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KEN - Knowledge for Ecological Networks: Catalysing Stakeholder
Involvement in the Practical Implementation of Ecological Networks

Current status of the practical implementation of ecological networks in Switzerland

September 2008

Raymond Pierre Lebeau
Antonio Righetti (PiU GmbH)

Federal Office for the Environment

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Abbreviations

ARE	Federal Office for Spatial Development
ASCI	Area of Special Conservation Interest
ASPO	Swiss Association for the Protection of Birds (<i>Association suisse pour la protection des oiseaux</i>)
CEP	Landscape development concepts (<i>Concepts d'évolution du paysage</i>)
CFF	Swiss Federal Railways
CPS	Swiss Landscape Concept (<i>Conception paysage suisse</i>)
CRSF	Swiss Floristics Network
CSCF	Swiss Centre for the Cartography of Fauna
DETEC	Federal Department for the Environment, Transport, Energy and Communications
ECA	Ecological compensation area
EIS	Environmental impact study
FEDRO	Federal Roads Office
FOAG / OFAG	Federal Office for Agriculture
FOEN / OFEV	Federal Office for the Environment
IP	Integrated Production in Switzerland
LPN	Federal law on nature and landscape protection
LAgr.	Federal law on Agriculture
MAI	Mouvement Agricole de l'Intyamou (Intyamou agricultural movement)
NEN	National Ecological Network (<i>Réseau écologique national, REN</i>)
OFT	Federal Office of Transport
OPN	Ordinance on nature and landscape protection
OQE	Ordinance on Ecological Quality (<i>Ordonnance sur la qualité écologique</i>)
PEEN	Pan-European Ecological Network
PER	Proof of ecological performance (<i>Prestations écologiques requises</i>)
SBF	Swiss Biodiversity Forum
UAA	Usable agricultural area
WSL	Swiss Federal Institute

Executive summary

Aim and methods

- Development and restoration of networks of biotopes.
- Elaboration of the National Ecological Network (NEN) in order to have a visual and general strategic element covering all ecological networks in Switzerland.

Main findings

- Ordinance on the regional promotion of the quality and connectivity of ecological compensation areas in agriculture (OQE, 2001).
- Restoration of the main corridors of ecological networks that have been disturbed by transportation routes (DETEC Directive, 2001).

Main results

- The ecological network is an important 'thread' at whatever level is considered (national, regional or local) and it has also proven to be an excellent dialogue tool, enabling trust in and the credibility of the partners to be established.
- Information and awareness-raising need to be developed, particularly among the main stakeholders and the public, the attractiveness of creating ecological networks should be strengthened through higher financial incentives, and in order to improve the quality of the areas involved, additional means should be supplied to finance the personnel responsible for network outreach activities.

Case studies

- 'Bommer Weiher' in the canton of Thurgau: The approach of a canton that, at the request of farmers from the village of Bomme, wished to develop a local concept for networks of ecological compensation areas, using a cantonal inventory of biotopes and NEN maps.
- Val de Ruz in the canton of Neuchâtel: Improvement of the ecological connectedness of natural or quasi-natural environments based on the desire to protect one of the last remaining populations of a highly endangered species of butterfly.
- Intyamon in the canton of Fribourg: Development of an ecological network initiated by farmers.
- Grenchener Wyti region in the Canton of Soleure: Construction of a 'covered passage' in connection with a motorway project before the NEN came into existence.
- Using the NEN as a basis for setting priorities in the management of railway embankments in Switzerland: Finding measures to counter the continual loss of biotopes and indicator species along railway embankments.

Conclusions and recommendations

- The NEN contributes to connecting ecosystems and encourages the cantons to take more detailed steps. It is an important tool for planning infrastructure systems at the general project level and can also play a central role in elaborating management plans.
- Other economic activities (urbanization, transportation routes, land improvement) still disrupt some projects when they are being planned. Biological monitoring is often non-existent, due to a lack of financial resources and qualified personnel.
- Experience shows that at project level, it is essential that every project includes all key people from the start. Direct exchanges between all participants have demonstrated their value, especially in being able to show advantages, reduce fears, solve problems and negotiate eventual compromises.
- Constraints and limits: There is little or no scientific follow-up due to a lack of financial means (policy). It should be taken into account that even an ecological network system that is 'perfect' at the conceptual level is not 'perfect' at the practical level. In addition, it is limited to the levels of the organisms chosen (guilds), in scale as well as areas envisaged.

1. Introduction

1.1 Important points

Switzerland has conceptual, legislative and concrete practical experience with ecological networks. Indeed, the aim of the **Swiss Landscape Concept (CPS)**, adopted by the Federal Council in 1997 – and therefore enforceable on federal departments in the exercise of their functions – is the 'development and restoration of networks of biotopes'. The main implications of this for the various federal institutions are:

Agriculture

- Develop technical and financial legislation to encourage farmers to strengthen biodiversity and to connect their ecological compensation areas (ECAs) to the network (OAS and OQE) in part with the cantonal departments of agriculture and nature and landscape protection.
- Federal law on Agriculture (LAgr.).
- Ordinance on the regional promotion of the quality and connectivity of ecological compensation areas in agriculture (OQE, 2001).
- Legislate to provide technical and financial incentives to farmers to strengthen biodiversity and to connect their ecological compensation areas to the network (OAS, 1998).

Spatial planning (federal and cantonal competence)

- When reviewing cantonal structural plans, verify that the requirements of ecological compensation and connectivity of ecosystems are taken into account (Art. 13 LAT, 1979). Further the implementation of 'landscape development concepts' (CEPs) by cantonal authorities.

Watercourses (federal and cantonal competence)

- Investigate the ecological potential of watercourses and their banks to leave a linear corridor of free space for flora and fauna, as well as flood waters (OACE, 1994) and finance these measures.

Federal roads (federal and cantonal competence)

- Restore the major axes of ecological networks that have been disrupted by transportation routes on the following bases:
 - environmental impact studies;
 - restoration of the main corridors of ecological networks that have been disturbed by transportation routes (DETEC Directive, 2001);
 - VSS norms (in particular SN 640, 690 and 692).

Forests (federal and cantonal competence)

- Maintain and further the quality and connectivity of forest biotopes and the ecological upgrading of forest edges (Lfo, 1991 and PFS, 2004).

Nature, hunting and landscape protection (federal and cantonal competence)

- Protect and restore habitats to ensure the genetic exchange of species of wild flora and fauna and link habitats that are important for biodiversity through effective ecological corridors (LPN/OPN, 1991, LChP).

1.2 NEN, the vision of an ecological network for Switzerland

In order to have available a visual and general strategic element covering all ecological networks in Switzerland, the *Réseau écologique national* (REN; National ecological network – NEN) was elaborated as an incentive cartographical tool.

This is an important document from the point of view of concept and practice, meeting the objectives of the 'Landscape 2020 (2003)' guidelines of the Federal Office for the Environment (FOEN). The *Réseau écologique national* (REN) is a technical and scientific report, published in 2004 as Switzerland's contribution to the indicative map of the Pan-European Ecological Network (PEEN). On topographical maps with scales of 1:500,000 and 1:100,000 the NEN presents an ecological vision for landscapes of all Swiss territory located below an altitude of 2100 m, and allows one to view existing and potential fragmentation and interconnectivity of living space (see Figure 1). It shows the general lines of the main ecological networks in Switzerland. It also integrates Areas of Special Conservation Interest (ASCIs) of the Emerald network of the Bern Convention.

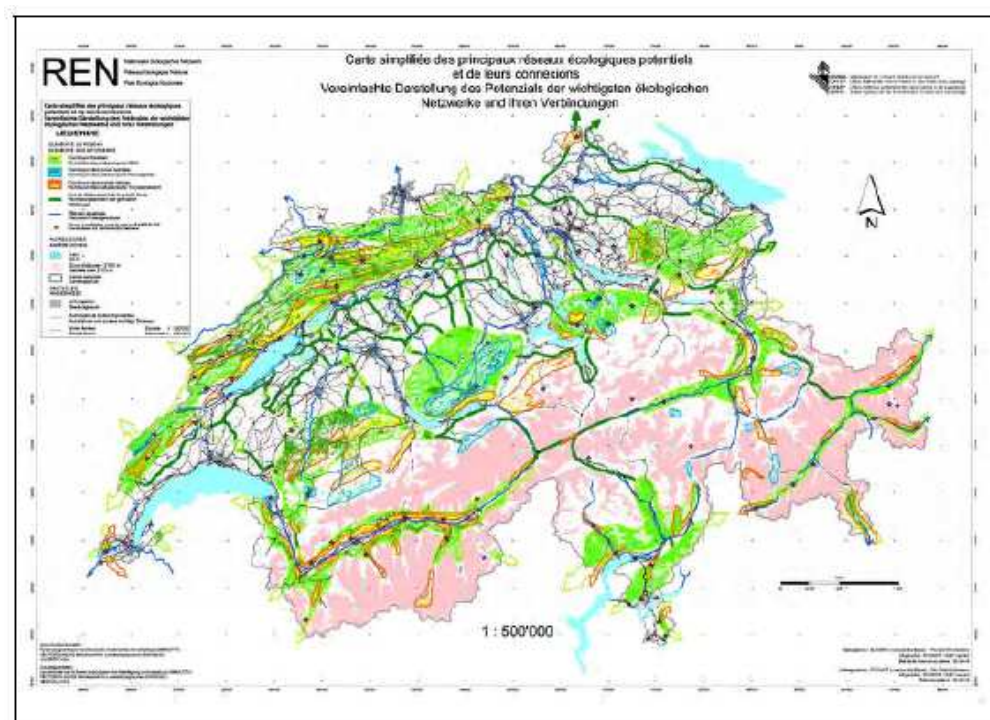


Figure 1: Simplified indicative map of the Swiss National Ecological Network – NEN. (Berthoud *et al.*, 2004)

1.3 Division of responsibilities between Confederation and cantons

Because of Switzerland's federal political system, the division of responsibilities is not easy to grasp. For example, responsibility for nature and landscape protection as well as spatial planning lies primarily with the cantons. However, in the execution of its own numerous

duties, the Confederation can act alone. Sometimes the allocation of responsibilities can change, as was the case, for example, with federal roads (motorways, etc.); main responsibility was recently placed exclusively in the federal domain. However, in most cases the cantons are responsible for implementing measures, with mixed financing cantons/Confederation. This implies close, coordinated and sustained collaboration between the various sectoral departments at federal and cantonal level.

Synergies occur mainly in the areas of watercourses, connecting ecological compensation areas in agriculture, as well as in the conservation of forest habitats in combination with hunting management, the conservation of species of flora and fauna and landscape conservation.

With respect to **experience**, it should be noted that tasks and responsibilities should not be allocated to subordinate or decentralized bodies if they are unable or would not wish to entirely undertake them without having an overview. **At the technical and scientific level**, besides monitoring, studies should be undertaken at the local level (1:25,000) to test the functional connectivity of ecological networks, in particular based on groups of species (guilds). However, the establishment, in the field, of effective connectivity areas to ensure the survival of metapopulations remains the main priority.

2. Materials and methods

The work is based on the experience acquired in recent years within the administration and during various projects dealing with the themes of ecological compensation and ecological networks. The following are particularly noteworthy:

- The officer who was in charge of ecological compensation at the Federal Office for the Environment until 2006;
- Project leader and officer in the projects Minimum required areas near to the natural state in the rural landscape (*Minimum requis de surfaces proches de l'état naturel dans le paysage rural*; Broggi, M.F. and H. Schlegel, 1990) and National Ecological Network NEN (*Réseau écologique national REN*; Berthoud et al., 2004), *Zerschneidung von Lebensräumen durch Verkehrsinfrastrukturen COST 341* (Oggier et al., 2001), and *Korridore für Wildtiere in der Schweiz. Grundlagen zur überregionalen Vernetzung von Lebensräumen* (Holzgang et al., 2001).

A total of seven representatives from various federal offices, science and private consulting companies were contacted for the interviews (see Table 1). The interviews were based on the questionnaire that was also used in the other participating countries.

Table 1: List of the organizations interviewed.

Organization	Address
Federal Roads Office (FEDRO)	Federal Roads Office (FEDRO) 3003 Bern SWITZERLAND
Swiss Biodiversity Forum of the Swiss Academy of Sciences	Schwarztorstrasse 9 3007 Bern SWITZERLAND
Federal Office for the Environment (FOEN) Wildlife and Forest Section - Biodiversity Management - Hazard Prevention Division - Agricultural Coordination	Federal Office for the Environment (FOEN) 3003 Bern SWITZERLAND
Federal Office for Spatial Development (ARE), Urban and Rural Development	Federal Office for Spatial Development (ARE) 3003 Bern SWITZERLAND
Private ecological company	L'Azuré CP 30 2053 Cernier (Neuchâtel) SWITZERLAND

3. Results

The results of the interviews are summarized in the following sections. For more details, see the Annex.

3.1 General

The ecological network concept and the need to compensate for ecosystem fragmentation are well understood by most official administrations that manage sectoral economic activities, but have not yet been fully implemented. The ecological network concept arrives either 'a little too soon' (lack of adequate incentives) or 'a little too late' (for example, for the road network, which is almost complete at the national level). In most areas, the concept of interconnectedness is a good 'doorway' to dialogue and the implementation of sustainable development.

The concept of connecting ecosystems (natural, semi-natural or man-made) arose in the 1990s as a complementary strategy to the strengthening of ecological quality in farmed areas. The OQE ordinance, which came into force in 2001, has proven to be a particularly effective legislative incentive for promoting ecological networks in agriculture. In forestry, the National Ecological Network (NEN) approach (core areas and dispersal areas) corresponds to that of the 'Strategy on forest biodiversity' (core areas = forest reserves, dispersal areas/corridors = patches of mainly virgin ancient forest). The most difficult problem to resolve is the delineation of mutual management responsibilities for ecotone areas, either by forest managers or by farmers. The problem is above all of an economic nature and about responsibility for the management of these areas, but it is hampering the implementation and completion of ecological networks. A solution has been found in the establishment of a common strategy (with mixed financing) for programmes of the Ordinance on Ecological Quality (OQE) and the Forest Biodiversity programme.

The approach to biological networks as adopted by the National Ecological Network process is perfectly suited to the understanding of ecosystem exchanges throughout the country. Simply analysing core areas and allocating legal status are not enough to guarantee optimal biodiversity at the national level.

Generally speaking, the ecological network is an important 'thread' at whatever level is considered (national, regional or local). It has also proven to be an excellent dialogue tool, enabling trust in and the credibility of the partners to be established. However, several points should be improved:

- Information and awareness-raising need to be developed, particularly through communication plans and among the main stakeholders and the public.
- The attractiveness of creating ecological networks should be strengthened through higher financial incentives.
- In order to improve the quality of the areas involved in the ecological networks, additional means should be supplied to finance the personnel responsible for network outreach activities, particularly at the regional and local level.

3.2 Stakeholder participation (Theme 1)

Switzerland is currently undertaking deep restructuring, at the level of government personnel and finance. New divisions of tasks and responsibilities have been decided upon between the cantons and the Confederation, leading to new priorities. The old strategies and concepts are certainly still in place, but most of the financing and the implementation measures now come under the cantons. The Federal Council has just decided on the establishment of a national biodiversity strategy, which will soon be brought before Parliament for approval. The ecological

network concept is a strong point of this strategy, and so follows the recommendations of the Earth Summit (Johannesburg, 2002), of the World Convention on Biological Diversity (Rio de Janeiro, 1992) and of the IUCN World Conservation Congress (Barcelona, 2008).

All of the stakeholders interviewed emphasized the need to implement ecological networks through sustainable development activities, within the general framework of sectoral economic activities. On the other hand, the scientific sector felt that it was not consulted enough, and that long-term implementation is not taken into account properly, thus leading to failures.

3.3 Balance between socio-economic interests and ecological connectivity (Theme 2)

The financing of measures to establish ecological networks was adjusted following cost reductions advocated in several authorities. However, programmes that were already committed to have started, with some conspicuous participation and investment, particularly by farmers, whose financing of the establishment of the network has even been increased. At the local level, each ecological network project constitutes a unique and non-transferable model case. The national NEN matrix plays an essential role here.

3.4 Synergies between ecological network activities (Theme 3)

Initially it was the Confederation that supported synergies between ecological network projects, mainly by steps to support the fight against fragmentation. The availability of data from the Coordination Centres for species of wild flora and fauna (centres of excellence) has enabled much to be achieved, particularly in agriculture, as well as in cross-border exchanges.

Coordination with international networks has also taken place, in particular with the Pan-European Ecological Network (PEEN).

4. Actual examples beyond policy

4.1 General system established in agriculture

Since 1993 Swiss agricultural policy has used financial incentives to favour biodiversity by encouraging the development of ecological networks. In this framework, farmers who wish to benefit from 'direct payments' (on a voluntary basis), should farm 7% of their usable agricultural area (UAA) in the form of **ecological compensation areas (ECAs)** and comply with the **proof of ecological performance (PER)** which stipulates the ecological services to be delivered by the farmers in order to receive payments.

ECAs can take various forms: almost entirely or semi-natural, as extensive or not very intensive meadows, litter meadows, flower fallow and rotational fallow, standard fruit trees, hedgerows, field coppices or woody banks along watercourses. At present, approximately 10% of the Swiss UAA is farmed as ECAs. However, in spite of these incentives, the positive effects on the quality of biodiversity have been rather modest, the farmers often registering areas that had already been extensively farmed and where the loss of yield was least, and not the areas that are most valuable for protecting threatened species.

In order to target the desired objectives more specifically, a new federal ordinance was enacted in 2001 which aimed at promoting the connectivity of the ECAs and improving their biological quality. The ordinance on the regional promotion of the quality and connectivity of ecological compensation areas in agriculture (Ordinance on Ecological Quality – OQE), founded on the basis of the federal law on agriculture (LAgr) and the federal law on landscape and nature protection (LPN), determined provisions for incentives based on results. It allows the Swiss Confederation to allocate additional financial resources in favour of the creation of local and/or regional ecological networks, according to the general indicative lines followed by the National Ecological Network (NEN). The OQE, formulating minimum standard requirements, gives the cantons considerable room to manoeuvre. The cantons are responsible for elaborating application criteria that are then submitted to the Confederation for approval. The financing is jointly assured by the Confederation (80%) and by the cantons (20%). Up until 2007, the payments made to the farmers could be up to CHF 500 per hectare of ECA connected to a network in accordance with the directives of the canton (now CHF 1,000). The minimum requirements of the Confederation regarding the connection of ECAs to an ecological network are as follows:

1. Objectives:

- a) *The objectives with respect to the promotion of floristic and faunal diversity should be defined. They are based on national, regional or local inventories or on published documents, objectives or scientific models, and take into account the specific development potential of the flora and fauna in the region concerned.*
- b) *Areas should be developed in particular:*
 1. *along watercourses; care should be taken to ensure that they have enough room to be able to fulfil their natural function;*
 2. *along forests;*
 3. *as an extension of existing ecological compensation areas and nature conservation areas.*
- c) *Synergies with projects for the conservation of natural resources and landscape planning projects should be used.*

2. Procedure to be followed

- a) A boundary is defined and drawn on a map. The map shows the initial situation of the various landscape elements.
- b) The final state of development of the ECAs should be drawn on a map.
- c) This implementation map should show:
 1. the objectives with respect to implementation;
 2. the intermediate steps;
 3. measures required in order to achieve these objectives.

Since the implementation of the OQE ordinance, many ECAs have been connected in agricultural areas, especially in cultivable mountain and hillside areas (see Table 1, and Figures 2 and 3).

Table 2: List of OQE payments made per region in 2006 (from the agricultural report 2006, FOAG 2007)

Payments¹ made in 2006 in accordance with the ordinance on ecological quality

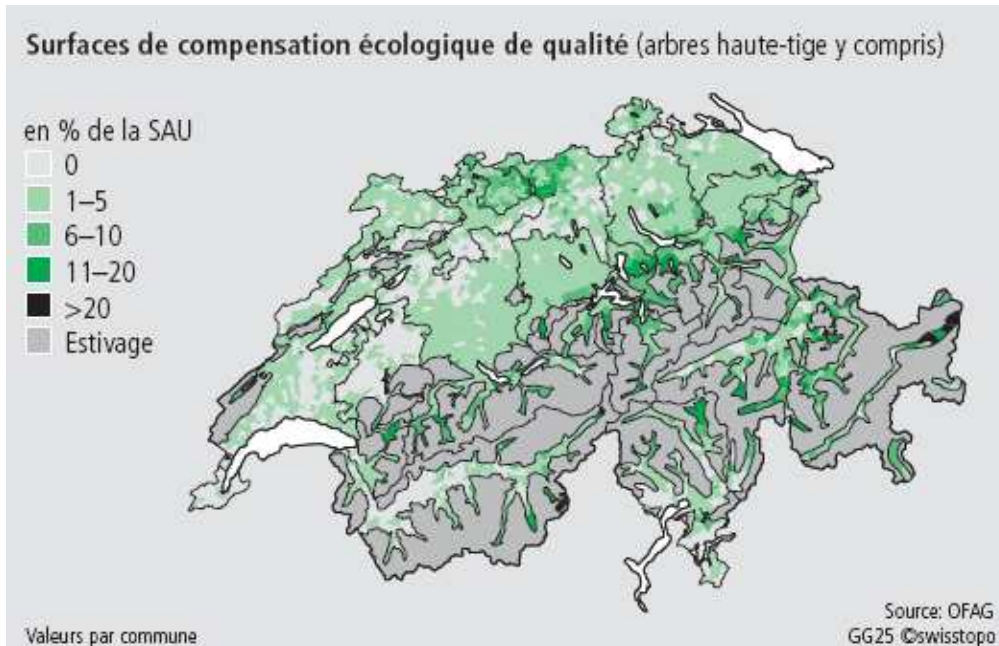
Parameter	Unit	Plains region	Hilly region	Mountain region	Total
Farms	Number	9,692	7,856	9,412	26,960
Area ²	Ha	14,529	12,243	22,400	49,172
Area per farm ²	Ha	1.50	1.56	2.38	1.82
Payment per farm	Fr.	995	1,086	1,284	1,122
Total payments	1,000 Fr.	9,642	8,529	12,086	30,256
Total payments in 2005	1,000 Fr.	8,802	8,133	10,507	27,442

¹ Excluding reductions, reimbursements and arrears.

² Conversion of standard trees: 1 tree = 1 are

Source: FOAG

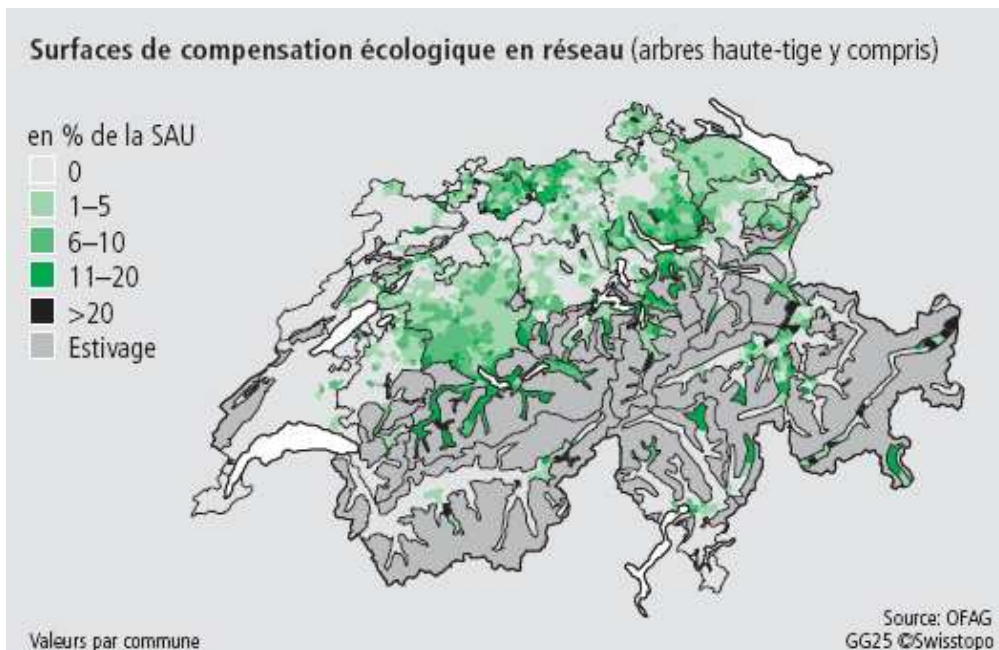
Quality ecological compensation areas (including standard trees), as percentage of UAA



Values per commune

Figure 2: Distribution of quality OQE areas in 2006. (From the agricultural report 2006, FOAG 2007)

Connected ecological compensation areas (including standard trees), as percentage of UAA



Values per commune

Figure 3: Distribution of connected OQE areas in 2006. Note: some cantons have not yet submitted their data. (From the agricultural report 2006, FOAG 2007)

Remarks: It can be seen that 26,960 farms, covering a total area of 49,172 ha, have received payments under the OQE, representing a payment of CHF 1,122 per farm.

The areas taken into account are (see also Table 2):

- extensive and not very intensive meadows, and litter meadows: 24,058 ha over 19,565 farms;
- hedgerows, coppices and woody banks: 728 ha over 3,543 farms.

In addition, payments were made on the basis of biological quality and connectivity for 482,728 standard fruit trees (almost half a million). This corresponds to 1/6 of all standard trees farmed in Switzerland.

Table 3: List of OQE payments made per type of area in 2006. (From the agricultural report 2006, FOAG 2007)

Payments¹ made in 2006 for biological quality and connection to network

Parameter	Unit	Biological quality	Connection to network	Biological quality and connection to network ²
Extensive / not very intensive meadows and litter meadows				
Farms	Number	9,372	12,388	7,177
Area	Ha	12,479	11,579	11,190
Payments	1,000 Fr.	4,770	4,577	8,646
Hedgerows, coppices and woody banks				
Farms	Number	519	2,506	1,037
Area	Ha	110	473	255
Payments	1,000 Fr.	43	209	204
Standard fruit trees				
Farms	Number	3,730	8,457	3,719
Trees	Unit	223,157	288,079	194,649
Payments	1,000 Fr.	3597	1142	4009
Other elements				
Farms	Number	-	6,360	-
Area	Ha	-	6,027	-
Payments	1,000 Fr.	-	3,068	-

¹ Excluding reductions, reimbursements and arrears.

² Combination of two programmes.

Source: FOAG

Since 2008 the financial incentives for connecting ECAs have been increased for the ecological networks on the plains in order to compensate for the loss of biodiversity, while also targeting the implementation of the NEN. The financial payment for connecting ECAs rose from CHF 500/ha to CHF 1,000/ha. In this context, the NEN constitutes an essential basic document enabling orientation of the planning of the ECAs and providing useful criteria for defining the objectives to be observed, laid down in the regional concepts for ecological networks drawn up by the cantonal authorities.

4.2 Example of ecological networks and agriculture at the cantonal level

The example of 'Bommer Weiher' in the canton of Thurgau is used to show the approach of a canton that, at the request of farmers from the village of Bomme, wished to develop a local concept for networks of ecological compensation areas, using a cantonal inventory of biotopes and NEN maps (see Figure 4).

During work for the NEN, ponds located near to the village, known to be nationally important breeding sites for several species of amphibians and odonata, were identified as concurrently belonging to a wetland continuum, an aquatic continuum and a corridor of a forest network connecting neighbouring wooded areas (see Figure 5).

Several ECAs are proposed to manage and strengthen natural habitats and landscape connecting elements:

- Areas of extensive meadows and litter areas act as buffer zones along the edges of ponds and watercourses.
- Areas of rotational fallow, extensive farming strips and ruderal areas reinforce the ecological quality of the agricultural areas of the corridors.
- Areas reserved for the meandering of watercourses have been abandoned in favour of strengthening riparian vegetation.

These areas (see Figure 6) taken as a whole are increasing the ecological value of the connecting corridor and developing the ponds, which can fully play their role as stepping-stones in an ecological corridor of cantonal importance and as nationally important core areas in the wetland network.

The cantonal master plan classifies the areas concerned as belonging to a sensitive landscape area of nature conservation. The landscape development concept (CEP) has shown the value of the site as a nationally important biotope and as part of a connecting corridor for cantonally important aquatic and forest networks. The ECAs, registered as useful agricultural areas, simultaneously meet the OQE's criteria for quality and connectivity and are eligible for financial payments envisaged for this purpose.

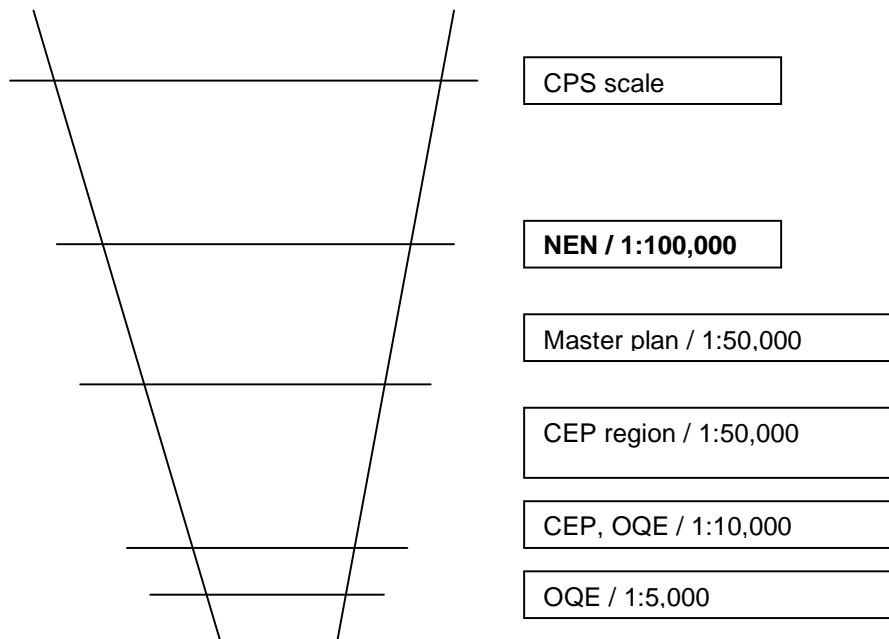


Figure 4: Diagram showing the position of the NEN in the planning process.



Figure 5: Detail from the map of the NEN, scale 1:100,000. (Berthoud *et al.*, 2004)

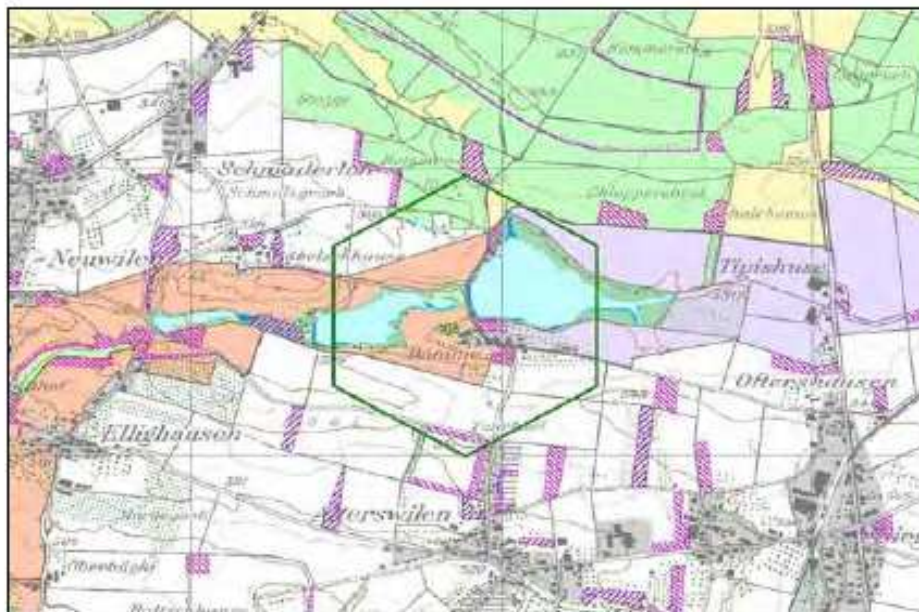


Figure 6: Detail from the Landscape development concept (CEP) of the Bomme region, scale 1/10,000. (Reproduced by permission of the Canton of Thurgau, in NEN, Berthoud *et al.*, 2004)

4.3 Ecological networks and agriculture at the regional level

4.3.1 Val de Ruz: Example of an ecological network improvement project, Canton of Neuchâtel

The aim of the project, which started in 1997, was to improve the ecological connectedness of natural or quasi-natural environments in the hilly plain of the Val de Ruz, located at an altitude of 800 m in the Neuchâtel Jura.

On the plain, which is surrounded by two forested slopes, there is intensive field crop farming and pastures. The valley's backbone is formed by a dense, branching hydrographical system. Most of the environments that are important for biodiversity are found along the river and its tributaries. Prominent landscape elements are the hedgerows and coppices, as well as striking lanes of old pear trees of ancient species. There are mosaics of wet meadows, marshy ponds and dry grasslands. These existing elements form the basis for the establishment of a functional ecological network.

The project covers an area of 45 km², of which 38 km² are usable agricultural area (UAA), distributed over 15 communes and including 106 farms, 188 of which are registered as ecological compensation areas (ECAs), i.e. almost 5% of the UAA (situation at the beginning of 1999).

Origin of the project

The project was born from the desire to protect one of the last remaining populations of the Dusky large blue (*Maculinea nausithous*), a highly endangered species of butterfly, listed in Annex II (Strictly protected) of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). This species of *Maculinea*, still present in this part of the Jura, is dependent on litter meadows that are not mown until August, after the egg-laying period. One of the required conditions is an abundance of Greater burnet (*Sanguisorba officinalis*), the food plant for the young caterpillars. At a certain point in the caterpillars' development, a species of ant (*Myrmica rubra*) takes care of them and their development continues in ant hills. Scientific monitoring showed that this species of ant had also undergone a severe decline as a result of changes in agricultural practices. This is why the Dusky large blue was chosen as 'priority species' for the OQE ecological network project in the Val de Ruz. Specific measures have been specially taken according to the needs of this species. Other priority or indicator target species have also been defined, such as Snake's-head Fritillary (*Fritillaria meleagris*) in wetlands, the Red-backed shrike and the hare.

Implementation objectives

It was envisaged to put in place approximately 185 ha of connected ECAs, of which 150 ha (80%) in the form of extensive meadows and wet litter meadows, 20 ha of extensive pastures, 10 ha of fallow land and 5 ha in the form of hedgerows and coppices.

Measures

Two types of measures have been formulated:

- Agricultural measures, related to the improvement of ecological compensation areas in the framework of the establishment of ecological networks according to the OQE, such as the regeneration of field cropping zones by the establishment of strips of fallow land, extensive meadows or small coppices.
- Specific measures to ensure the survival of priority species, such as late mowing of wet meadows and of drainage channel embankments, or the creation of new sites that are favourable to the Dusky large blue.

End situation

Target values have been set for each floristic and faunal objective, as well as for each type of environment. A map of the desired end situation has been drawn up, allowing localization of the sectors for which financial payments have been granted in the framework of the application of the OQE, based on cantonal directives on ecological networks.

Intermediate phase

The first phase took place from 1997 to 1999, before the OQE came into force. However, it has enabled the broad definition of a 'theoretical ecological network' that should be established. It was followed by a phase of individual meetings with farmers involved with the project. The implementation phase itself ended in 2007. Next will come a project follow-up phase.

Financing

The project was financed on the basis of provisions related to the establishment of ECAs (Direct payments) then, in the course of the project, by provisions under the OQE. Supplementary financing, for specific or more targeted services, was provided by the federal and cantonal departments of nature and landscape protection. The project also received support from the Fonds suisse pour le paysage (Swiss landscape fund) and cantonal NGOs (Pro Natura, WWF, and the Fédération des chasseurs neuchâtelois – Neuchâtel hunters' federation).

Information, the project's messenger

A working group was set up to take care of project management, outreach and communication. The plenary session of the working group, bringing all the partners together, took decisions related to the global orientation of the project, in agreement with the cantonal authorities. With respect to communication, besides presentations, visits and conferences, articles have been published regularly in the press, and a circular was distributed to the inhabitants of Val de Ruz in order to improve the awareness of the region's inhabitants and users of the contribution of the agricultural world to the protection of nature, landscape and ecological networks.

Monitoring the effects of measures and results

Achievement of objectives is assessed annually by means of a monitoring system, set up in 2002 and still operational. In 2007 the Val de Ruz plain counted 430 ha of ECAs, 200 of which are connected (5.3% of the UAA). Thus, the initial objectives have been amply achieved.

The expert evaluation is very positive and both scientist and citizen can today see the beauty and advantages of a restored ecological network, making a substantial contribution to the strengthening of biodiversity in the region.

4.3.2 Intyamon: Example of an ecological network initiated by farmers, Canton of Fribourg

The Intyamon valley, formed by the river Sarine, is located in Gruyère in the Canton of Fribourg, between Enney and Montbovon. The valley floor, oriented north-east south-west, is situated between 700 m downstream (Enney) and 800 m upstream (Montbovon). The valley is dominated by peaks rising to over 2,200 m. The valley's climate and geography have led to agriculture based on pastures and dairy production (Gruyère AOC).

The most important impacts on the landscape are caused by the canalization of the Sarine and the Lessoc reservoir. Agricultural practices have also altered the landscape. Since the 1950s, farming of the valley floor has intensified. Plot sizes are increasing, while the number of farms is decreasing. Mowing is usually carried out simultaneously on large areas, changing the flora and reducing breeding opportunities for the birds nesting in these meadows.

Natural environments

The alluvial zone of the Sarine is a very important environment, in spite of the various human impacts to which it has been subjected. The valley floor, which is very flat, is farmed fairly intensively (hay meadows and some crops) and natural elements are quite rare. The two slopes are rich in dry grasslands and dry pastures. There are also about ten marshes and wet meadows.

Origin of the project

The Intyamou network project under the Ordinance on Ecological Quality (OQE) was initiated by the Mouvement Agricole de l'Intyamou (MAI; Intyamou agricultural movement), which brings together about thirty of the valley's 56 farmers. From the start, the main actors have benefited from important support from the Institut agricole de Grangeneuve (IAG; Grangeneuve agricultural institute). The farmers appointed a biologist for the final elaboration of the project.

Objectives

Ecological compensation areas and natural or quasi-natural environments should be laid out, developed and added to so that:

- the indicator animal species to be promoted have an area that is large enough and suitable for finding food, breeding, reproduction and overwintering, and the plant species are able to become established and to multiply;
- conditions favourable to gene flow and the propagation of animal and plant species are brought together.

The objective being pursued is for 75 to 85% of the 56 farmers to take part in the project and for 7 to 8% of the useful agricultural area in the valley to consist of ecological compensation areas that meet the criteria of the network. This represents 105 to 120 ha, which must be distributed precisely over the various zones in the project area.

Species

The following species, which are priority and indicator species of the area, should be promoted by the project and measures should be taken: the Scarce large blue butterfly (*Maculinea teleius*), the Dusky large blue butterfly (*Maculinea nausithous*), the Large blue butterfly (*Maculinea arion*), the Bush cricket (*Polysarcus denticauda*), the Whinchat, the Red-backed shrike, the Common kestrel, the Skylark, the Yellowhammer, the Tree pipit, the hare, the Sand lizard, the Yellow-bellied toad, the Lesser marbled fritillary, Wild thyme, the Narcissus – the indicator species of Mesobromion (limestone grasslands).

Measures

The proposed measures concern the species to be promoted and aim, on the one hand, to preserve and/or improve the biological quality of existing compensation areas (ECAs) through adequate farming. On the other hand, the development of new ECAs is proposed, in order to compensate for the deficits in natural environments in the intensively farmed areas. Specific measures are proposed for certain species, such as the Whinchat, the Scarce large blue butterfly and the Dusky large blue butterfly.

End situation

The end situation is shown on a map of scale 1:5,000. It includes the various areas as well as the concrete measures proposed to the farmers within these areas.

Project implementation and monitoring of results

Every farmer involved in the project has received a catalogue of measures that could be carried out on his farm. He chooses the measures that suit him from among those proposed. A person appointed by the MAI is responsible for registering the measures chosen, checking them and informing the Department of Agriculture of them, so that the OQE payment can be made. Information is also forwarded to the specialist. Only changes in the numbers of the Whinchat, the Scarce large blue butterfly and the Dusky large blue butterfly are subject to systematic follow-up.

In 2005, three years into the project, the preliminary results were evaluated by a specialist appointed by the MAI and presented in an interim report intended for the canton. In 2008,

after 6 years of operation, the specialist will draw up a final report, on which the continuation of the project for a new six-year cycle will depend.

Information and special measures

The public has been made aware of the project through public events (morning excursion, Whinchat day, reptile exhibition) and press articles. A course in hedgerow maintenance was organized for the farmers. In addition, in 2005 ornithologists from Fribourg placed 22 nest boxes for the Common kestrel on barns and farmhouses in the open areas of the valley.

Financing

Costs incurred in project development and implementation are mainly borne by the farmers. The canton contributed to financing the elaboration of the project. It also covers costs related to measures for certain species, such as the Whinchat, the Scarce large blue butterfly and the Dusky large blue butterfly. The Swiss Association for the Protection of Birds/ASPO BirdLife Suisse and the Swiss Landscape Fund finance studies related to the protection of the Whinchat.

Interim results

During the first three years of the project (2003-2005), the network contributed to maintaining the farming of plots which – economically speaking – are not very interesting, but which have great ecological value. On the other hand, it has been almost impossible to encourage the farmers to establish ECAs on the plain, on ground that gives good yields. This situation is highlighted by the comparison of the general objectives and the objectives per area. Although the total of 120 ha of ECA was reached after three years, the quantitative and qualitative objectives related to the ECAs are far from being achieved in all parts of the project area.

4.4 Using the NEN as a basis for planning road networks

The Grenchen Wyti region (Canton of Soleure) is considered a hot spot for migratory birds and a site with a very dense hare population. In the 1990s during the planning of a motorway project, there were long, lively discussions on the choice of the route of this major road. Fortunately, after numerous assessments – in particular by the Standing Committee of the Bern Convention – an alternative comprising a 'covered passage' was decided upon (see Figure 7).



Figure 7: Construction of the covered passage at Grenchen Wyti (FOEN).

If the NEN had been in existence at the time, the high ecological value would have been recognized at the start of planning (see Figure 8). Today any infrastructure planning at the national level must take the NEN into account (see in particular VSS Norms SN 640, 690 and 692).

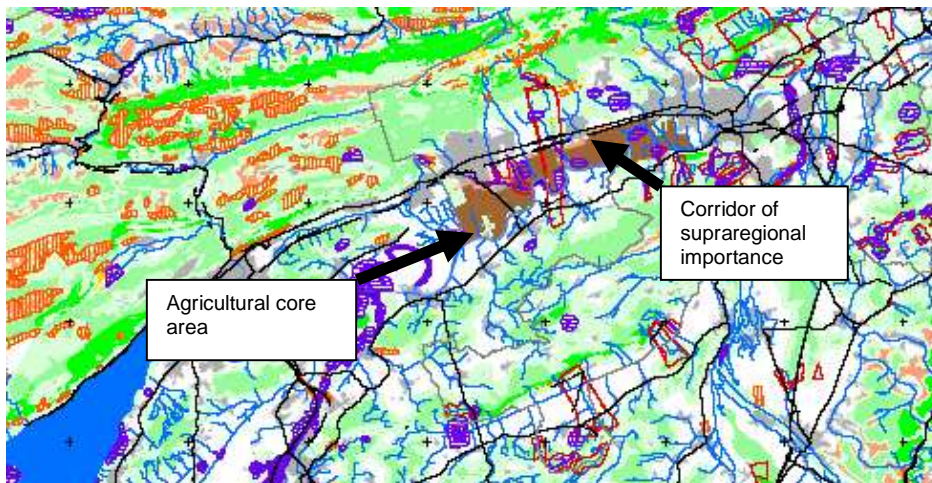


Figure 8: Detail from the NEN map, showing the Grenchen Wyti region.

4.5 Using the NEN as a basis for setting priorities in the management of railway embankments in Switzerland

As a result of historically extensive management, and taking into account the higher than average ecological richness of railway embankments and roads due to the distinctive topographical and structural characteristics of these infrastructures, it has been observed that the embankments form privileged habitats for many wild species (xeric plants, invertebrates, reptiles, amphibians, etc.). In densely urbanized areas (urban, industrial areas) or areas that are very intensively farmed (agriculture, market gardening), the embankments are often the last refuge for many rare and threatened species. They also form ideal dispersal corridors between various core areas and, because of this, have a high ecological value, which is visible even on the NEN maps (see Figure 9).

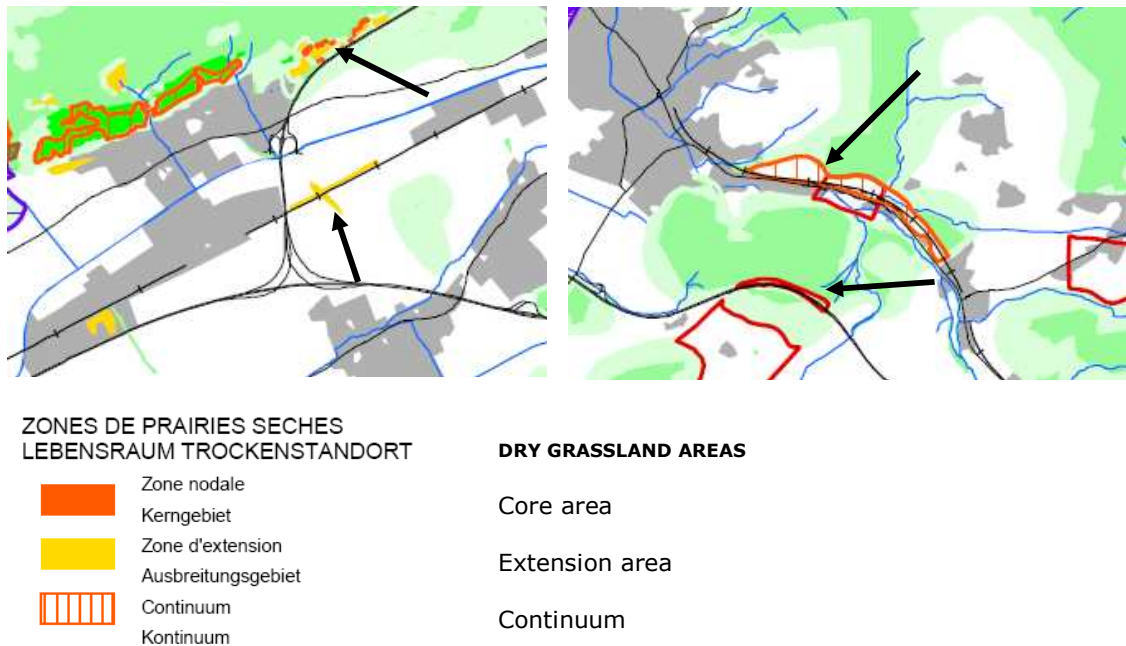


Figure 9: Extracts from NEN maps showing the value of railway and road embankments in the network.

However, adequate ecological management of the embankments requires considerable financial and staff budgets, and administrations do not always give priority to ecology. Unfortunately, the deterioration of biotopes and loss of indicator species on rough grazing land have been observed.

Measures are now being undertaken to counter these continual losses, following the example of the motorway embankments managed by the Canton of Basel-Landschaft based on a model concept. This work has even received the sustainable development prize awarded by Pro Natura (Ligue suisse pour la protection de la nature). With respect to the management of railway embankments, the obstacles are not only at the cost level, but especially at the safety level. The Federal Office of Transport (OFT), the Swiss Federal Railways (CFF) and the Federal Office for the Environment (FOEN) recently launched a project to find optimum economic, safety and ecological solutions. Within this framework, the NEN plays a central role, guiding particular points of the research.

5. Conclusions and recommendations

With a view to the establishment of ecological networks in Switzerland, the OQE ordinance, which came into force in 2001, has proven to be a very effective legislative incentive in promoting ecological networks in agriculture.

To promote the establishment of ecological networks in the country and as a reference point for all projects affecting nature and the landscape, the national ecological network was developed in 2004. The NEN provides a general overview of Switzerland's most important biotopes and the potential of the landscape.

General experience with these two central elements in establishing ecological networks can be summarized as follows:

Positive points:

- a) The NEN contributes to connecting ecosystems and encourages the cantons to take more detailed steps in order to take into account the functionality of ecological connectivities in the landscape, at the regional and local levels.
- b) The OQE has been and still is at the root of good and new forms of collaboration between the farmers themselves, with the administrative authorities concerned as well as with the other users of rural areas (forests, watercourses, the public).
- c) Raising public awareness of the problems of nature and landscape protection, for example in the field of connecting ECAs, has strengthened the idea of the usefulness of conserving biodiversity in the interests of all.
- d) Targeted measures, adapted to the needs of wild species of flora and fauna, have furthered biodiversity on the plots of land concerned, where satisfactory results have been recorded.
- e) The NEN is an important tool for planning infrastructure systems at the general project level and can also play a central role in elaborating management plans.

Negative points:

- a) Funds for the establishment and monitoring of an ecological network project by a paid project initiator (leader) are not readily available.
- b) Biological monitoring is often non-existent, due to a lack of financial resources and qualified personnel.
- c) The establishment of the initial situation of an ecological network project, which is also a useful basis for evaluation of results, is not yet optimal in the ongoing projects.
- d) Other economic activities (urbanization, transportation routes, land improvement) still disrupt some projects when they are being planned.
- e) The participation of (and provision of information to) all important local stakeholders has not been achieved everywhere.
- f) The concept of landscape potential, i.e. of the dynamism of the networks, is still often not adequately taken into account.

Experience shows that at project level, it is essential that every project includes all key people from the start. Direct exchanges between all participants have demonstrated their value, especially in being able to show advantages, reduce fears, solve problems and negotiate eventual compromises. The project manager needs the necessary financial means to remunerate participants as well as a propensity to discuss and find compromises. General legal conditions should take this form of inclusion into account by allowing enough room to manoeuvre to maintain flexibility and be able to develop joint solutions for the purpose of mediation. In addition, the project manager should have access to a wide variety of

information and a potential for synergy. Consequently, the possibility of imposing sanctions becomes negligible.

In addition, the following can be said:

- Constraints and limits: There is little or no scientific follow-up due to a lack of financial means (policy). It should be taken into account that even an ecological network system that is 'perfect' at the conceptual level is not 'perfect' at the practical level. In addition, it is limited to the levels of the organisms chosen (guilds), in scale as well as areas envisaged.
- Observed gaps in knowledge: At present, scientists do not yet have the 'responses' of fauna to the measures taken, but just preliminary feedback.
- New ideas: It should be up to the scientists to develop solutions, because the preventive principle should be applied. Monitoring.
- To be improved: A lack of information and adequate participation is often noted. Additional efforts are necessary to fill these gaps.
- Strengthen financial means: The financial incentives often do not seem to be sufficient.

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Internet sites

Fauna

www.art.admin.ch

FAL/CSCF eco-wildlife database to find target and high-profile species under the heading 'Thèmes / Ecologie du paysage, biodiversité'.

www.cscf.ch

Centre Suisse de la Cartographie de la Faune.

www.karch.ch

Centre de coordination pour la protection des amphibiens et des reptiles de Suisse.

www.pan-partnerschaft.de/dload/Tab%20Entfernungen.pdf

Compilation of dispersion distances of various animal species.

www.pan-partnerschaft.de/dload/Tab%20Minimalareal.pdf

Compilation of dispersion distances of various animal species.

www.wild.unizh.ch

Wildtier Schweiz and Centre suisse de documentation sur la recherche de la faune: important documentation on Swiss mammals (articles from the *Wildbiologie* series).

www.wsl.ch/land/products/biomod/habmaps.html

Typology of natural environments by the CSCF, according to Gonseth: general maps showing percentage of each environment type.

www.wsl.ch/land/products/biomod/potential.html

Maps of potential distribution of some animal species.

Flora

www.botanik.ch

Internet portal with numerous links to sites dealing with botany.

www.crsf.ch

Centre du réseau suisse de floristique: study of several species in possible delimited geographical areas.

www.wsl.ch/land/products/webflora/welcome-de.ehtml

Swiss Web Flora: distribution maps of all flowering plants, detailed maps for the rarest species, including practical sheets for conservation, literature database for regional work.

Red lists

www.bafu.admin.ch

Under the heading 'Thèmes / Listes rouges' are the red lists for:

- animal species
- ferns and flowering plants
- mosses
- lichens
- fungi

Landscapes and habitats

www.umweltzustand.admin.ch

Cartographic module giving current information on the state of the environment. The headings 'Paysages' and 'Habitats' give information and links on:

- nationally important landscapes, natural sites and nature reserves (IFP)
- alluvial areas
- wetlands
- high-lying marshes
- low-lying marshes
- amphibian breeding sites
- water birds and migratory bird reserves

Legal bases

www.admin.ch/ch/f/rs/rs.html

Systematic collection of federal laws.

www.admin.ch/ch/f/rs/45.html#45

- Federal law on nature and landscape protection (LPN)
- Ordinance on nature and landscape protection (OPN)
- Ordinance on the federal inventory of landscapes, natural sites and nature reserves (OIFP)
- Ordinance on alluvial areas
- Ordinance on high-lying marshes
- Ordinance on low-lying marshes
- Ordinance on amphibian breeding sites
- Ordinance on wetlands.

www.admin.ch/ch/d/sr/61.html#613

- Ordinance on financial equalization.

www.admin.ch/ch/f/rs/91.html#910

- Ordinance on Ecological Quality (OQE)
- Ordinance on direct payments.

www.admin.ch/ch/f/rs/c922_32

- Ordinance on water birds and migratory bird reserves

www.blw.admin.ch/themen/00006/00051/index.html

Technical provisions for executing the OQE, under the heading 'Informations complémentaires'

Annex: Detailed interview results

Federal Roads Office (FEDRO)

General

First of all, it should be emphasized that the term 'network' is not limited to 'ecological network', but also applies to 'road network', 'railway network' and other 'communications networks'. In the area of roads, 'ecological networks' were highlighted in the framework of environmental impact studies (EIS), through road planning norms (called 'VSS norms', in particular SN 640, 690 and 692) as well as through the directive of the Federal Department for the Environment, Transport, Energy and Communications (*La planification et la construction des passages à faune à travers des voies de communications / Planning and construction of wildlife passages across transportation routes*, DETEC, 2001). Conceptually, the NEN approach corresponds to a certain extent to that of the roads network (core areas and dispersal areas/corridors). However, taking into account the fact that most of the national road network is almost finished, the concept of 'ecological network' is 'a little late'. All that remains to be done on the road network is incidental drainage work.

Theme 1: Stakeholder involvement in different sectors

The Federal Roads Office (FEDRO) operates throughout the country, i.e. at the national level, the motorways and major roads. Among the various ecosystems described in the NEN as having priority are forests (mainly because of the theme 'corridors for large animals') and the continuum of watercourses. FEDRO has recently strengthened its perception of ecology by adding an expert in nature and landscape to its existing staff. New efforts will be made to contribute to the implementation of the NEN, for example by requiring the ecological maintenance of road embankments. Within FEDRO there is no reluctance with respect to the requirements of the interconnectedness of ecosystems, but there are delays in the implementation of suitable actions, mainly because of various departmental reorganizations and the recently decided changes in the allocation of responsibilities between the cantons and the Confederation. Nevertheless, conflicts can still arise!

Theme 2: Balance between socio-economic interests and ecological connectivity

Financing of measures is limited. The measures concerned are 'replacement/restoration' measures decided upon when projects were approved, normal maintenance work and general maintenance work based on the road network drainage concept in view of the demands of the interconnectedness of large animals. The financing rule is based on the principles of balanced 'cost-benefit' accounting.

Moreover, model cases are unknown, each section representing a special case.

Theme 3: Synergies between activities at the regional, national and international level

So far, FEDRO has not stressed ecological questions at the international level. Perhaps this will develop in the future. For the moment, FEDRO is of the opinion that the necessary bases exist (e.g. VSS norms, Directives, NEN), that they adequately cover ecological aspects and that with the strengthening of know-how currently taking place, they are on the right path.

Swiss Biodiversity Forum (SBF)

General

First, it should be emphasized that the approach to biological networks as adopted by the National Ecological Network (NEN) process is perfectly suited to the understanding of ecosystem exchanges throughout the country. Analysis of the core areas alone is not enough to guarantee monitoring of all national biodiversity.

Theme 1: Stakeholder involvement in different sectors

The NEN should be taken into account in all sectoral planning. However, in practice, it obviously will not be possible to guarantee all interconnections for all continua of the NEN. Ideally, the implementation of the NEN should be included in the Landscape development concepts (CEP) carried out at the cantonal and regional levels.

In theory, all stakeholders in an ecological network are involved (or should be). Unfortunately, the SBF feels that scientists are not consulted enough (in the cases that are known) and that essential problems related to concrete application (practice) and long-term implementation are often not tackled. As a consequence, the results are sometimes unsatisfactory for both the users and ecology. This is not the case in the framework of ecological compensation in agriculture, which is based on ecological and landscape criteria, as is easily shown by the available results. At the spatial planning level, consideration of the requirements of connectivity areas for wild flora and fauna should be decidedly strengthened and new initiatives should be taken.

Theme 2: Balance between socio-economic interests and ecological connectivity

The shortcomings in this thematic area seem to be situated in the procedures applied. The positive results in ecological compensation in agriculture (e.g. projects in Thurgau), confirm the rule that the participation of all stakeholders is an essential initial condition.

Theme 3: Synergies between activities at the regional, national and international level

All stakeholders in the economic sectoral activities concerned – even development and town planning – should be involved in a project from the beginning. Moreover, it may be advantageous to create new 'comprehensive' tools that go beyond the existing ones and may provide an overview of the problems posed (for example, including agricultural AND forestry problems together, and no longer treating them separately). Finally, the problem of ecological networks should be taken more seriously in the implementation of economic sectoral activities, and communication and awareness raising should be strengthened.

Federal Office for the Environment (FOEN), Wildlife and Biodiversity Management Section

General

The NEN approach (core areas and dispersal areas) corresponds to that of the 'Strategy on forest biodiversity' (core areas = forest reserves, dispersal areas/corridors = patches of mainly virgin, ancient forest).

The most difficult problem to resolve is the delineation of mutual management responsibilities for ecotone areas, either by forest managers or by farmers. The problem is above all of an economic nature and about responsibility for the management of these areas, but it is hampering the implementation and completion of ecological networks. A possible solution (being studied in wooded pastures) may be to establish a common strategy (with mixed financing) between programmes of the Ordinance on Ecological Quality (OQE) and the Forest Biodiversity programme.

Theme 1: Stakeholder involvement in different sectors

A large-scale programme of reallocation of tasks between the cantons and the Confederation (RTP) is currently underway, leading to new allocations of responsibility and financing channels for projects. The NEN, a non-binding guide, serves as a connecting thread for the cantons in evaluating their ecological networks. It also serves as a general guide in forest planning at the cantonal and regional levels as well as in game management. However, the NEN needs to be better taken into account in work related to spatial planning.

With respect to evaluation, taking into account that the strategic programme 'Forest Biodiversity' has just started, it is premature to make any judgements before 2010, but already it can be said that preliminary experience is positive.

Theme 2: Balance between socio-economic interests and ecological connectivity

For financing the establishment of connectivity areas in forests, basic provisions exist that foresee 'contributions to the area' linked to precise conditions. The cantonal forestry departments have received a detailed description of the conditions that have to be met in order to receive payments.

At present, no model cases are known.

Theme 3: Synergies between activities at the regional, national and international level

The Federal Forest Service does not maintain direct international contacts, but there is close contact between the cantonal forestry services and their counterparts in neighbouring countries (for example: Canton of Tessin/Italy, for adjoining forest reserves; Canton of Geneva/Haute-Savoie and Ain, France for the Urban and environment project in the Franco-Valdo-Genevese region, an INTERREG project).

One solution to further work on connecting ecosystems to the network would be to create a Coordination Office responsible for furthering synergies for the joint establishment of ecological networks (especially in the fields of agriculture, forestry and watercourses).

More generally, it is imperative that the Federal Office for the Environment receive additional funds that can be used directly for the implementation of the NEN.

FOEN, Agricultural Coordination

General

The concept of connecting ecosystems (natural, semi-natural or man-made) arose in the 1990s as a complementary strategy to the strengthening of ecological quality in farmed areas. The OQE ordinance is proving to be a particularly effective legislative incentive for promoting ecological networks in agriculture (see Section 3.1).

Theme 1: Stakeholder involvement in different sectors

The ecological network concept in Switzerland is based on the NEN concept; it is more refined by a change of scale, from the national to the local level. Detailed network plans should include natural wildlife habitats – including unprotected ones – even if they are located outside the usable agricultural area (UAA). Ecological networks in agriculture must be implemented at the local level, but based on cantonal stipulations and minimal requirements of the Confederation. The obstacles observed which are hindering the creation of networks are:

In lowland areas, there are severe structural, organizational and economic constraints on intensive lowland farms. The structure of such farms and the organization of work according to equipment potential mean that farmers do not favour ecological networks on their land, in general considering them to be 'barriers' to rational work.

In spite of the fact that a farmer earns more money by receiving ecological payments for his land than from growing wheat (and market prices continue to fall), many of those who practise intensive farming prefer to continue harvesting wheat, even though it is less profitable! This is also a question of mentality. It should also be added that on lowlands only 1-2% of farmers' incomes is derived from ecological compensation payments made by the public authorities. 20% of income comes from other direct payments and 80% of farmers' income still comes directly from market prices.

The main stakeholders, besides farmers who join on a voluntary basis, are the cantonal departments of agriculture and of nature and landscape protection. The communes, private

companies and some NGOs also contribute to the process. Their participation should take place clearly from the start of the process. Regulatory changes that may be necessary include the requirement for a clear, detailed definition of the 'initial situation' in the creation of a network and the need to ensure biological monitoring.

Theme 2: Balance between socio-economic interests and ecological connectivity

Financing is described later in this report. The OQE also includes 'losses of yield'. Moreover, each ecological network project constitutes a unique and non-transferable model case.

Theme 3: Synergies between activities at the regional, national and international level

The existing institutions effectively provide for the harmonization of the various concepts through framework conditions laid down in legislation and directives. The national institutions in Switzerland are the Federal Office for Agriculture (FOAG) and the Federal Office for the Environment (FOEN). They benefit from the support of technical and scientific bodies such as AGRIDEA (Reckenholz/Lausanne), the Swiss Centre for the Cartography of Fauna (CSCF, Neuchâtel) and the Swiss Floristics Network (CRSF, Geneva). Important contributions are also made by the Swiss Ornithological Station (Sempach) and NGOs concerned (WWF, Pro Natura). There are still very few cross-border exchanges, but they are taking place in Basle, Schaffouse and Geneva.

In order to improve the situation, and increase stakeholder involvement, the following should be done:

- Strengthen the outreach of network projects.
- Change the direct payments structure to selectively encourage only sustainable, environmentally friendly agriculture.
- Strengthen communication with consumers in order to highlight the image of the farmer who is 'in touch with nature'.

With respect to synergies, we note the example of the Integrated Production in Switzerland (IP) programme, which took the Skylark as its mascot and laid down requirements for growing wheat in correlation with the survival of this species, considered as an 'added value'. The result is that a large cooperative society (Migros) is now buying wheat produced under IP for more than the normal market price!

Private Ecological Company 'L'Azuré'

General

The situation could be improved by integrating the OQE programme into the system of proof of ecological performance (PER), which would improve its financial attractiveness.

Theme 1: Stakeholder involvement in different sectors

Common concepts are those of the NEN and the OQE. Potential barriers to connecting ecological compensation areas in agriculture are:

- Raw materials (fodder) requirements for livestock. Particularly as a result of the gradual suspension of the dairy quota system, the number of cows per farm is increasing, as are fodder requirements. Therefore, registering too many areas as ecological compensation areas would risk penalizing the farmer.
- The farmer needs enough space to spread the manure produced by his livestock. Farmers cannot place more than 10-12% of agricultural land in ECAs, depending on the number of head of cattle, without compromising their possibilities for spreading manure in accordance with the standards currently in force.

At stakeholder level, besides the farmers themselves, the canton is the initiator of ecological network projects (departments of agricultural and of nature and landscape protection). The canton receives support from the Agricultural extension service and private applied ecology companies, who collaborate in project preparation, in close contact with farmers, one of whom acts as a liaison with the rest. All of the above-mentioned stakeholders are involved and are

members of a joint coordination committee, together with scientists and NGOs (WWF, Pro Natura).

Possible desirable legislative changes include the extension of agricultural financial payments for the areas that are farmed but lie outside the usable agricultural area, such as agricultural use of summer pastures, which include many species-rich dry grasslands, or forest edges maintained by the farmers themselves. Extending legislation to allow payments to be made for farming these areas – taking Art. 77a LAgr. into account – could improve the situation.

With respect to the reluctance to collaborate observed in some stakeholders, the following can be pointed out: According to the regulations, farmers' voluntary participation in the OQE programme lasts for six years. Some farmers are afraid that at the end of this period the requirements will change, will become stricter, and that fixed conditions will become compulsory in the longer term. In order to remove this reluctance, the payments offered should be increased. However, if in return the authority requires stricter conditions, which could be seen as obstacles to farming, this would risk losing the farmers' confidence, which in the long term could lead to a breakdown in dialogue and to the abandonment of the voluntary-based programme. The solution would be to pursue the current system, with additional bonuses (not automatic) when the farmer undertakes new activities which favour biodiversity and interconnectedness.

Theme 2: Balance between socio-economic interests and ecological connectivity

The system foreseen by the OQE works well, but it would be advisable to reward ecological quality with bonuses, as an extra, according to the richness in biological diversity of the areas considered. Each ecological network project is a 'model case' in itself. At the local level, very diverse strategies are employed, according to the areas of the country (plains, mountains), farm types, the climatic conditions and the size of the plots of land.

Theme 3: Synergies between activities at the regional, national and international level

Future and synergies: The OQE programme will probably be integrated into the proof of ecological performance (PER) system that is compulsory if one wishes to receive direct payments. The ideal system would be to set standard norms for all farms and to link them to additional incentive payments covering new services, such as the establishment of an ecological network (an 'à la carte' network), measures against erosion, or farming methods which are even more advantageous for biodiversity. This proposal would lead to more flexibility in the implementation and financing of measures, but would require more work in the form of providing advice to farmers.

As for synergies, experience shows that the fact of planning an ecological network in agriculture and of actually implementing it enables closer contacts to be formed with a major user of rural areas – the farmer – and simultaneous action to be taken on other problems related to environmental protection.

Federal Office for Spatial Development (ARE)

General

In spatial planning at the national level the NEN can be used in various tools. Adequately informing key personnel at all levels of implementation is a fundamental piece of the mosaic.

Theme 1: Stakeholder involvement in different sectors

At the national level, ARE bases itself on the NEN. The levels at which ecological networks are planned vary, but should be adapted to the local/regional conditions.

Three main instruments should be taken into account in spatial planning:

- Cantonal master plan: this is the only document that is examined at federal level for compliance with federal requirements and thus approved by the Confederation. The master plan includes basic principles (in accordance with Art. 13 LAT, for example the NEN) as

well as the canton's landscape plans, which should include – at an early stage in the planning process – the problem of ecological networks.

- Land-use plan, including 'green belts', the integration concepts and the landscape development concepts (CEP). Knowledge on ecological networks should be updated during regular reviews of these plans.
- Building permits: these fall under the responsibility of the communes, then the cantons. They can make a very positive contribution to the implementation of ecological networks, especially in urban areas (e.g. Zurich).

At stakeholder level the participation of all concerned, including the public, should be promoted, especially in urban areas, where it is fundamentally important to raise awareness of the problems of the permeability of areas, which is essential to wildlife migration.

At the strategy level, there is the Swiss Landscape Concept (CPS), many 'bases' (including the NEN), as well as legislation in specialized areas. But there is as yet no strategy to prevent fragmentation of the landscape. A strategy for the development of ecosystem interconnectedness could perhaps be proposed, because without a general vision covering all of the country, the cantons will not be able to satisfactorily complete a comprehensive landscape policy. The landscape initiative launched in 2007 that envisages a change in the federal Constitution, a subject to be dealt with in the coming years, should be noted.

With respect to observed reluctance, this is partly political, but in particular financial in nature. The financial incentives must be higher and simpler. The language used must be better adapted to the discussion partners concerned.

Theme 2: Balance between socio-economic interests and ecological connectivity

In spatial planning there is a lack of available funds for measures favouring interconnectedness and the development of natural potential, except in a few urban cases. Betterment levies are sometimes proposed, but this practice is still disputed. There are only a few model cases that take ecological networks into account, for example at Kersatz (communal level), the CEP (regional), and some cantonal plans (Aargau, Thurgau, Bern). The cantonal ecological network project for the plains area in Valais, currently being drawn up, should also be mentioned.

Theme 3: Synergies between activities at the regional, national and international level

With respect to the difficulties in achieving an understanding of the importance of ecological networks, it should once more be mentioned that it is always difficult to introduce something new. Because there are so few examples of cross-border exchanges, we can mention only the work of the Rhine Commission between Switzerland and Germany, and the Franco-Valdo-Genevese Association between Switzerland and France.

The keys to success are:

- properly informing key people
- political stimulation and availability of finance
- suitable legislation, which currently seems to be the case.

Note: A third generation of cantonal master plans is being prepared. More targeted information by the cantonal authorities on the Swiss NEN could improve consideration of ecological networks in spatial planning.

FOEN, Hazard Prevention

General

The approach to biological networks as adopted by the National Ecological Network (NEN) process corresponds perfectly to the route taken in policy concerning natural hazard protection, in particular flood protection. It is essential that the ecological network concept be incorporated in all these areas. Upstream, comprehensive planning is indispensable, linked to

concrete actions at the local level. The 'network' concept should be an important thread running through this process.

Theme 1: Stakeholder involvement in different sectors

In Switzerland the ecological network concept chosen by the NEN is completely in line with the approach to protection from natural hazards in general. Obviously, depending on the level at which this policy is applied, from national to local, it should be refined and taken into account in all concrete project proposals. The NEN recognizes the rivers network as being the most important. In addition, the network of hedgerows and forest edges as important transition areas between agricultural and forest areas forms a particularly significant network that merits consideration. Moreover, particularly at the local level, a landscape with a functional ecological network is a major factor in human health.

The following basic documents should be taken into account: the guidelines *Plus d'espace pour les cours d'eau* (More space for watercourses), the 2001 Directives on this subject and the *Handbuch NFA* (NFA Handbook), which also mentions the NEN and shows which conditions are to be fulfilled in order to receive higher contributions from the federal authorities.

The main keys to success in any project implementation are, on the one hand, true involvement of all stakeholders from the start – based on the definition of the project's goals – and, on the other hand, a financial incentives scheme that is really adapted to needs. For example, in flood protection projects, in order to be eligible for basic financing (35%), the project must show that it takes fundamental ecological aspects into account. If the project includes involvement of all stakeholders from the start of planning and additional consideration of ecological aspects (especially a network) and if the whole respects a positive economic cost/utility balance, then the payment can increase by up to 6% (2% for each point).

In general, the results of this system are very positive. Problems encountered are especially related to urban areas. Often there is not enough space available to establish a network for terrestrial fauna. On the other hand, it is always possible to create stepping-stones for these species and to improve the river ecosystem. Outside urban areas, agricultural interests sometimes oppose sustainable solutions. But even in these cases, this is due to a lack of economic incentives rather than fundamental objections. To offset this, agricultural budgets favouring biodiversity and landscape should be higher and provide more incentive. In particular, it is very important to give more weight to riparian wetlands.

Theme 2: Balance between socio-economic interests and ecological connectivity

As stated above, financing is based on minimum conditions and bonuses. Furthermore, existing synergies between flood protection and ecology, including connecting the landscape, should be highlighted.

From the long list of positive examples the following projects should be mentioned: The Thur correction project, which already included the ecological network concept in the 1990s, and the Rhône development project in Valais, currently in the implementation phase.

Theme 3: Synergies between activities at the regional, national and international level

The ecological network concept should be taken into account in all sectoral policy that concerns aspects of the landscape, and the various approaches should be harmonized. The task of harmonization should be entrusted to the Federal Office for the Environment (FOEN) – in the framework of the strategy recognized by the Federal Council – and provided with the necessary funding. As a priority, FOEN should ensure that there is real coordination between agriculture and forest economy. So far, in spite of the efforts undertaken, none of the stakeholders have really succeeded in breaking through their limitations by viewing the situation globally with a view to sustainable development. Moreover, with regard to cross-

border collaboration, initiatives have been developed with Germany and Austria (Alpenrhein, Bodenseekommission) as well as with France in the Geneva region.