapes which are valuable from a nature conservation perspective are very attractive recreational spaces, for besides offering ideal conditions for sports and leisure, they also offer very special experiences of nature. With the increasing pressure of use, however, conflicts can emerge between the interests of “nature consumers” and nature conservation objectives. These may affect areas which constitute important habitats for rare and sensitive species and which are of major importance for the biotope network. Various types of sport (kite-flying, paragliding, gliding) may also have a negative impact. With the development of quiet zones and the simultaneous creation of alternative offers for sportspersons and holiday-makers in areas which are relatively tolerant of disturbance, incentives can be created for sportspersons to abandon those areas which are highly sensitive to disturbance. The provision of attractive substitute sites is intended to create “win-win situations”.

Impact

Impact in particular on	Small mammals, Big mammals, Birds
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Ecological impact

Improvement or preservation of habitats	Calming measures for individual areas particularly sensitive to disturbance lead to an improvement in the habitat quality of sensitive species (e.g. black grouse).
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Element of ecological network	Depending on the quality of the areas and on the species occurring in them, valuable areas from a nature conservation perspective constitute important elements of an ecological network.
Time of realisation for measure	Immediate: The positive impacts of suitable strategies are noticeable immediately after implementation; long-term acceptance, however, will probably only emerge over time.
Impact scope	Regional: Strategies should be planned with a broader spatial perspective, otherwise conflicts will merely be shifted into neighbouring areas.
Implementation	
Implementation period	Years: The procedure should be based on intensive participation by all stakeholder groups to enable feasible solutions, with majority support, to be developed for the conflict situation.
Frequency	Recurring: Requires long-term action adapted to actual needs.
Economic and legal aspects	
Costs	Medium (10'000-100'000 EUR): The planning process, which is based on the involvement of all stakeholders, requires a long period of time, and scientific studies must be produced.
Socio-economic impacts	Low: No negative impacts are expected if alternative flight areas are provided.
Sources of financing	Private sponsor, Public: local, Public: regional, Public: national, Public: European
Legal situation	Voluntary agreement.
Further information	
Evaluation	In the Upper Rhön region (Bavaria, Germany), as part of a close cooperation between aviation sport and nature conservation representatives, an agreement was formulated between 1998 and 2003 which was supported by the Federal Agency for Nature Conservation (BfN). The agreement between the Society for the Promotion of Gliding on the Wasserkuppe and the Biosphere Reserve Authority contains clear and tried-and-tested regulations.
Information	Germany: A project report published in the BfN-Skripten series is available on the internet and contains information on the entire planning process: http://www.bfn.de/fileadmin/MDB/documents/skript83_text.pdf
Contact	Germany: Expert support at the Federal Agency for Nature Conservation: Michael Pütsch

Communities

Biotope network plans on the local scale



To implement the right measures in the right way and in the right place an area-wide biotope network plan is necessary. © Wikipedia commons

Involved sectors

Agriculture, Forestry, Water management, Fishery, Hunting, Spatial planning, Tourism and leisure, Nature protection, Transport, Local population/citizens, Municipalities

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

Targeted and functional measures are important for effective biotope networking. An area-wide biotope network plan is essential if the right measures are to be implemented in the right way and in the right place. At the level of the local authority, priority areas for the biotope network can be included in the appropriate planning documents. This permits the land use interests of the various sectors to be weighed up at the same time. Ecological interests and development potential for the residential and economic area need not necessarily conflict.

Impact

Impact in particular on

Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects, Fish

Ecological impact

Reduction of fragmentation or creation of new valuable habitats

High-level biotope network planning can help reduce habitat fragmentation. In the best case, the combined plans of several local authorities constitute a supra-regional biotope network concept.

Improvement or preservation of habitats	Individual biotope improvements derive from development and improvement measures taken in the framework of the biotope network concept.
Element of ecological network	Targeted improvements are made to the individual elements of the local biotope network.
Time of realisation for measure	Immediate, Weeks, Months: Biotope network planning at the municipal level combines various measures with diverse effects in a range of sectors.
Impact scope	Local (municipality), Regional, Transregional: Depending on the actual design and integration of the local authority's biotope network concept in the higher-level planning process, the measures can have regional and supra-regional effects.
Implementation	
Implementation period	Years: Field data capture and the subsequent concept design phase take time. Several years may elapse between the initial planning phase and final implementation.
Frequency	Non-recurring, Recurring: The biotope network concept and related planning documents need to be updated every few years. Some of the measures involved may only need to be taken once.
Economic and legal aspects	
Costs	Medium (10'000-100'000 EUR): The costs of the concept can vary significantly depending on the data already available.
Socio-economic impacts	No direct impact: Promotion of the plans for a biotope network can have positive effects on the regional economy(e.g. tourism). Benefits may also derive from the clear planning specifications.
Sources of financing	Private sponsor, Public: local, Public: regional
Legal situation	Local biotope network concepts should be integrated in the relevant planning instruments in the interest of a strong legal position in the implementation phase.
Further information	
Evaluation	In Neumarkt in the Salzburg region of Austria, such a concept was developed in 2007-2009 and integrated in the local spatial development plan.
Information	Austria: To obtain further information or order the Neumarkt report go to: http://www.vielfaltleben.at/article/articleview/81282/1/29332

Contact Austria: Office of the Salzburg Regional Government, Department of Nature Protection

Population

Near-natural gardening



Near-natural gardens ideally offer a large number of structures and biotopes for a wide range of species of flora and fauna. © CIPRA International

Involved sectors

Local population/citizens, Municipalities

Affected habitats

Areas for settlements and transport

Description

Near-natural gardens with large quantities of robust indigenous trees and shrubs, herbs and other plants are an asset for built-up areas that can also contribute to the creation of biotope networks. Near-natural gardens ideally offer a large number of structures and biotopes for a wide range of species of flora and fauna. Dry stone walls, piles of stones and twigs, deadwood, fruit trees and ponds all play an important role as living spaces, refuges, sources of food, and hunting and nesting grounds. In the near-natural garden, the compost used as fertiliser completes the natural cycle. Synthetic products such as pesticides, herbicides and mineral fertilisers are superfluous.

Impact

Impact in particular on Small mammals, Reptiles, Amphibians, Birds, Insects

Ecological impact

Improvement or preservation of habitats Near-natural design enhances the garden's suitability as a biotope for various small mammals, amphibians, reptiles and insects.

Element of ecological network In combination with other near-natural spaces, near-natural gardens can form part of a local biotope network.

Time of realisation for measure Immediate, Weeks: Depending on the timing of the measures, the effects can be seen in the current vegetation period already.

Impact scope Very localised (plot), Local (municipality): Individual near-natural spaces can form part of a local biotope network.

Implementation

Implementation period Days, Weeks: Some measures can be implemented immediately (replacement with indigenous species, discontinued use of artificial fertilisers) whereas others take more time and effort (building a dry-stone wall or creating a pond).

Frequency Non-recurring, Recurring: Depending on the specific solutions selected, one-off or repeated activities may be required.

Economic and legal aspects

Costs Very low (less than 1'000 EUR): Most measures can be implemented at little expense and may even save money.

Socio-economic impacts No direct impact: Depending on the plants chosen for the near-natural garden, some can be used in the kitchen.

Sources of financing Private sponsor, Public: local, Public: regional

Further information

Evaluation A number of programmes have been launched in support of near-natural gardens, but there is rarely any higher-level planning for a biotope network.

Information Austria: Austrian programme entitled "Natur im Garten":
<http://www.gemeinden.umweltberatung.at/start.asp?b=3608>
Germany: Tips for laying out a near-natural garden available from Naturschutzbund Deutschland:
<http://hamburg.nabu.de/projekte/garten/gartentipps/05213.html>

Other .

Connectivity measures with support from church-owned land



The churches are important owners of land and farmland. © Rainer Sturm/ pixelio.de

Involved sectors

Agriculture, Forestry, Nature protection, Local population/citizens, Other: Church

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

The churches are important owners of land and farmland which are also suitable for the creation of a network of interlinked biotopes, and can thus serve as an important partner in the planning of biotope network measures. If the church backs the development of a biotope network and works actively to ensure that appropriate measures are implemented on its property, the tenants can also be sensitised to the importance of the biotope network, and the tenancies are then linked to the implementation of relevant measures. In order to increase acceptance of the biotope network and plan appropriate measures, the planning process should involve as many different stakeholders as possible (besides church workers, this should include nature conservation experts, local community representatives, farmers etc.). Appropriate public relations work can be used to encourage similar initiatives in other regions.

Impact

Impact in particular on	Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects
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Ecological impact

Improvement or preservation of habitats	Depending on the measures and habitats concerned, the quality of individual habitats is improved.
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Element of ecological network	With appropriate planning, church land can form elements of an ecological network, perhaps even on a transregional basis.
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Time of realisation for measure	Months: The impacts depend heavily on the measures and ecosystems concerned.
Impact scope	Local (municipality): Integrating the measure into an overall strategy increases its impact accordingly.
Implementation	
Implementation period	Months: Here, too, the duration of the measures to be implemented is dependent on the measures involved, and the preparation and planning will also take time.
Frequency	Non-recurring, Recurring: Single or repeated action, depending on type of measure.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): Many different measures can be planned and implemented depending on the situation at the outset and the conditions of the land involved.
Socio-economic impacts	Low: Subsidies can increase the incomes of the farmers involved or can offset any additional costs incurred.
Sources of financing	Private sponsor, Public: local, Public: regional
Legal situation	Suitable measures can be promoted by cultural landscape and countryside management programmes.
Further information	
Evaluation	Two such initiatives have already been implemented in Germany which have been very successful and are to be continued (a biotope network with church land in Bavaria and a biotope network with the help of church land in Saxony-Anhalt).
Information	Other: http://www.pan-partnerschaft.de/faltblatt/naila.pdf , https://www.dbu.de/projekt_18212/_db_1036.html or http://www.kfh-wb.de/projekte/biot.htm
Contact	Germany: Information from the Association for the Protection of Nature in Bavaria (BN), Hof group, contact person: Klaus Schaumberg

Environmentally compatible design of power lines



Power lines are shaping the landscape now for about hundred years.

© Cornerstone/pixelio.de

Involved sectors

Agriculture, Forestry, Hunting, Spatial planning, Tourism and leisure, Nature protection,
Other: Energy

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland,
Arable land, Areas for settlements and transport, Waterbodies

Description

Power lines have been a feature of the landscape for almost 100 years. At present, there is virtually no alternative to them when it comes to Europe's extra high voltage sector. Wide aisles of low-growing woodland emerge, particularly when the conductor cables cross large forest areas at the normal height. Nonetheless, there are still interesting options to promote ecoconnectivity in this cultural landscape, even in areas with encroaching woodland growth due to lack of agricultural use. With well-thought-out and systematic biotope management planning, these areas can become important habitats, connecting routes, stepping stones and corridors in the biotope network.

Impact

Impact in particular on	Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects
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Ecological impact

Improvement or preservation of habitats	With well-thought-out and sensible biotope management planning, various habitats and biotopes can be created in the aisles beneath power lines.
Element of ecological network	With appropriate design, there are good opportunities for these routes to become corridors and newly created or maintained biotopes can become stepping stones or even core areas.

Time of realisation for measure	Long term: The development of their impact as elements of a biotope network requires careful planning and a long-term design and maintenance process.
Impact scope	Local (municipality): A regional strategy is imperative, but the impact will generally have local significance only.
Implementation	
Implementation period	Months: The overhead power line network is very large. Individual measures like creating special new biotopes happen relatively quickly, but action on a broader basis is a task that will take many years.
Frequency	Recurring: Requires long-term measures.
Economic and legal aspects	
Costs	High (100'000-1 Mio EUR): Costs vary depending on the project being planned. The maintenance measures in the aisles must, however, take place regularly, involving continuous labour costs.
Socio-economic impacts	Low: The landscape is upgraded, especially areas with overhead power lines, which are generally viewed in negative terms.
Sources of financing	Other private sources, Public: regional, Public: national
Further information	
Evaluation	Individual examples with committed energy suppliers and well-thought-out strategies can produce very good results, particularly in terms of connectivity. However, there are areas where overhead cables should definitely be removed and laid underground.
Information	Other: Information on biotope management in power line routes can be obtained from energy supplier RWE, for example.
Contact	Switzerland: Expert at the Swiss Federal Institute of Technology, Zurich: Dr. Thomas Coch, nature and landscape conservation

Determination of light pollution



Light pollution denotes the brightening of the night sky caused by artificial light sources. © Helmut J. Salzer/ pixelio.de

Involved sectors

Tourism and leisure, Nature protection, Transport, Local population/citizens, Other: Districts and other local authorities

Affected habitats

Areas for settlements and transport

Description

The term “light pollution” denotes the brightening of the night sky caused by artificial light sources whose light is dispersed into the atmosphere. This can have various effects: the growth cycle of plants, for example, may be influenced by an artificially brightened environment. The sensory organs of nocturnal animals are specially adapted to night-time conditions, which makes them particularly sensitive to artificial light. Animals therefore attempt to avoid sources of light, so a well-lit street can therefore constitute a major barrier and contribute to habitat fragmentation. A large proportion of light pollution comes from poorly constructed or poorly installed light sources and can be avoided without any negative impacts, e.g. on road safety. An audit of public lighting can help to identify problem areas and offer appropriate solutions.

Impact

Impact in particular on Small mammals, Big mammals, Amphibians, Birds, Insects

Ecological impact

Reduction of Brightly lit roads and residential areas, but also ski slopes, natural fragmentation or creation and cultural monuments, and floodlights from nightclubs can have of new valuable habitats substantial barrier effects at night.

Improvement or Bright lighting affects all nocturnal animals. Intensive lighting can preservation of habitats also disturb the growth of plants. Reducing the intensity of lights can therefore help to improve their habitats.

Time of realisation for measure	Immediate: Reducing light intensity creates positive effects immediately.
Impact scope	Local (municipality): In sensitive areas, e.g. the migration routes of birds or bats, the measures taken locally to improve the lighting situation can have transregional significance.
Implementation	
Implementation period	Months: Carrying out the audit can take a relatively long time, depending on the data. The proposed improvements will be implemented over the long term and will depend on the budget and decisions made.
Frequency	Non-recurring: Measures should be followed by an evaluation of their success.
Economic and legal aspects	
Costs	Low (1'000-10'000 EUR): This type of audit will cost between €2,000 and 10,000, depending on the size of the municipality, the number of light sources, and the availability of data. Subsidies from the public purse may be available up to around 80% of the costs.
Socio-economic impacts	High: After such an audit, It is estimated that municipalities can cut their energy costs by 20-40% through targeted investment.
Sources of financing	Public: local, Public: regional, Public: national, Public: European
Further information	
Evaluation	Besides the positive impacts on nocturnal animals, the scheme also has positive effects on human health, not to forget the cost savings through better thought-out lighting.
Information	Other: Comprehensive information on the issue of light pollution is available from the International Dark-Sky Association http://www.darksky.org/ (en)
Contact	France: e.g. ADEME (French Environment and Energy Management Agency) in France http://www2.ademe.fr/ (fr, en)
Good Practice	Light pollution/light smog audits, Isère, France Diagnostic de la pollution lumineuse Diagnostica dell'inquinamento luminoso

Safety measures on electricity masts and cables



The energy supply is generally reliant on a dense network of overground cables. © K.T./pixelio.de

Involved sectors

Nature protection, Other: Energy

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

In the Alps, too, the energy supply is generally reliant on a dense network of overground cables. For birds, especially migratory species, these cables – and to an even greater extent, dangerously constructed electricity masts – pose a major hazard. Masts are a popular roosting and resting place for many species of bird. The type of mast construction determines whether these are safe places for birds. On many masts in the mid-voltage network, for example, the arrival or departure of a bird in flight may trigger an earth fault or short circuit which kills the bird. For large species of bird in particular, such as white and black storks, the Eurasian Eagle Owl (*Bubo bubo*), Lesser Spotted Eagle (*Aquila pomarina*) and Griffon Vulture (*Gyps fulvus*), electrocution by power lines is now one of the main causes of population decline. In areas which birds regularly fly over in large numbers at low altitude (e.g. topographical bottlenecks in valleys), the cables should be laid underground or the areas bypassed altogether. If this is not possible, safety measures should be applied to cables and masts.

Impact

Impact in particular on Birds

Ecological impact

Reduction of fragmentation or creation of new valuable habitats	Safety measures for cables are a priority, particularly in EU bird protection areas, near the breeding places of endangered species, in rubbish dumps, water bodies and wetlands.
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Improvement or preservation of habitats	Safeguards roosting and resting places for both migrating and sedentary birds.
Time of realisation for measure	Immediate: Once the safety measures have been completed, the birds are no longer in danger.
Impact scope	Very localised (plot): Although the direct impact of the measure is local, entire populations can be affected in terms of the number of birds killed.
Implementation	
Implementation period	Years: The application of safety measures to masts and other technical structures over a wide area depends on the number of masts and the density of the supply network, and can be very time-consuming.
Frequency	Non-recurring
Economic and legal aspects	
Costs	Very high (>1 Mio. EUR): Applying safety measures to masts and cables over a wide area will incur very high costs (up to several millions of euros).
Socio-economic impacts	Low
Sources of financing	Other private sources, Public: local, Public: regional, Public: national
Legal situation	The application of safety measures to masts and other technical structures associated with overhead energy cables is already established in law in many countries, eg in the German Federal Nature Conservation Act.
Further information	
Evaluation	Numerous international and national ornithological and nature conservation societies, along with research institutions and nature protection authorities have produced comprehensive investigations and studies, which present in detail the technology for bird-friendly cable construction and the ways of making dangerous masts safe. The decline in mortality on refurbished masts has been proved scientifically.

Information	Other: Nature Conservation and Biodiversity Union (NABU) brochure: Vorsicht Stromschlag! - recommendations for protecting birds on overhead power cables. Europarat / Conseil de l'Europe (2006) : Lignes à haute tension - comment protéger les oiseaux. Sauvegarde de la nature n°140. Strasbourg, 76 p.
Contact	Other: NABU – Federal working group on birds and powerlines. http://www.birdsandpowerlines.org/ BirdLife International
Good Practice	<u>Marking of power lines and appropriate design of electricity pylons</u> <u>Signalisation des lignes électriques et aménagement des pylônes électriques</u> <u>Visualizzazione degli elettrodotti e configurazione dei tralicci</u>

Corridor contracts



Region Rhône-Alpes/F contributes with corridor contracts to the ecological connectivity.
© Franz Schutze/Zeitenpiegel

Involved sectors

Other: Districts and other local authorities

Affected habitats

Forest, Shrubs and wooded areas, Bogs and fens, wetlands, Alpine habitats, Grassland, Arable land, Areas for settlements and transport, Waterbodies

Description

In 2008, the French region of Rhône-Alpes completed the mapping of its regional ecological network. In order to support projects and initiatives which contribute to maintaining or improving ecological connectivity, the region offers so-called “corridor contracts”. Ideally, projects receiving support should involve several local authorities. Contracts are awarded for a period of five years. Support is provided for schemes which directly help to maintain or improve connectivity, as well as to schemes which aim to safeguard the elements of a biotope network in the long term via planning tools, environmental education and public relations work. A guide has been produced for prospective stakeholders which contains detailed information on the regional scheme and the contractual process.

Impact

Impact in particular on Small mammals, Big mammals, Reptiles, Amphibians, Birds, Insects, Fish

Ecological impact

Reduction of fragmentation or creation of new valuable habitats Measures to reduce fragmentation are being promoted.

Improvement or preservation of habitats Measures to improve habitats are being promoted.

Element of ecological network Measures to create elements and structures of a biotope network are being promoted.

Other Measures regarding environmental education, public relations work etc. are being promoted.

Time of realisation for measure Immediate: The support becomes available immediately after the contract is approved and for a period of 5 years.

Impact scope **Regional: The scope of impact and implementation can differ greatly depending on the project being promoted, however, as a rule, several local authorities should be involved.**

Implementation

Implementation period Long term: The contracts are concluded for a period of 5 years.

Frequency Non-recurring, Recurring: Individual measures should be part of an overall concept and be executed over a number of years (say, 5). Some measures only need to be taken once.

Economic and legal aspects

Costs	High (100'000-1 Mio EUR): On average, support is available for 50% of the costs of the project. The highest subsidy rate is €1 million per contract or €200,000 per year. The overall budget for the region is set once the pilot projects have been evaluated.
Socio-economic impacts	Medium: Dependent on the project being supported.
Sources of financing	Public: regional
Legal situation	A 5-year contract between one or several local authorities and the region.
Further information	
Evaluation	The first contract, for the Gresivaudan Valley in the Département Isère, France, was signed in February 2009, so an evaluation of the tool has not yet been possible.
Information	France: Rhône-Alpes region http://biodiversite.rhonealpes.fr/spip.php?rubrique2/ http://www.rhone-alpes.ecologie.gouv.fr/
Contact	France: Person responsible in the Rhône-Alpes region: Hélène Guilloy

V GOOD PRACTICE

Selected measures deemed to be of particular interest on account of their innovative approach, originality or exemplary execution are described in more detail on the basis of concrete examples. Apart from providing you with a stimulus, these practical examples provide practical information such as contact persons and references.

Nature conservation

Wetland restoration in the Bavarian Alps: the Allgäuer Moorallianz

The peat bog and litter meadow landscapes of the Bavarian Alps count among the richest and most significant wetland landscapes in Germany. The transition between the peat bogs in the Alpine region and the pre-Alpine lowlands is very well-preserved here. Furthermore, the large traditional grazing areas ("Allmende") of Eastern Allgäu are a significant locus of near-natural peat meadows.

The area is also home to numerous indigenous peatland fauna such as the Moorland Clouded Yellow butterfly (*Colias palaeno*) and the Azure Hawker dragonfly (*Aeshna caerulea*), including more than 90 species which are critically endangered or at risk of extinction (including the Violet Copper butterfly (*Lycaena helle*), the Pygmy Damselfly (*Nehalennia speciosa*) and the common European adder (*Vipera berus*)).



© Bund Naturschutz Ostallgaeu

In order to safeguard this important natural heritage, a number of authorities, municipalities and associations have joined together to form the Allgäuer Moorallianz (i.e. Allgäu Wetland Alliance). The Alliance aims to preserve and restore the wetlands of the Bavarian Alps (Allgäu). It involves a wide range of stakeholders, including farmers, authorities, schools and countryside management associations, tourism initiatives and nature conservation bodies. In many areas, the wet meadows and litter meadows which accompany peat bogs have been drained, intensified and replaced with grassland. On the farmed areas, dairy farming predominates, while at higher altitudes, Alpine farming plays an important role. In all, more than 90% of Bavaria's peat bogs are seriously degraded or damaged in some other way.

Only 5-10% can now be regarded as being near-natural, and only 1%, at most, are still in a natural state.

The aim of the “Allgäuer Moorallianz” project is therefore to safeguard and develop the most important core zones of the Bavarian wetlands by means of an intact hydrological regime and appropriate use. This involves measures such as rewetting of high and transitional peat bogs, blocking of drainage ditches, and near-natural restructuring of streams. A further aim is to manage the grassland belt around the peat bogs in an environmentally compatible manner, using adapted forms of use such as haymaking and grazing management techniques. Particularly valuable areas such as step-sensitive wetland water bodies and headwaters require particular protection, and species-rich dry meadows should be re-established. Through appropriate forest thinning measures, the development of structurally rich forest/open land transitions is being encouraged as habitats for black grouse and wood grouse (capercaillie).

Besides pursuing numerous nature conservation objectives, the Allgäuer Moorallianz also focusses on a broad range of socio-economic issues. These include sensitising and informing the public and political decision-makers. A further aim is to develop suitable areas for local recreation and tourism with a view to developing “peat bog tourism”. Marketing strategies for the agricultural products produced as part of the management measures also form part of the project, including the marketing of litter from litter meadows via a litter exchange. In order to enhance the region’s tourism appeal, various pathways will be laid out to attract and channel tourists and enhance their experience of this natural area. A comprehensive environmental education programme offers guided walks, excursions and project days, e.g. for schools, and is specifically targeted at the local population. Besides placing emphasis on nature conservation issues, these educational measures also underline the importance of wetlands for climate and flood protection.

Summary

The “Allgäuer Moorallianz” project brings together a range of different actors and makes a major contribution to the biotope network. It promotes the peat bog landscape on a targeted basis within the framework of a regional strategy. With its comprehensive objectives, which link nature conservation aspects with socio-economic objectives and practical ideas for implementation, it pursues an innovative approach to the valorisation of the biotope’s potential. The project was one of the winners in the first group of the “Idee Natur: Zukunftspreis Naturschutz” competition run by the Federal Agency for Nature Conservation and will possibly receive support as a large-scale nature conservation project.

Contacts and further information

“Idee Natur” competition run by the Federal Agency for Nature Conservation
<http://www.idee-natur.de/wettbewerb.html> (de)

Information from the Association for the Protection of Nature in Bavaria (BN)
www.kempten.bund-naturschutz.de/index.php?id=6263 (de)

Habitat connectivity for bats in the Alpine region

Within the framework of the Interreg III B Project “Living Space Network”, cross-border concepts and measures for protecting bat populations in the Alps were developed. These provide a basis on which to generate valuable impetus for measures to maintain and connect habitats of relevance to bats.



© IRKA

Because of its near-natural state and landscape diversity, the Alpine area is characterised by a fauna rich in bat species. Due to the high demands that bats make on their habitat, they are particularly important for the biotope network. Bats are reliant on highly diverse and networked structures. Depending on the time of day and the season, they use a wide variety of habitats, which may be located several hundred kilometres apart. On the one hand, they need roosts; on the other, they need spaces that are suitable as hunting grounds, including near-natural forests and structurally rich cultivated landscapes.

A key outcome of the bat protection project is the production of comprehensive Guidelines for the Renovation of Buildings, which identify the roosting requirements of around 20 different bat species that make use of buildings for their roosting places. Many species of bat are heavily dependent on buildings for their roosts because natural hiding places have become rare in woodlands as a result of intensive forms of cultivation. During the restoration or renovation of old buildings, disturbances to the bats and their roosting places can therefore easily occur. The Guidelines draw on more than 230 case studies relating to the renovation of buildings, for the most part from the Alpine area. The Guidelines provide information about the ecology of the roosting places of the various species, including seasonal and spatial use and the key characteristics of the roosts. Drawing on experience, the bats' reaction to disturbance and changes at the roost are described, and guidance for the renovation of buildings with roosting places is provided for each species.

Moreover, as part of the project, targeted measures have been taken to support the hunting grounds of the Lesser Mouse-Eared Bat (*Myotis blythii*). With this objective in mind, a cross-border concept was developed for the conservation of near-natural grassland. Through the targeted improvement of habitats, the aim is to increase the range of potential hunting grounds and the food supply and thus achieve a positive development in bat stocks. Depending on the region and conditions, a wide range of measures may be required to support the bats' hunting grounds. In landscape which is mainly subject to intensive use, extensivisation of agricultural areas or the creation of meadows for extensive use can have a

positive impact. In this context, the cutting dates and frequency of mowing play an important role, and it is also essential to refrain from using fertiliser. In other regions, however, a shift away from agriculture, and the resulting bush encroachment and reforestation, may pose a threat to potential hunting grounds, so other measures and tools must be developed for these areas. Furthermore, support for the hunting grounds of bats cannot be viewed in isolation from measures to protect their nurseries. A comprehensive strategy should therefore be developed which takes account of bats' various habitat requirements.

Alongside other pilot projects for targeted bat conservation in the Alps, various publicity events and campaigns have been carried out within the framework of the "Living Space Network" Project, including an international conference and flanking measures to raise public awareness of bat conservation.

Summary

Within the framework of the INTERREG project, a range of highly diverse approaches has been developed which can help to protect bat populations in the Alps. The Guidelines for the Renovation of Buildings are an outstanding tool for bat-friendly renovation and restoration of buildings. However, the concepts devised can only be successful if they are applied in practice and continuously developed.

The project outcomes can provide a valuable basis for the planning of bat-friendly measures in the biotope network and offer a range of ideas at many different levels.

Contacts and further information

INTERREG III B "Living Space Network", Pilot Project Bats, and the Guidelines for the Renovation of Buildings:

<http://www.lsn.tirol.gv.at/en/index.htm> (de, en, it)

<http://www.fledermausschutz.at/downloads/GuidelinesfortheRenovationofbuildings.pdf> (en)

Agriculture

Project in the Regional Natural Park (PNR) of the Massif des Bauges, France

The species inventory of a grassland reflects the way in which it is managed and its location. If the management method remains unchanged, the species composition will generally remain unchanged as well. This correlation opens up the opportunity to link subsidies for extensive grassland to the occurrence of key species of flora. In order to implement this innovative, results-oriented approach, a list of meadow flowers serves as a simple tool for reliable identification of extensive species-rich grassland.



© Caroline Begle

As part of the Species-rich Grassland Programme, subsidies are paid according to the occurrence of certain easily identifiable plant species (indicator plants). Compliance with the commitments is monitored using a specially developed control method on site. During the period before the first growing crop is used (which, depending on altitude and phenological course, takes place between mid-May and mid-June), the farmers inspect their areas using a prescribed methodology and note the indicator plants found there. Subsidies are paid if a certain number of the various indicator species is found on the areas concerned.

Participation in the scheme is voluntary. Participating farmers undertake to preserve the species richness of their grasslands (meadows and pasturage). Farmers retain the choice of practices and resources to be used, so that biodiversity is not seen as a constraint: it calls upon their technical skills and sense of responsibility. They are also sensitised to issues such as nature conservation and biodiversity. In order to publicise the scheme more widely, a competition to reward farmers with the most attractive flowering meadows is held every year.

The project was launched in the Regional Natural Park (PNR) of the Massif des Bauges in 2006. In May 2008, 70 farmers with a total area of 1000 hectares were participating in the project. Funding amounts to €89/ha on all participating areas.

Summary

The experience gained in the Regional Natural Park (PNR) of the Massif des Bauges is very positive. The new results-oriented subsidies for species-rich meadows and pastures are achieving high acceptance among farmers, as they are rewarded for their work on a results-oriented basis without having to deal with extra red tape, while being respected for their experience and professional knowledge. The staff at the Natural Park, who accompany the

scheme, also view it in positive terms: they are no longer required to act as inspectors but provide advice and support to farmers, resulting in a new form of communication and cooperation.

This is still a relatively new scheme at the Regional Natural Park (PNR) of the Massif des Bauges. In Baden-Württemberg (Germany), a similar scheme has been under way since 2002 and has proved very successful. Here, more than 10,000 farmers have participated in the scheme, which is funded by the MEKA II and III programmes. In France, a total of eight natural parks are experimenting with similar programmes to promote species-rich grassland.

Positive ecological impacts have been demonstrated in Germany based on multiannual monitoring. It is still too early for any such ecological assessment in the Regional Natural Park (PNR) of the Massif des Bauges.

Contact

Parc naturel régional du Massif des Bauges
(Regional Natural Park (PNR) of the Massif des Bauges), contact: Philippe Mestelan
<http://www.parcdesbauges.com/agriculture/agri-environnement/> (fr)

Further information

Ministry of Food and Rural Areas of the Federal State of Baden-Wuerttemberg (MLR):
information about the Species-rich Grassland Programme (under the MEKA programme) in
Baden-Württemberg
http://www.landwirtschaft-mlr.baden-wuerttemberg.de/servlet/PB/menu/1040915_11/index1215700849246.html (de)

Comprehensive report on a study visit focussing on species-rich grassland, organised by the
Regional Natural Park (PNR) of the Massif des Bauges and INRA Avignon and containing
many details of the schemes in Baden-Württemberg and the Regional Natural Park (PNR) of
the Massif des Bauges
http://www.alparc.org/content/download/21418/199283/version/1/file/Rapport_voyage_MEKA_Juillet07.pdf (fr)

Oppermann R., Gujer H.U. (Hrsg.) (2003): Artenreiches Grünland Bewerten und fördern -
MEKA und ÖQV in der Praxis. Ulmer, 199 p.

Species rich seeding on agricultural fields, Würzburg district, Germany

Within the framework of a pilot project entitled “The Biotope Network in the Cultural Landscape” (“Mit Biotopverbund in die Kulturlandschaft”), the aim is to establish a comprehensive network of interlinked biotopes in two municipalities in Würzburg district, Germany, within five years. At the same time, a further aim is to reduce the potential for conflict between different types of land use, including farming and forestry, hunting, nature conservation and recreation.

To this end, various species-rich seed mixtures, containing wild and cultivated plants, were developed and were mainly sown on set-aside areas. During project implementation, existing tools for structural development in the agricultural sector – including agri-environmental measures, parcel exchange and set-aside – should be deployed, combined with new measures and developed further. An interdisciplinary team, whose members include biologists, forest scientists and countryside managers, was established to run the project, and a number of different authorities were involved, including agriculture and forestry offices and landscape management associations. Farmers, hunters and local community representatives were also invited to participate.



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As a first step, local people were asked to give their views on what kind of farmland they wished to see. Surveys were carried out, and it became apparent that most people in the region would like to see more waysides with flowering plants, hedges and patches of woodland, stretches of water and mixed orchards.

Efforts were therefore made to identify ways of taking local people's wishes into account in the creation of a biotope network. However, it became apparent that establishing permanent landscape structures (hedges, patches of woodland) on this generally very fertile farmland was likely to pose major problems and could only be achieved in combination with compensation and substitution measures. A key aspect of the biotope network was therefore to encourage the growth of flowering plants on cropland. To this end, species-rich seeding was undertaken on set-aside areas, whose composition was developed further during the course of the project and geared towards the needs of various species of fauna. Various types of seed mix were developed, such as a flower mixture which proved particularly suitable for outlying and fallow land in the locality. A key criterion was that the seed mixes should have no negative implications for agriculture and that conventional production could

be resumed on these areas at any time. Local species were also deliberately selected for seeding.

Summary

The areas which have undergone species-rich sowing provide food and cover for a wide range of species on farmland which is otherwise lacking in structure. The importance of the sown areas for species protection was demonstrated by numerous scientific studies which monitored the impacts on birds and invertebrates (ground beetles, spiders, butterflies). Impacts on hedge dwellers were also demonstrated (e.g. the Red-Backed Shrike (*Lanius collurio*)).

A further survey conducted at the end of the project term found that the flowering areas met with great acceptance among farmers, hunters and the local community alike. In total, 3.56% of the municipality, i.e. 8% of the agricultural production area, was “greened” as part of the project. Funding for relevant areas can be covered by agri-environmental measures. As an innovative funding option, one possibility that could be considered is to obtain a financial contribution from hunters and the municipalities, given that they benefit from the measure. Overall, the project showed that in an intensively used landscape in particular, species-rich seeding with wild flowers offers a good opportunity to create attractive and ecologically effective biotope network structures.

The seeding of areas with an assortment of wild-flower species, e.g. in the form of agricultural field margin projects, forms part of many agri-environmental programmes. The “Biotope Network in the Cultural Landscape” (“Mit Biotopverbund in die Kulturlandschaft”) project specifically investigated the importance of habitat creation on set-aside areas for the implementation of biotope network projects. Similar results were achieved in the DBU-funded project “Lebensraum Brache” (“Habitat Fallow Land” project) which explores ways of making fallow land more hospitable to wild fauna using agricultural market policy instruments (set-aside) in Germany.

Contact

Bavarian State Institute for Viticulture and Horticulture (LWG), Countryside Management Department, contact: Martin Degenbeck

<http://www.lwg.bayern.de/landespflge/landschaftspflege/25786/> (de)

Further information

Bayerische Landesanstalt für Weinbau und Gartenpflege, Abteilung Landespflge (2007): Mit Biotopverbund in die Kulturlandschaft. Artenreiche Ansaaten auf Ackerflächen als neues Hauptinstrument des Naturschutzes – Ergebnisse eines Pilotprojektes im Landkreis Würzburg

(Bavarian State Institute for Viticulture and Horticulture (LWG), Countryside Management Department: The Biotope Network in the Cultural Landscape” (“Mit Biotopverbund in die Kulturlandschaft”), Species-rich Seeding on Agricultural Fields as an important new instrument in nature conservation – outcomes of a pilot project in Würzburg district) http://www.lwg.bayern.de/landespflge/landschaftspflege/25786/ansaat_pilotpro.pdf (de)

Projekt „Lebensraum Brache“ der Deutschen Wildtierstiftung, gefördert durch die Deutsche Bundesstiftung Umwelt (DBU). Endbericht „Wer Vielfalt sät, schafft Lebensräume! – Von monotonen Ackerbrachen und Stilllegungsflächen zu wertvollen Habitaten“

[http://www.lebensraum-](http://www.lebensraum-brache.de/)

[brache.de/ downloads/service/downloads/eigene/2007_Endbericht_Lebensraum_Brache.pdf](http://www.lebensraum-brache.de/downloads/service/downloads/eigene/2007_Endbericht_Lebensraum_Brache.pdf)

(de)

"Habitat Fallow Land" Project of the German Wildlife Foundation, financed by the German Federal Foundation for the Environment (DBU). Final report of the project: "Creating habitats by sowing a wide variety of plant species: From monotonous set-asides to valuable wildlife habitats habitats"

http://www.cic-wildlife.org/uploads/media/Lebensraum_Brache_web_EN.pdf

(en)

Tourism and leisure

“Experience the Green Belt”, Germany

Due to its wealth of species and habitats, many of them endangered, and its key role in the biotope network, the Green Belt has particularly high value for nature conservation. Located at the former inner-German border, nature was able to develop undisturbed for decades. The Green Belt also connects valuable areas and cleared, intensively used agricultural landscapes such as the fertile plains along its borders and offers the only remaining refuge for a wealth of species of flora and fauna which are sensitive to disturbance and/or are endangered.



© Frankenwald Tourismus RV / Thüringer Wald

To assure the preservation of the Green Belt in the long term, the Federal Agency for Nature Conservation (BfN) has supported a project entitled “Experience the Green Belt” since 2007. It is intended to increase awareness of the importance of the Green Belt in the region and beyond, and improve its visibility, thus making it possible for visitors and holiday-makers to experience its landscapes with their specific history. The project includes specific measures for landscape management, the provision of uniform waymarks and signage, the creation of

bicycle and hiking routes, exhibitions, and development and marketing of tourist and nature conservation offers.

Three model regions along the Green Belt have been identified for the development of appropriate marketing strategies, each focussing on a different overarching theme. A key element here is the region's history as the former inner-German border. For each region, appropriate tourist offers have been developed, with local tourism businesses being encouraged to participate. The involvement of local crafts and other historical aspects of the region are also important.

Transboundary cooperation is also being supported in each model region. This extends not only to overcoming administrative (e.g. county or state) borders, but also borders between different disciplines such as nature conservation, agriculture, and tourism, and between the persons responsible for managing historic sites. The aim is therefore to pursue an integrative approach which makes a valuable contribution to environmentally compatible regional development in the long term.

The various stakeholders in the model regions are given professional and scientific support. General project evaluation is important here, as is the development of a uniform brand image, specialist advice and central marketing.

Summary

A wide range of offers has already been developed; these are being marketed jointly on the Internet and in brochures with "Erlebnis Grünes Band/Experience Green Belt" branding.

Further information

Information from the Federal Agency for Nature Conservation

http://www.bfn.de/0311_gruenes_band.html (de)

Erlebnis Grünes Band / Experience the Green Belt website

<http://www.erlebnisgruenesband.de/> (de)

[http://www.erlebnisgruenesband.de/fileadmin/dateien/wb/Broschuere -
Erlebnis Gruenes Band Informationen englisch.pdf](http://www.erlebnisgruenesband.de/fileadmin/dateien/wb/Broschuere-_Erlebnis_Gruenes_Band_Informationen_englisch.pdf) (en)

Climbing strategies: an environmentally friendly approach to climbing, Germany

Many rocky crags and rockfaces provide refuge for rare and protected species of flora and fauna. Ferns and mosses flourish in the damp and shady conditions at the foot of rock walls, while adaptation to drought and temperature extremes is required if species are to survive in the intense sunshine at the mountain top.



© DAV Archiv

And between these two extremes, many different plants find their niche at close quarters: lichens grow on smooth rock surfaces, flowering plants find a habitat in small cavities, clumps of vegetation proliferate on rocky ledges, while heathers can be found at the summit. Highly specialised fauna also have their habitat among the rocks: the Peregrine Falcon (*Falco peregrinus*) and Eurasian Eagle Owl (*Bubo bubo*) are just two of the species of bird which are highly dependent on rocky biotopes. Some extremely specialised and rare species of insect can be found here as well, while the highly endangered mammals living in rocky habitats include various species of bat which overwinter in caves and often have their summer roosts in rock fissures. To ensure that these unique biotopes are not damaged by climbers, strategies for environmentally compatible climbing are both useful and necessary.

Measures adopted by the German Alpine Association (DAV)

The package of measures adopted by the German Alpine Association (DAV) on eco-friendly climbing involves working with public authorities and nature conservation organisations to develop climbing strategies. The DAV is relying on a wide variety of solutions to identify, at micro level, those areas where environmentally compatible climbing is possible and those where no climbing should take place in the interests of nature conservation. Approaches and sections of rock which are closed to climbers are marked with symbols which have been standardised on a nationwide basis. During the breeding season of protected species of bird, such as the peregrine falcon, rocky areas, or sections of them, will temporarily be declared no-go areas.

Local wardens with responsibility for crags are a key element of this strategy. Together with the other German climbing associations (e.g. the German Climbing Association (Bundesverband IG Klettern e.V.) and Pfalz Climbers Association (Vereinigung der Pfälzer Kletterer)), the DAV has created a structure for the management of Germany's non-Alpine climbing areas which encompasses the highest body at federal level to the state and regional committees down to local wardens and safeguards the continued existence of Germany's

climbing areas in an intact natural environment. The wardens coordinate activities such as environmentally compatible renovation of routes, creation of access pathways, and active participation in peregrine monitoring.

Standardised nationwide signage of crags facilitates communication with climbers. Vegetation on rocky areas is often a colourful mosaic, with vegetation-free zones intermingling with patches of vegetation growth. In order to take account of this diversity, micro-scale rock zoning often forms part of the climbing strategies. The “cross and arrow” symbols ensure clarity and mark out the border between those areas of rock which are off-limits and those to which there is free access. They also indicate the optimal approach route in sensitive areas.

Furthermore, a unique rock information system has been created as an Internet portal which provides in-depth information about Germany’s climbing areas. It includes a detailed crag search facility, interactive maps, background information on regional biotopes, national and regional news, and useful tools for wardens.

Summary

Through a contractual (voluntary) agreement, acceptance of the requisite measures among stakeholders is very high. The easing of burdens on the authorities and the ensuing cost savings, as well as the high degree of flexibility, also testifies to the usefulness of this approach. If monitoring of the scheme’s success brings new scientific knowledge to light, the arrangements can be adapted without major organisational or financial effort.

The strategy presented is based on clear agreements with users (climbers) and active participation by volunteers. It is flanked by PR work which also offers a simple but effective opportunity to engage in dialogue with climbers and raise their awareness of nature conservation issues within the framework of their leisure activities.

Further information

Comprehensive information about the climbing strategies and environmentally compatible climbing is available from the rock information system:

<http://www.dav-felsinfo.de> (de)

Environment-friendly ski touring, Berchtesgaden, Germany

Ski touring and snowshoeing have become increasingly popular winter sports in recent years, offering an experience of the winter landscape off the pathways and pistes. However, they take sportspersons into the refuge areas of wild animals, which are highly sensitive to disturbance in winter.



© Christian Schneider

Example from Berchtesgaden National Park, Germany

In Berchtesgaden National Park, in consultation with the Alpine associations, the National Park administration clears six traditional ski tour routes through the woods on a regular basis as guidance for winter sportspeople. The aim is to prevent any extension of ski touring in terms of area, the number of hours per day or in intensity. In order to concentrate the spatial use of the protected area and to protect the tranquillity of the wildlife's rest and retreat areas, only the routes described in pertinent guide literature should be taken.

In addition, the German Alpine Association's (DAV) project "Environmentally Friendly Ski Touring" was also applied to the National Park region. The project's goal is to implement ski touring in a compatible and sustainable way with nature. Thanks to the routing, sensitive wildlife habitats - in particular that of the grouse – should be affected as little as possible.

For critically sensitive zones, the German Alpine Association publishes information for touring skiers regarding recommended routes (this includes demarcation of sensitive areas, waymarking, and information boards and maps at car parks). Efforts are also being made to promote cooperation with the authors and publishers of guidebooks. All the relevant authorities and associations (forestry offices and rural county offices, mountain rescue services, the Association for the Protection of Nature in Bavaria (BN), the Bavarian Society for the Protection of Birds (LBV), the German Ski Association (DSV), the Bavarian Hunting Association, the Bavarian Farmers' Association, the Association for the Protection of Mountains (Verein zum Schutz der Bergwelt), International Friends of Nature, etc.) are involved in this joint initiative, which is also accompanied by scientific studies on the topic "Disturbance of wild fauna by winter sportspersons".

Summary

There has been a very positive response and acceptance of the measures among ski tourers, especially around the protected area. Positive impacts, especially on grouse populations, have been demonstrated in various areas, including the German uplands.

Further information

Information on the “Environment-friendly Ski Touring” project is available from the German Alpine Association at: http://www.alpenverein.de/template_loader.php?tplpage_id=51 (de)

Information on the projects in Berchtesgaden National Park:

http://www.nationalpark-berchtesgaden.bayern.de/01_nationalpark/01_aufgaben/09_management/06_skibergsteigen/index.htm (de)

Public relations work

"Grünes Licht für ökologische Korridore" (Green Light for ecological corridors), French-Swiss border in the Geneva Basin area

The “Green Light for Ecological Corridors” educational pathway was developed within the framework of a transnational Interreg III A project by three nature conservation organisations: Pro Natura Genève, Appollon 74 and FRAPNA Haute-Savoie. It runs from the Arve river in Switzerland to the higher altitudes of the Salève. Along the pathway, there are numerous information boards which explain the significance of ecological corridors. The boards were designed in conjunction with school classes from the local area. As part of this collaboration, teachers and students explored the topic of habitat connectivity in great detail. 20 classes were involved in total.



© Yann Kohler

The pathway is structured along two main themes. On the one hand, it aims to underscore the importance of protecting existing habitats. On the other, it outlines various opportunities to reduce landscape fragmentation and thus facilitate the mobility of fauna. In addition, various other educational tools, such as a brochure and a touring exhibition, were developed as part of the project.

In parallel to this project, an information campaign was targeted specifically at persons in positions of responsibility in the field of spatial planning and in the local administrations. A manual with decision-making aids was designed especially for this group, and information

events were organised. One of the main objectives of these events was to present the multifunctionality of corridors which are significant not only in ecological terms but which also perform key social functions (as spaces for leisure and recreation) and economic functions (e.g. through sustainable management of roadside verges).

Summary

This measure cannot be expected to produce direct ecological impacts. However, the good cooperation and extremely high level of interest on the part of the many participating school classes, as well as the well-attended daytime and evening events for decision-makers in the municipalities and administrations, demonstrate the high level of interest in the measure and are thus likely to have an indirect positive ecological impact.

Contact

Contact at FRAPNA Haute-Savoie: Damien Hiribarrondo

<http://www.frapna-haute-savoie.org/> (fr)

Further information

A brochure about the project and further details can be accessed at:

<http://www.pronatura.ch/ge/index.php?lang=3&mz=5> (fr)

“Nature sans frontières” (Nature without Frontiers) games kit from the French nature conservation organisational FRAPNA

Children are the adults of tomorrow – and will be responsible for decision-making and action. For that reason, it is important to teach them about ecological relationships and the key functions of natural systems. This can be achieved simply and effectively through play. The “Nature sans frontières” (Nature without Frontiers) games kit from the French nature conservation organisational FRAPNA is a very useful teaching tool in this context.

All living creatures depend on being able to move around their environment in order to find food and partners for reproduction and reach their seasonal habitats – in other words, to access the resources which are vital for life. However, numerous barriers obstruct the mobility of many species, forcing them to cross obstacles such as roads, fences and railway lines, for example. These barriers interrupt the natural connecting elements between the various habitats. However, there are ways of overcoming these obstacles.

The games kit is a practical tool which enables children and young people to learn about the mobility needs of various sample species, recognise possible barriers and identify simple solutions to overcome them. The easily accessible games are ideally suited to the classroom and excursions into the local environment.

The kit comprises a theoretical guide with explanations of the issues, suggested action and solutions (80 pages); an activity book with instructions for observations, experiments and various activities (60 pages) and several games (card games, board games, identification sets and bird silhouettes). An interactive game for children is also available on the Internet. The kit was developed in 2005-2008 as part of an environmental education campaign on the issue of ecological corridors. A “Nature sans frontières” children’s club was also established as a forum where school classes and groups can share their observations and experiences. The club also publishes a magazine at regular intervals (3 issues a year). There is also a website which provides up-to-date news and information about the campaign.

Further information

Website of the environmental education campaign:

<http://www.frapna-haute-savoie.org/> (de)

“Running Wild” – the wildcat run, Germany

In September 2006, BUND Deutschland (Friends of the Earth Germany), in cooperation with the Sports Federation of Thuringia, organised a “race for life” for the European wildcat (*Felis silvestris silvestris*) for the first time. Called “Running Wild”, the event was intended to highlight the fact that the forests in Thuringia, Bavaria and Hesse need to be reconnected so that wildcats have large areas in which to roam. One aim of the “Running Wild” project was to publicise the planned migration corridor for wildcats between Hainich National Park and the Thuringian Forest (Thüringer Wald).

The run was organised by various stakeholders in the region, including sportspersons, conservation and environmental organisations, public authorities and members of the business community. A well-known female sports personality from the region agreed to be the project’s patron.



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The wildcat run is part of the “Wildcat Rescue Network” project organised by Friends of the Earth Germany (BUND), which aims to develop a network comprising some 20,000

kilometres of migration corridor for endangered forest species, including the wildcat but also the badger and European Pine Marten (*Martes martes*). Nature conservation organisations and volunteers have drawn up a plan for a network of wildcat migration corridors, which is intended, in future, to support environmentally compatible planning of transport routes, housing and industrial sites.

Within the project framework, studies found that some small wildcat populations are living in geographically separate areas. A comprehensive analysis of the impediments to their dispersion was also undertaken. The aim is to reconnect these very isolated populations once again and thus help to safeguard the wildcat's long-term future. To this end, corridors – around 50 m wide and 20 km in length – consisting of vegetation and trees will be created to facilitate the wildcat's dispersion from Hainich National Park to the Thuringian Forest. In the long term, other corridors will also be created in order to connect forested areas in Thuringia, Bavaria, Hesse, Lower Saxony and Baden-Württemberg.

The wildcat run is an important aspect of the project. It supported the publicity work and was used as an instrument to present the planned corridor and inform the general public about the wildcat, its significance and needs. Besides the main runs over various distances, an extensive framework programme was also organised in order to raise awareness of biological diversity and the importance of ecological connectivity in the landscape.

Summary

The first “Running Wild” race in Thuringia in September 2006 involved some 250 runners and was attended by around 2000 visitors. The event was a major success, and as a result, two further wildcat runs took place in 2008, one in Thuringia and the other in Hesse.

The run which took place in June 2008 was organised by BUND Waldeck Frankenberg and covered a route from Rothaargebirge towards Burgwald-Kellerwald. It was intended to publicise the planned wildcat corridor between these two areas. The event was awarded the MUNA Environmental Prize by the German Wildlife Foundation (DBU) in the “environmental communication” class. This biotope networking project makes a valuable contribution to species and nature conservation, and the wildcat run is an outstanding communication tool to raise awareness of the problem of landscape fragmentation. The organisation of wildcat runs at local level sensitises the public to the issue, and offers an opportunity to provide comprehensive information and generate additional funds for wildcat conservation. BUND Thüringen (Friends of the Earth Thuringia) also offers wildcat sponsorships as a way of encouraging interest in the Wildcat Rescue Network in Thuringia.

Further information

“Running Wild” – the wildcat race for life
<http://wildkatzet3.bund.net/index.php?id=79> (de)

Water resources management

LIFE Project: Wild River Landscape of the Tyrolean Lech, Austria

Running waters are key elements of ecological connectivity. They form natural linear elements of a network many kilometres long, and with their associated ecosystems, are important corridors enabling flora and fauna alike to migrate and multiply. Very often, however, they are no longer able to fulfil this natural function in full as the space and dynamics left to most of the rivers are severely limited.

This applies to numerous rivers in the Alpine region. At the same time, flowing waters are highly conducive to cross-border cooperation as they generally flow through several countries and often form natural boundaries which may also constitute national borders. Furthermore, measures adopted along watercourses also contribute to the implementation of the EU Water Framework Directive (WFD) as the restoration of the continuity of watercourses is an integral element of the WFD and a mandatory task for the member states.

Measures relating to flowing waters, especially for their revitalisation, are often very wide-ranging in scope as they involve many actors with very different interests. These measures are also very cost-intensive.



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In the Lech valley of Tyrol, which is part of the Natura 2000 network, the LIFE Project: Wild River Landscape of the Tyrolean Lech was carried out in 2001-2006. It included protective hydro-engineering, revitalisation and nature conservation measures. The project was aimed, inter alia, at the conservation and restoration of the near-natural dynamic river habitats and the improvement of flood protection. It also aimed to promote significant species of fauna and flora which are sensitive to disturbance and endangered, and to sensitise the public to nature conservation issues. As part of this process, it was essential to bring together as many organisations with highly diverse interests as possible.

A range of measures were implemented as part of the project, the key ones being:

- River extension and the restoration of near-natural habitats by removing several building constructions.

- Step-by-step removal of bed load protection at the river feeders to ensure unobstructed bed load transport and thus raise the river bed, the aim being to prevent further deepening of the bed and a drop in groundwater.
- Through various smaller measures, revitalization of the river's side waters and linking up to their parent river.
- For selected target species, preservation and resettlement projects were carried out. The target species included Bilek's azure damselfly, the German tamarisk (*Myricaria germanica*), the Lady's Slipper, Little Ringed Plover (*Charadrius dubius*), a species of grasshopper typical of Northern Alpine regions (*Bryodemella tuberculata*) and the Bullhead (*Cottus gobio*).
- The setting-up of observation platforms and adventure paths, such as the viewing tower as part of the "experience birdlife" path, was intended to encourage a positive drive for environmentally sustainable tourism. At the same time, target species, such as the Lady's Slipper, were protected through management elements of the project.
- An information centre acts as a starting point for excursions and events to raise awareness. Information is also provided about the project and the Lech habitat.

Summary

The LIFE project has provided the impetus for a range of cooperation measures between various partners on issues such as flood protection, revitalisation and tourism. For example, the Tyrolean Lech Valley Nature Park was established in 2005. What's more, the INTERREG Pilot Project "Running Waters" took the LIFE project as its starting point. Building on existing structures, targeted measures to take forward the ecological network were carried out, including the development of a conservation strategy for gravel-breeders at Halblech and comprehensive publicity work focussing on the importance of various landscape elements. These include, in particular, the "Aktion Lechfloss 2005" ("Lechfloss 2005" programme). As part of the INTERREG project, proposals were also developed for other transnational watercourses which could be applied to other similar projects as well.

Further information

Information about the LIFE project in the Tyrolean Lech can be accessed at:

<http://www.tiroler-lech.at> (de)

Information on the INTERREG III B Project ("Living Space Network"), Pilot Project "Running Waters":

<http://www.lsn.tirol.gv.at/de/index.htm> (de, en, it)

<http://www.lsn.tirol.gv.at/de/doc/fliessgewaesser.pdf> (de),

http://www.lsn.tirol.gv.at/it/doc/fliessgewaesser_it.pdf (it)

Transport

Managed mowing of roadside verges, Isère, France

Delaying mowing gives plants the opportunity to bloom and form fruits and seeds. In this way, they can provide food and cover for insects and other small animals. The habitat quality of green strips and roadside verges depends on various factors, and mowing is one of the factors which are easiest to influence. By delaying mowing of verges until late summer, or by using mosaic-type mowing techniques, which involves mowing only a small area at a time, habitat conditions can be improved, e.g. for butterflies and various other species.



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Example: Département Isère, France

In the Département Isère, the highways department and the administration of the Département (Conseil Général), in partnership with the nature conservation organisation GENTIANA, have been running a project entitled “Managed mowing of roadside verges: protecting nature”, which focusses on the roadside verges and green strips in the road network. By abandoning the use of pesticides and adopting a properly thought-out and planned approach to mowing, the aim is to protect biodiversity. The range of species of flora and fauna occurring in the roadside verges in the Département was previously recorded in a comprehensive survey undertaken by GENTIANA. Mowing is now undertaken in line with the principle: “As much mowing as necessary and as little as possible”. Particular consideration is given to the safety of road users in this context, but no mowing takes place until the majority of flowering plants have bloomed and seeds have formed.

Summary

Signs at strategically and ecologically important sections of the highway network draw attention to the scheme and inform the public. The project’s positive impacts on flora and fauna have already been demonstrated. In addition, better planning of working time and use of resources, as well as a reduced workload, has helped to cut costs.

Further information

Information on the project, together with checklists and examples, are available on the GENTIANA website.

<http://www.gentiana.org/site:gestion> (fr)

Other .

Light pollution/light smog audits, Isère, France

The term “light pollution” denotes the brightening of the night sky caused by artificial lighting whose light is dispersed into the atmosphere. This can have various effects: the growth cycle of plants, for example, may be influenced by an artificially brightened environment. The widespread presence of white light sources with a high proportion of blue in the spectrum can pose serious problems for the navigation or orientation of nocturnal insects as well as for migrating birds.

The sensory organs of nocturnal animals are specially adapted to night-time conditions, which makes them particularly sensitive to artificial light. This is one reason for the large number of night-time accidents involving wildlife. Animals therefore attempt to avoid sources of light, so a well-lit street can therefore constitute a major barrier and contribute to habitat fragmentation.



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In recent years, artificial light sources have greatly increased in number, as various statistics bear out: in the Swiss Alps, for example, the illuminated area doubled in the period from 1992 to 2000, with the intensity of lighting increasing in parallel. In France, the number of light sources has increased by 30% in the past 10 years, and the period of illumination has doubled in municipalities with less than 5000 residents.

Example from Département Isère, France

A large proportion of light pollution comes from poorly constructed or poorly installed light sources and can be avoided without any negative impacts, e.g. on road safety. The administration of Département Isère supports municipalities which carry out an audit of their public lighting. This involves the use of a prescribed check sheet to ensure the quality of

the audit. Around 12 of these audits have been carried out since 2004. The costs amount to between € 2,000 – 10,000, depending on the size of the municipality, the number of light sources, and the availability of data. Subsidies from the public purse may be available up to around 80% of the costs. It is estimated that municipalities can cut their energy costs by 20-40% through targeted investment.

Among other things, the audit involves an analysis of the type and amount of public lighting, mapping of larger light spots, and the development of solutions for problem areas (e.g. illumination of tourist attractions, ski pistes, night clubs, and natural monuments).

Summary

Besides the positive impacts on nocturnal animals, the scheme also has positive effects on human health and achieves cost savings through better thought-out lighting and the avoidance of unnecessary light sources.

Contact and further information

Contact: ADEME (French Environment and Energy Management Agency)

<http://www2.ademe.fr> (fr, en)

Comprehensive information on the issue of light pollution is available from the International Dark-Sky Association

<http://www.darksky.org> (en)

Marking of power lines and appropriate design of electricity pylons

Collision with power lines and electrocution kill hundreds of birds every year. Furthermore, major above-ground power lines fragment open landscapes and thus reduce the number of large open spaces used by birds during migration.



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Accidents of this type can be avoided or at least reduced through good cooperation between bird protection and nature conservation organisations and power line operators. To determine the regional situation, any dead birds found must be documented, collected and analysed as a basis for the adoption of appropriate measures. These include:

- encouraging underground location of cables in high-risk areas;
- removing particularly dangerous masts (e.g. models which are open at the top, which can become a death-trap for hollow-breeders);
- encouraging underground location of new 20,000 volt cables; alternatively, if this is not possible, incorporating appropriate safety features to protect birds;
- taking account of biotopes in the planning and implementation of work to clear routes for power lines (nesting periods etc.)
- making routes as environmentally compatible and sensitive as possible.
- visual marking of particularly dangerous power lines (e.g. using red warning balls)

Further information

Council of Europe/Conseil de l'Europe (2006): Lignes à haute tension - comment protéger les oiseaux/Protecting birds from powerlines Sauvegarde de la nature/Nature and environment n°140. Strasbourg, 76 p.

http://book.coe.int/FR/ficheouvrage.php?PAGEID=36&lang=FR&produit_aliasid=1827 (fr)

http://book.coe.int/EN/ficheouvrage.php?PAGEID=36&lang=EN&produit_aliasid=1827 (en)