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Swiss Biodiversity Strategy

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Development of a Strategy for the Conservation and Promotion of Biodiversity

Publishing information

Senior project management (FOEN)
Willy Geiger, Thomas Göttin, Evelyne Marendaz Guignet, Christine Hofmann, Florian Wild

Project management
Sarah Pearson Perret (FOEN), Claudia Jacobi and Michael Herrmann (PrivatePublicConsulting)

Contributions
Urs Amstutz (Swiss Forest Owners Association), Roger Bisig (Konferenz der Landwirtschaftsämter der Schweiz), Georg Brosi (Jagd- und Fischereiverwalterkonferenz), Ernst Brugger (BHP Consulting), Beat Bürgenmeier (University of Geneva), Simona Capaul (PrivatePublicConsulting), Alexandra Cropt (Swiss Farmers Union), Gérald Dayer (Canton of Valais), Thomas Egger (Schweizerische Arbeitsgemeinschaft für die Berggebiete), Kurt Eichenberger (WWF Schweiz), Anders Gautschi (Schweizerische Arbeitsgemeinschaft für die Berggebiete), Oliver Graf (Publizack), Olivier Guex (VS), Markus Haberthür (Ambio), Barbara Haering (ECONCEPT), Heinz Hänni (Swiss Farmers Union), Christian Hediger (UNA), Lukas Jenni (Swiss Ornithological Institute), Gregor Klaus, Marcus Knill (Knill&Knill), Raymond-Pierre Lebeau, Peter Lehmann (sanu), Sandra Limacher (WaldKultur GmbH), René Longet (Schweizerischer Städteverband), Richard Maurer (Canton of Aargau), Gilles Mulhauser (Canton of Geneva), Werner Müller (Swiss Association for the Protection of Birds SVS/BirdLife Switzerland), Urs Näf (Swiss Business Federation), Martin Nydegger (Switzerland Tourism), Daniela Pauli (Swiss Biodiversity Forum), Patrick Scheuchzer (ECOPLAN), Thomas Stirnimann (Canton of Lucerne), Thomas Vellacott (WWF), Bertrand von Arx (Konferenz der Beauftragten für Natur- und Landschaftsschutz), Felix Walter (ECOPLAN), Eric Widmer (Gruner AG), Othmar Wüest (Konferenz der kantonalen Forstdirektoren), Willi Zimmermann (Swiss Federal Institute of Technology Zurich), Maria Luisa Zürcher (Schweizerischer Gemeindeverband), Dominique Zygmont (scienceindustries).

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Table of contents

Management Summary

Background

Biodiversity is an indispensable basis for life on earth and hence also a central pillar of human existence. It encompasses the diversity of ecosystems, species and genes. Biodiversity sums up the variety and diversity of life in a single word.

Biodiversity provides essential services for society and the economy; these services are known as ecosystem services. The variety of these services is vast: biodiversity supplies food, among other things, it influences the climate, conserves water and air quality, is a component of soil formation, and, last but not least, provides humans with space for leisure and recreation. A deterioration in the status of biodiversity prompts a decline in these services and, accordingly, poses a threat to the sustainable development of the economy and society.

In recent decades, biodiversity suffered severe losses worldwide and its status is currently assessed as under threat. The OECD Environmental Performance Reviews: Switzerland 2007 (confirmed by the Environment Switzerland reports of 2009 and 2011) and Switzerland's Fourth National Report under the Convention on Biodiversity give a negative assessment of the status of biodiversity in Switzerland. Moreover, in a comprehensive analysis carried out in 2010, Swiss biodiversity scientists reached the conclusion that the low point in the process of decline has not yet been reached.

The loss of biodiversity is insidious and is, therefore, scarcely perceived by society. Society adapts to the change before it realises what it has lost in terms of vital functions and services. Biodiversity loss in Switzerland may be summarised in terms of the following challenges:

- Significant quantitative and qualitative habitat loss and increasing habitat fragmentation can be observed due to settlement development, mobility and the associated infrastructure development.
- Many once common species are affected by drastic range loss and declining population sizes. The populations of around one third of the approximately 46,000 known plant, animal and fungal species in Switzerland are under threat.
- Considerable knowledge gaps still exist today in relation to genetic diversity in Switzerland. It is important that these gaps be closed so that the potential represented by this diversity can be preserved and used, both today and in the future.

The international community of states has recognised that the loss of biodiversity must be halted. Hence, Switzerland signed the Convention on Biological Diversity (Biodiversity Convention) in 1992. It came into force in 1995 and now has a total of 193 contracting parties. The aim of this convention is the global conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits that arise from the use of genetic resources. For the implementation of the biodiversity goals, the participating states have undertaken to develop independent national biodiversity strategies.

In 2002, the parties to the Biodiversity Convention agreed on the mission of reducing biodiversity loss significantly at global, national and regional levels by 2010. On the occasion of the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity in Nagoya (Japan), it emerged, however, that none of the states had succeeded in fulfilling this mission. A new strategic plan was adopted for the

period 2011 to 2020, which is applicable for all national and international biodiversity-relevant conventions and whose 20 goals provide a framework concept for the implementation of the mission at national and regional levels.

On 18 September 2008, the Swiss parliament responded to the loss of biodiversity and the associated international developments by including the development of a Swiss Biodiversity Strategy in the legislature planning for 2007-2011. The Federal Department of the Environment, Transport, Energy and Communication (DETEC) was mandated with the development of the Swiss Biodiversity Strategy in the Federal Council decision of 1 July 2009.

This strategy is the result of the implementation of this parliamentary mandate. It is the product of intensive engagement with the topic both within the federal administration and in cooperation with experts from the cantons, the private sector, and science and research. Representatives of the relevant interest groups were also invited to provide expert support for the process.

The ten strategic goals of the Swiss Biodiversity Strategy

The ten strategic goals of the Swiss Biodiversity Strategy describe the focal points, on which all actors must base their activities in the years between now and 2020 so that they can jointly generate a sufficient impact and achieve clear results.

The ten goals fulfil the Swiss parliament's mandate of 18 September 2008 and, in keeping with the Federal Council decision of 1 July 2008, aim to ensure the long-term conservation and promotion of biodiversity both in Switzerland and at global level. The overall objective "Biodiversity is rich and has the capacity to react to change. Biodiversity and its ecosystem services are conserved in the long term" shall be achieved through the implementation of the ten strategic goals.

The strategic goals are coordinated with each other and their implementation is mutually influential and supportive. The goals shall be pursued as a common set for the conservation and promotion of biodiversity.

1. **By 2020, the use of natural resources and interventions involving them are sustainable so that the conservation of ecosystems and their services and of species and their genetic diversity is ensured.**

   The economic sectors and policy areas have a significant influence on biodiversity, however they also benefit from numerous ecosystem services. The utilisation, conservation and promotion of biodiversity should be coordinated with each other in an optimal way. The different sectors should take the importance of biodiversity into account in their actions and decisions. In concrete terms this means:

   - **Spatial planning:** In principle, biodiversity shall be taken into account throughout the country in interventions through buildings and facilities carried out in the context of projects involving all active spatially-relevant sectoral policies. It shall be dealt with systematically in sectoral plans, cantonal structure plans and in the context of land-use planning. The areas necessary for the conservation and promotion of biodiversity shall be guaranteed. Comprehensive consideration shall be given to the legal obligation to restore and compensate for degraded habitats deserving of protection. Further improvements can be achieved through increased coordination in spatial planning in relation to biodiversity.
   - **Forestry sector:** Near-natural silviculture, which is enshrined in the forestry legalisation, shall be implemented in all managed forest areas. The area assigned to

forest reserves shall be increased from 5% of total forest area today to 8%. Deadwood and varied structures shall be available in all of Switzerland's major regions in ecologically sufficient volumes and quality. In locations in which habitat protection is insufficient, species promotion measures shall protect and promote forest-related species.

- **Agriculture:** The fulfilment of the "Environmental Targets for Agriculture" (Umweltziele Landwirtschaft) is essential for the conservation of biodiversity. The environmental targets shall be implemented on a regionally quantified, qualified and coordinated basis in the area of biodiversity. The importance of ecosystem services for agriculture shall be recognised and their valorisation through the market and society shall be guaranteed in the different agricultural production processes. The incentives provided for services for the promotion of biodiversity shall be increased and the quality and interconnection of existing ecological compensation areas shall be improved; new biodiversity priority areas (ecological compensation areas) shall be created where necessary.
- **Hunting and fishing:** The sustainable use of biodiversity through hunting and fishing must be improved in a targeted way and verified periodically. Thinking, planning and acting in supra-regional wildlife areas and surface water catchment areas (instead of at communal or cantonal areas) shall be promoted through ordinances and incentives.
- **Tourism, sport and leisure:** Sport and tourism shall contribute to the protection of biodiversity through nature-compatible services and infrastructure. The possible ways in which measures for the promotion of biodiversity can be achieved here shall be explored on all political levels and in cooperation with the sport and tourism sectors.
- **Transport:** To facilitate the extensive interconnection of habitats and populations, new separation effects shall be avoided; in addition a package of measures will be necessary comprising, among other things, the construction of new wildlife passages, the upgrading of existing wildlife passages through ecological compensation areas in the area of habitat connection corridors and the creation of replacement habitats. The measures that have already been implemented in this regard shall be guaranteed in the long term.
- **Renewable energies:** With the decision for the phasing out of nuclear power, the Federal Council is focusing on the use of renewable energies. Conflicts of interest with biodiversity shall be resolved where possible through existing strategies and recommendations. Where necessary, the Confederation shall examine the development of additional enforcement aids. Moreover, the Confederation would like to support the cooperation between the cantons and in this way facilitate comprehensive planning.
- **Sites, buildings and facilities owned by the state:** Requirements relating to biodiversity shall be taken into account in the use of state-owned sites, buildings and facilities. The high ecological value of sites that are no longer needed must be conserved in the case of a change in use or sale. In the case of other areas that are not of any significant natural value today, the possibility of their availability for interconnection or as protected areas for biodiversity shall be verified.
- **Production, services/trade and consumption**: In order for biodiversity to be given greater consideration in business decisions and for the negative impact of economic activities on biodiversity to be reduced, Switzerland shall increase its focus on market-based instruments and incentives, environmental product information, internationally recognised sustainability standards and the integration of environmental and sustainability factors into financial market processes. Switzerland's public procurement shall be carried out in a sustainable way, biodiversity goals and the impacts on global biodiversity shall be adequately taken into account in national decisions and in economic sectoral policies and strategies and

national and international initiatives shall be promoted in the area of biodiversity and the economy.

2. **By 2020, an ecological infrastructure consisting of protected and connected areas is developed. The state of threatened habitats is improved.**

   Connected habitats are a basic prerequisite for ensuring that biodiversity is rich and has the capacity to react to change (e.g. climate change). Existing protected areas shall be extended and qualitatively improved where necessary. Connected areas should guarantee the passability of the landscape between the protected areas.

3. **By 2020, the conservation status of the populations of national priority species is improved and their extinction prevented insofar as possible. The spread of invasive alien species with the potential to cause damage is contained.**

   Individual species or groups of species cannot be promoted sufficiently through habitat protection alone and require additional specific measures in future to guarantee their survival. Invasive alien species with the potential to cause damage pose a threat to native species; hence their spread should be prevented.

4. **By 2020, genetic impoverishment is decelerated and, if possible, halted. The conservation and sustainable use of genetic resources, including that of livestock and crops, is ensured.**

   A high level of genetic diversity enables species to adapt better to altered environmental conditions. It is the basis for the survival of species and maintenance of ecosystem services. It is also a source for research and industry, and for agriculture and forestry.

5. **By 2020, the negative impacts of existing financial incentives on biodiversity are identified and avoided, if possible. Where appropriate, new positive incentives are created.**

   Today's tax and funding system involves some incentives that have a negative impact on biodiversity. Existing incentives must be examined, therefore, and possible improvements developed. The action fields involved here are no longer located solely at national level but also at cantonal and international levels.

6. **By 2020, ecosystem services are recorded quantitatively. This enables their consideration in the measurement of welfare as complementary indicators to gross domestic product and in regulatory impact assessments.**

   An intact environment is crucial to the welfare of a country. Gross domestic product (GDP), the standard measure of growth incorporates neither the services provided by ecosystems nor the corresponding economic value of biodiversity. To conserve and promote biodiversity, the creation of a comprehensive welfare measurement system that incorporates the natural capital is important, however, as this is the only way that the overall performance for the economy and society can be correctly portrayed.

7. **By 2020, sufficient knowledge about biodiversity is available to society and provides the basis for the universal understanding of biodiversity as a central pillar of life, and for its consideration in relevant decision-making processes.**

   Decision makers in the areas of politics, the economy and society influence biodiversity directly or indirectly through their actions. In-depth knowledge about species and ecosystems and their services and an understanding of how personal and political decisions influence biodiversity enable the apprehension of responsibility for the

conservation of biodiversity. The necessary knowledge must be made accessible in a comprehensible way for the administration, politics and the public.

8. **By 2020, biodiversity in settlement areas is promoted so that settlement areas contribute to the connection of habitats, settlement-specific species are conserved and the population is able to experience nature in the residential environment and in local recreational areas.**

   The potential offered by spatial planning in relation to ecological connection and the creation or conservation of open and green spaces in settlements is not yet fully exploited by current policy implementation. As part of the revision of the spatial planning legislation, the requirements of the spatial planning instruments for cantons and communes in the area of nature and landscape shall be described in greater detail

9. **By 2020, Switzerland's commitment to the conservation of global biodiversity at international level is strengthened.**

   Biodiversity exceeds the borders of countries; ecosystems depend on each other globally and have a mutually stabilising effect. To guarantee the ecosystems and the services they provide, it is essential to engage at global level in efforts to conserve and promote biodiversity.

10. **By 2020, the monitoring of changes in ecosystems and in species and genetic diversity is ensured.**

    The reliable observation of changes in biodiversity in Switzerland must be made possible. The biodiversity monitoring that already exists today provides a basis for further developments. It must be ensured that the implementation of the strategy can be monitored in terms of its effectiveness. This means that measures can be adapted in the course of their implementation.

General conditions for the implementation of the strategy

An action plan shall be developed for the implementation of the Swiss Biodiversity Strategy which will describe the attainment of the strategic goals in concrete detail. This action plan shall contain a series of measures specifically tailored to the individual areas of implementation and/or different actors and economic sectors. The action plan shall also clarify whether and when particular legislative amendments are required at federal level to enable the implementation of the strategy. The action plan shall be developed in cooperation with the partners who are affected by the proposed measures. The action plan shall be available 24 months after the adoption of the strategy by the Federal Council, at the latest. The preparatory work necessary for the action plan, which is possible within the framework of the current legislation, shall be initiated as soon as possible.

The implementation of the strategy will necessitate the provision of additional financial and human resources. The definitive requirement can only be determined on the basis of the action plan to be developed.

For the assessment of the Swiss Biodiversity Strategy and its implementation, it is planned to produce an interim report by 2017 and an overall evaluation after 2020 regarding the effect and implementation efficiency of the strategy.

1 Introduction

1.1 Background

Biodiversity as the basis of life

Biodiversity is an indispensable basis for life on earth. The diversity of ecosystems, species and genes provides, among other things, clean water and pure air. In addition, biodiversity supplies us with natural resources. A deterioration in the state of biodiversity poses a threat to these services. Current knowledge highlights the fact that we must tackle the challenge posed by a deterioration in the state of biodiversity today. The rate of species extinction caused by human activities currently exceeds the natural rate by a factor of 100 to 1000.[1, 2] Approximately 75 % of the genetic diversity of agricultural crops has been lost since the beginning of the 20th century.[3]

Convention on Biological Diversity

The international community of states has realised that the loss of biodiversity must be counteracted. Hence, in 1992, Switzerland signed the Convention on Biological Diversity, CBD,[4] (Biodiversity Convention), which entered into force in 1995[5] and now has 193 contracting parties. The objectives of this Convention are the global conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising from the use of genetic resources.[6] In order to implement these biodiversity objectives, the parties to the Convention have undertaken to prepare national biodiversity strategies.[7,8]

In 2002, the parties to the Biodiversity Convention agreed on the goal of halting the loss of biodiversity significantly at global, national and regional levels.[9] On the occasion of the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity in Nagoya (Japan) in October, it had to be ascertained, however, that none of the parties had succeeded in attaining this objective. Hence, a new strategic plan[10] was adopted for the period 2011-2020 (see Chapter 3.4).

Status of biodiversity in Switzerland

With regard to Switzerland, the OECD Environmental Performance Reviews: Switzerland (2007),[11] the Environment Switzerland 2007[12] report and Switzerland's Fourth

1 Mace G. et al. 2005: Biodiversity. In: Ecosystems and Human Wellbeing: Current State and Trends (Eds. Hassan H., Scholes R., Ash, N.). Washington DC: Island Press, Chapter 4, p. 79–115

2 Bergamin F. 2011: Kontroverse um das Artensterben. Wissenschaftler bezeichnen Voraussagen von Aussterberaten als zu hoch. In: NZZ Online, available at www.nzz.ch/nachrichten/hintergrund/wissenschaft/kontroverse_um_das_artensterben_1.10693163.html [Status on 25.05.2011]

3 Message from Ahmed Djoghlaf, Executive Secretary, Convention on Biological Diversity on the Occasion of World Food Day, October 16, 2009 – Achieving Food Security in Times of Crisis

4 173 contracting parties currently have national biodiversity strategies and corresponding action plans. www.cbd.int

5 SR 0.451.43

6 The Federal Council adopts the internationally widely accepted definition of sustainable development, which was developed by the World Commission on Environment and Development in 1987 with a view to the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, and is known as the "Brundtland definition", after the chairman of the commission responsible for its formulation. According to this definition, development is sustainable when it guarantees that the needs of the present generation are met without compromising the ability of future generations to meet their own needs.

7 Article 6a of the Convention on Biodiversity

8 EU Biodiversity Strategy to 2020 (03.05.2011). http://ec.europa.eu/environment/nature/biodiversity/comm²006/2020.htm

9 Sixth Conference of the Parties to the Convention on Biological Diversity, April 2002, COP Decision VI/26, B. Mission, Art. 11

10 Tenth Conference of the Parties to the Convention on Biological Diversity, October 2010, COP 10 Decision X/2, Strategic Plan for Biodiversity 2011–2020

11 OECD Environmental Performance Reviews. http://www.oecd-ilibrary.org/environment/oecd-environmental-performance-reviews-switzerland-2007_9789264030541-en

12 Published by the FOEN and FSO (2007, 2009, 2011): Environment Switzerland. http://www.bafu.admin.ch/publikationen/00027/index.html?lang=en

National Report under the Convention on Biological Diversity[13] give a negative assessment of the status of biodiversity in Switzerland. Moreover, in a comprehensive analysis carried out in 2010, Swiss biodiversity scientists reach the conclusion that the lowest point in the process of decline has not yet been reached.[14]

1.2 Parliamentary mandate

Political mandate

The Swiss parliament responded to the loss of biodiversity and the associated international developments on 18 September 2008 by including the development of a Swiss Biodiversity Strategy in the legislature planning for 2007-2011. With the Federal Council decision of 1 July 2009, the Federal Department of the Environment, Transport, Energy and Communication (DETEC) was mandated to develop a Swiss Biodiversity Strategy with the following cornerstones:

Cornerstones and sub-objectives

- Biodiversity is rich and capable of reacting to change.
- Biodiversity and its ecosystem services are conserved in the long term.

As a precondition to the achievement of this, the following four sub-objectives are planned:

- Protected and priority areas for biodiversity are designated and subject to a binding guarantee.
- The use of resources is sustainable.
- Biodiversity is understood by society as a central basis of life and ecosystem services are promoted and given greater consideration in the context of the economy.
- Greater attention is paid to Switzerland's responsibility for global biodiversity.

The Swiss Biodiversity Strategy is a component of the Federal Council's Sustainable Development Strategy.

1.3 Process

This strategy is the result of the implementation of the aforementioned parliamentary mandate. It is the product of intensive engagement with the topic, both within the federal administration and in cooperation with experts from the cantons, the private sector, and science and research. Representatives of the relevant interest groups were also invited to provide expert support.

The strategy builds on the Swiss tradition of a close relationship with nature and the achievements of recent years. It also takes into account the fact that biodiversity is dynamic and that evolution always involves change. However, it also takes into consideration that, once lost, biodiversity (e.g. the extinction of a species) is gone forever. Attention is focused on the fact that humans are influencing the process of change on earth today more than ever before (climate change, emissions, pollutant inputs etc.). The responsibility of society and its (public and private) actors for the conservation of biodiversity goes hand in hand with this influence.

[13] FOEN (publisher) 2010: Implementing the Biodiversity Convention. Abriged Version of Switzerland's Fourth National Report, Bern

[14] Lachat T. et al. 2010: Wandel der Biodiversität in der Schweiz seit 1900. Ist die Talsohle erreicht? Zürich Bristol Stiftung; Bern, Stuttgart, Wien: Haupt

1.4 Interfaces and balancing of interests

Biodiversity is found everywhere on earth where living nature exists. As a result, the Swiss Biodiversity Strategy must engage with wide-ranging thematic and organisational interfaces. The most important interfaces are identified in Chapter 6 (previous promotion of biodiversity in relevant areas) and in the description of the action fields for the strategic goals (Chapter 7). Moreover, this strategy should be seen as being integrated into an extensive network of other federal strategies and programmes (Annex A4).

Balancing values, interests and objectives

Where interfaces exist, questions often arise regarding potential conflicts of values, interest and objectives, but also regarding possible synergies. This strategy addresses these issues insofar as they are already visible and can be demarcated at strategic level. It may be expected that a large number of the potential conflicts and synergies will only emerge in the context of the concrete implementation measures. Hence, eventual conflicts of values, interest and objectives must be analysed and balanced against each other in the context of the implementation of the strategy. Moreover, by no means does every potential conflict become manifest at either strategic level or during concrete implementation. Clearly defined interfaces and well illuminated conflict areas can contribute to the finding of new solutions. In particular, interests, objectives and values must be identified in areas that are interconnected and dependent on each other in the long term.

A purely technical approach is not always expedient. In the case of fundamental topics (e.g. food supply, energy supply, long-term conservation of ecosystems), it will be necessary to identify at political level the balances that must be struck in the short and long term.

2 Concept and Meaning of Biodiversity

2.1 The concept of biodiversity

Switzerland follows the definition of biodiversity that was adopted at the United Nations Conference on the Environment and Development of 1992 in the context of the Biodiversity Convention.[15] Biodiversity relates to all aspects of the diversity of the living world and includes the following levels and their interaction:

- ecosystem diversity;
- species diversity;
- genetic diversity.

Ecosystem diversity

Ecosystems are communities of plants, animals and microorganisms which interact with each other as a functional unit and with their non-living environment. A distinction is made between terrestrial ecosystems (e.g. steppes, mixed deciduous forests) and aquatic ecosystems (e.g. watercourses). Ecosystems are fundamentally open systems; they require an energy flow for their conservation. Moreover, they are dynamic; the structures do not persist in a particular state but change over the course of time and through their interaction with other systems. In addition, due to the large number of interactions involved here, ecosystems usually display a high degree of complexity.

Species diversity

The diversity of species (the widely varying types of animals, plants, fungi, bacteria) is the level of biodiversity most familiar to the majority of people. For example, even at a cursory glance, it is possible to identify different species of grasses and weeds, butterflies, grasshoppers, bees and beetles in a typical meadow. Today, around 1.8 million species are known to science, a quarter of which live in the soil. However, the number of as yet undescribed species is estimated to be higher. Around 46,000 species are known in Switzerland, however it is believed that the country could be home to around 70,000 species of plants, animals, and fungi.[16]

Genetic diversity

Another level of biodiversity describes the genetic differences that exist between species. Genetic differences arise, for example, in populations of a plant species that have adapted to local conditions and between different varieties of cherry. In the case of crops and livestock, based on the production area and area of application, humans deliberately foster certain characteristics through breeding, and have created enormous genetic diversity as a result. Genetic diversity is an important component of biodiversity as it is the basis for the adaptability of species to new environmental conditions which arise constantly, for example, in association with climate change. Species with a low level of genetic diversity face a greater risk of extinction.

Insufficient awareness of biodiversity

Although the concept of biodiversity has become more familiar since the International Year of Biodiversity (2010), it is still relatively unknown, however. It should also be noted that the knowledge about the status of biodiversity in both the area of society and the economy is insufficient. Equally underdeveloped is the awareness that decision-makers from business and politics, citizens and consumers often influence biodiversity directly and indirectly through their actions on a daily basis.[17]

[15] Convention on Biological Diversity, Article 2. www.cbd.int/convention/articles.shtml?a=cbd-02
[16] Duelli P. 2004: Wie viele Arten leben in der Schweiz? Infoblatt Forsch.bereich Landsch. 61: p. 4
[17] gfs.bern 2010: Studie Wahrnehmung und Einstellung zur Biodiversität. Schlussbericht

2.2 Measurability

Indicators

Due to its complexity, biodiversity is very difficult to measure directly. The Biodiversity Convention and other actors use indicators to describe the status and development of biodiversity. A distinction can be made between the following types of indicators:

- qualitative indicators: e.g. status of ecosystems;
- quantitative indicators: e.g. number of species;
- direct indicators: e. g. species diversity within a group (e. g. mosses, breeding birds, locusts) or several groups:
- indirect indicators: e.g. total area of all nature conservation areas.

The three levels of biodiversity (ecosystems, species, genetic diversity) are examined. The measurands at ecosystem level include, for example, the diversity and range of the different habitat types, which may be natural, near-natural or strongly influenced by humans. The composition of species found in a particular site is another important measure of biodiversity. Laboratory methods are usually required for the measurement of genetic diversity. The consideration of a single level of biodiversity is usually insufficient; changes can often only be observed through a combination of indirect indicators.

Swiss Biodiversity Monitoring

Switzerland has different specific monitoring systems for species, species groups and biotopes. It has also developed a Swiss Biodiversity Monitoring (BDM-CH) system which provides information about the changes in biodiversity in Switzerland over extended periods of time. Switzerland was one of the first countries to present and implement a set of indicators for ecosystem services.[18] However, indicators are still lacking on the level of the genetic diversity of wild species. Moreover, rare species, in particular, are inadequately recorded.[19]

The future assessment of the development of biodiversity shall be correlated with the coming into force of the Ordinance on the Protection of Nature and Cultural Heritage (NCHO)[20] of 16 January 1991. Swiss policy on the protection of biodiversity became active at this point. The aim then was to maintain the status of biodiversity that existed at the time; this has not been achieved.

2.3 The importance of biodiversity for society

Value of biodiversity

The understanding of the importance of biodiversity is strongly shaped by societal values. Although these change with time, in terms of biodiversity, the issues of respect for nature, the use of the resources provided by biodiversity and the use of its ecosystem services constantly arise. The conservation and promotion of biodiversity is viewed as important in society for both ethical and economic reasons.

Ethical aspects of biodiversity

With regard to the ethical aspects, three reasons as to why biodiversity must be conserved in the long term are viewed as important. First, biodiversity is attributed with an intrinsic value. Intrinsic value means that biodiversity as such – that is independent of the benefit it has for humans – has a value that obliges us to take care of it. Second, biodiversity is viewed as a necessary condition for the guaranteeing of individual moral

[18] Staub C. et al. 2011: Indikatoren für Ökosystemleistungen. Systematik, Methodik und Umsetzungsempfehlungen für eine wohlfahrtsbezogene Umweltberichterstattung. Bern: Bundesamt für Umwelt. Umwelt-Wissen Nr. 1102

[19] Biodiversity Monitoring Switzerland. http://www.biodiversitymonitoring.ch/en/home.html

[20] Ordinance of 16 January 1991 on the Protection of Nature and Cultural Heritage (NCHO), SR 451.1

rights to certain natural resources and must be conserved for this reason. These rights include, for example, the right to clean air and clean drinking water. These rights can only be guaranteed if the necessary associated ecosystem services are safeguarded. Third, biodiversity can contribute to human well-being and, therefore, to a good quality of life. The different possibilities for experiencing nature come to mind here. For example, the natural diversity experienced by many people as beautiful and the experience of nature as homeland are assessed as something that can improve the quality of life.

Economic importance of biologically versatile ecosystems

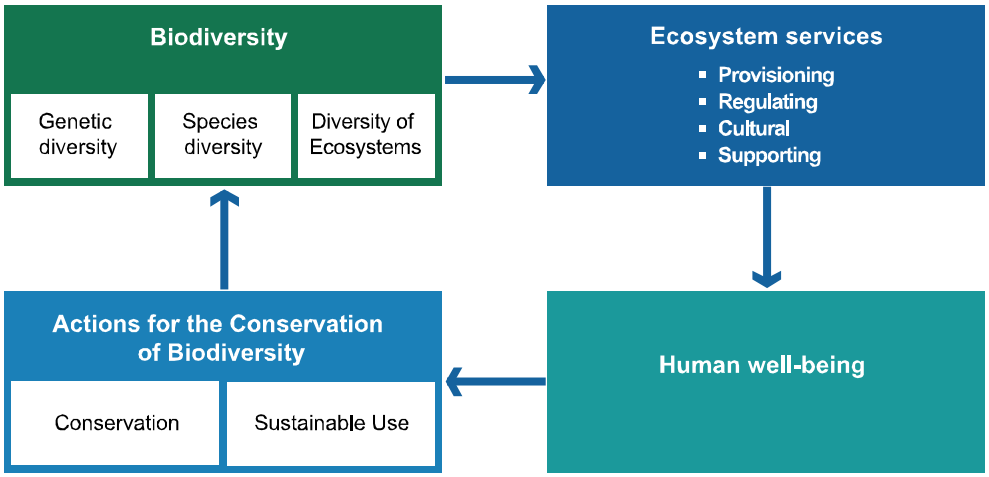
In addition to an ethical approach, for some time now, a more economically moulded attitude to the societal value of biodiversity has become established. This views biologically versatile ecosystems as an important economic resource for humans. There is also an increasing awareness of the fact that the ecosystems provide free services such as the purification of air and water, the provision of soil fertility and the pollination of crops and wild plants. The services provided by biodiversity are vital and, based on the knowledge currently available, they cannot be replaced artificially even if, thanks to new technologies, they can be substituted in part.

According to the international classification system proposed by the Millennium Ecosystem Assessment,[21] a distinction may be made between the following ecosystem services (Fig.1):

- supply services: food, wood, fibres, genetic resources;
- regulating services: climate regulation, protection against natural hazards and disease, maintenance of water and air quality, waste disposal;
- cultural services: recreation and leisure, aesthetic pleasure, spiritual fulfilment;
- supporting services: soil formation, maintenance of nutrient cycles.

Fig.1 Biodiversity and its conservation

Biodiversity is the basis of the ecosystem services that are essential for human well-being. Humans implement measures to conserve and promote biodiversity in order to preserve the ecosystem services.



Source: Corporate Biodiversity Management Handbook. A guide for practical implementation. Federal Ministry for the Environment, Nature Conservation and Reactor Safety. Berlin, June 2010

[21] Millennium Ecosystem Assessment 2005: Ecosystems and Human Well-being: Synthesis. Washington DC: Island Press, S. 39ff. http://de.wikipedia.org/wiki/Millennium_Ecosystem_Assessment

Value components of biodiversity

Rich biodiversity is fundamental to the provision of these services. They generate direct benefits as production factors or consumer goods and indirect benefits in the form of protection and regulating services. In addition to these direct and indirect functional values of ecosystem services, biodiversity also presents an option value (possible future benefit), a bequest value (benefit through conservation for future generations) and an existence value (benefit purely based on the knowledge that intact ecosystems exist, for example, or certain species like the ibex) (Tab. 1). [22]

Tab. 1 Value components of biodiversity

Overview of the different value components of biodiversity
(Total economic value of environmental goods as applied to biodiversity and ecosystem services).

Use Values			Non-Use Values	
Direct Use Value	Indirect Use Value	Options Value	Bequest Value	Existence Value
e. g. Parks and forests that provide recreational services, values for agriculture, fishery, genetic resources	e. g. Regulation of water quality and quantity, Nutrient production in the soil	e. g. Future visits to forests, future availability of genetic resources	e. g. Conservation of natural habitats for future generations	e. g. Existence value for the species diversity in the world's oceans and for less visible species

Source: Markandya, A. et al. (2008): The Economics of Ecosystems and Biodiversity – Phase 1 (Scoping) Economic Analysis and Synthesis. Italy

Existing approaches for the economic evaluation of biological diversity and ecosystem services are presented in the TEEB studies [23] (The Economics of Ecosystems and Biodiversity). [24]

Use of biodiversity

Most of the societal and economic value produced by biodiversity is available today as a free good. The lack of a price for these goods contributes to the fact that there are currently few incentives for the conservation and promotion of biodiversity and its ecosystem services. This promotes the over-use and degradation of biodiversity. Those who degrade biodiversity often do not have to cover the associated costs. At the same time, due to the inadequate sharing of the benefits arising from the use of biodiversity, the resources required for its conservation and promotion are lacking. It will be necessary to ensure in future that these effects can be counteracted.

[22] The value components presented here correspond to the concept of total economic value (TEV), an approach widely used in environmental economics.
[23] TEEB (The Economics of Ecosystems and Biodiversity). www.teebweb.org
[24] According to TEEB, for example, the earth's approximately 100,000 protected areas provide humans with ecosystem services with a monetary value of between USD 4.4 and 5.2 billion per year.

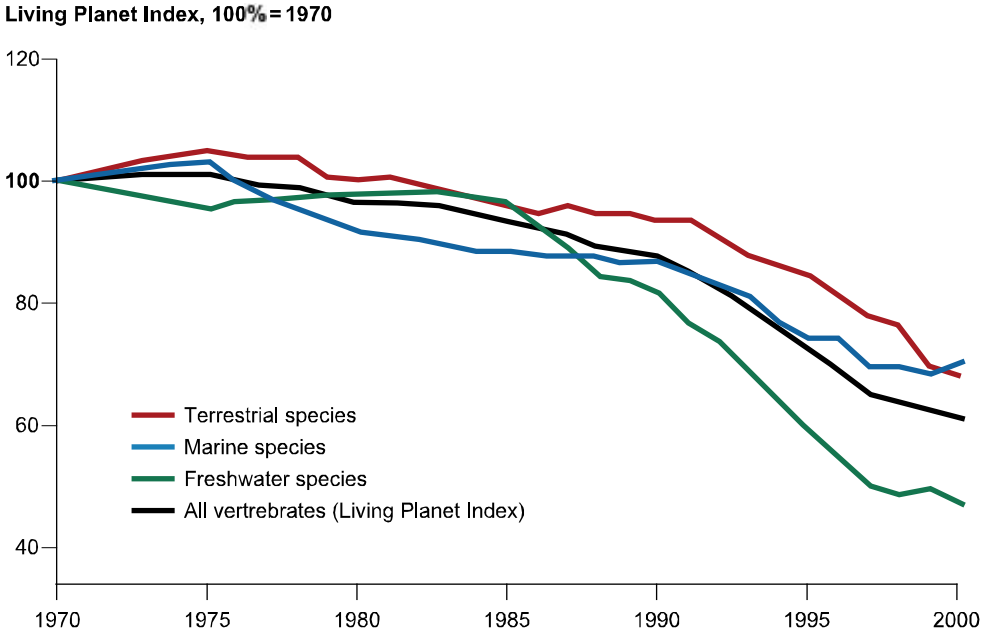
3 Biodiversity in the International Context

3.1 The global status of biodiversity

Generally speaking, humanity has consumed more natural resources since the mid-1980s than the earth has been able to regenerate.[25] This has consequences for biodiversity. The increasing loss of biodiversity has been observed in all ecosystems around the world (Fig. 2).[26] The Millennium Ecosystem Assessment assumes that up to 60% of the ecosystems studied have already deteriorated.[27] Future scenarios show that climate change and the growth of the world's population, in particular, will put additional pressure on global biodiversity.

Fig. 2 Living Planet Index, 1970–2000

The Living Planet Index is an indicator of the status of global biodiversity that has measured trends in vertebrate populations in freshwater and marine species since 1970. It is based on data from 1,145 vertebrate species (555 terrestrial species, 323 freshwater species and 267 marine species). The Living Planet Index fell by a total of 40% between 1970 and 2000, the terrestrial species index by 30%, the freshwater species index by 50% and the marine species index by 30%.



Source: WWF, UNEP-WCMC

Global action required

Biodiversity goes beyond national borders, ecosystems depend on each other around the globe and stabilise each other. In order to safeguard ecosystems and the services they provide, it is essential for the entire world to become involved in conserving and promoting biodiversity. Increasing global interconnectedness, international economic and trade activities, and nationwide use of resources all point to the fact that this task needs to be a joint undertaking by the various global actors.

[25] Hirstein A. 2008: Buchhaltung über die Natur. In: NZZ am Sonntag, 03.02.2008, p. 67–69: Mathis Wackernagel, Mathis Wackernagel, founder and President of Global Footprint Network in Oakland near San Francisco: "Since the mid-1980s we have been consuming more resources than the earth can regenerate."

[26] Secretariat of the Convention on Biological Diversity 2010: Global Biodiversity Outlook 3. Montreal

[27] Millennium Ecosystem Assessment 2005: Ecosystems and Human Well-being: Synthesis. Washington DC: Island Press, p. 39ff. http://en.wikipedia.org/wiki/Millennium_Ecosystem_Assessment

3.2 Global interdependence

Switzerland's interdependence on other countries around the world is complex. Other countries produce genetic resources that are used in Switzerland in a variety of sectors (e.g. agriculture and food industries, pharmacology and biotechnology industries, academic research).

Switzerland's influence on global biodiversity

However, Switzerland also influences global biodiversity. Since the middle of last century, resource consumption in Switzerland has grown considerably.[28] The environmental impacts, generated abroad by domestic consumer demand, are markedly greater than those caused directly in the country.[29] To satisfy this consumption, raw materials, semi-finished and finished products must be imported (see also Chapter 6.10). Raw materials extraction, production, use, disposal and the recycling of these goods all have direct or indirect impacts on global biodiversity.

Switzerland also influences global biodiversity by importing and exporting services[30] within the context of the international value chain, including its foreign investments. Therefore, foreign trade and development cooperation must be environmentally sustainable and biodiversity-friendly in accordance with the principle of sustainability. The criteria that apply to Swiss companies and their activities can have a significant effect on global biodiversity. In the context of economic development cooperation, Switzerland has programmes that promote, among other things, sustainable trade and investment in biodiversity products and services,[31] the implementation of ABS[32] in partner countries, the protection of tropical rainforests and the establishment of sustainability labels in the international commodity trade.

3.3 International agreements

The Convention on Biodiversity defines political and strategic principles

At international level, various conventions and institutions deal with the protection and sustainable use of biodiversity. The Convention on Biological Diversity (CBD)[33] was adopted as the central convention at the Earth Summit in Rio de Janeiro in 1992 and ratified by Switzerland in 1994. It came into force in 1995. The CBD is not a convention that strictly concerns environmental conservation because it also discusses sustainable use and equitable benefit-sharing, not to mention the economic potential of natural resources, as essential aspects of biodiversity conservation. Fair and equitable benefit-sharing arising from the use of genetic resources became a reality in 2010 with the adoption of the Nagoya Protocol on Access and Benefit-Sharing (ABS).[34] The provisions of the CBD relating to the international transport of living genetically modified organisms are expanded by the Cartagena Protocol[35] and the Supplementary Protocol on Liability. While focused on biodiversity, the CBD also deals with international trade, incentive measures, tourism, technology transfer, traditional knowledge and the issues of responsibility and liability. With its universal validity, the CBD now repre-

[28] FSO 2008: Monitoring Sustainable Development. Switzerland in a Globalised World. Online at http://www.bfs.admin.ch/bfs/portal/en/index/themen/21/22/publ.html?publicationID=3444 [Status: 29.07.2011]

[29] Jungbluth N. et al. 2011: Environmental Impacts of Swiss Consumption and Production. Environmentally extended input-output-analysis. ESU-services GmbH, Rütter+Partner, commissioned by the Federal Office for the Environment (FOEN). Bern

[30] For example, consulting, technology transfer

[31] Through the sustainable management of biodiversity resources (food; ingredients for pharmaceutics and cosmetics; ornamental flowers, etc.) or services (eco-tourism) based on BioTrade Principles, trade can make a concrete contribution to the conservation of healthy biodiversity.

[32] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity. www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf

[33] Convention of 5 June 1992 on Biological Diversity (CBD; SR 0.451.43)

[34] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity. www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf

[35] Cartagena Protocol. http://bch.cbd.int/protocol/text

sents a global forum of states in which the political and strategic principles of international biodiversity policy are being defined.

Numerous regional and international agreements

In addition, a multilateral system has developed a result of the various international and regional agreements, which Switzerland has ratified. While a few agreements are merely limited to biodiversity (CITES,[36] Ramsar Convention on Wetlands,[37] Bonn Convention,[38] Bern Convention[39]), other multilateral agreements are concerned with some of its minor aspects (UNFCCC,[40] UNCCD[41]). Various agreements and organisations deal with the sectoral policies that are important for biodiversity, such as agriculture (FAO[42,43]), forestry (UNFF[44] and ITTO[45]), intellectual property (WIPO[46]), tourism (UNWTO[47]) and international trade (WTO[48]). Switzerland actively contributes to the advancement of multilateral agreements that deal with biodiversity issues and participating in the projects of international non-governmental organisations in the area of biodiversity such as the International Union for Conversation of Nature (IUCN[49]) and Wetlands International,[50] of which it is a member state. It actively promotes the synergy process of the conventions and the activities of the Global Environment Facility (GEF[51], the financing mechanism of the CBD) and other financing mechanisms and development programmes (e.g. World Bank[52], UNDP[53], REDD+[54], FAO[55] etc.).

Within Europe, Switzerland is involved in the Council of Europe and its contractual relations with the EU.[56] It supports European initiatives[57] and processes (PEBLDS[58] and Forest Europe[59]).

Common elements of all of the agreements

By analysing the conventions, the Conferences of the Parties and multilateral and bilateral cooperation, it is possible to identify common elements that have taken root in the international context. These essentially involve the following main ideas and principles (see Glossary): precautionary principle, polluter-pays principle, sustainable use, addressing the causes, user-pays principle, environmental policy integration principle and Access and Benefit-Sharing.

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[36] Convention of 3 March 1973 on International Trade in Endangered Species of Wild Fauna and Flora (CITES; SR 0.453)
[37] Convention of 2 February 1971 on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention; SR 0.451.45)
[38] Convention of 23 June 1979 on the Conservation of Migratory Species of Wild Animals (Bonn Convention; SR 0.451.46)
[39] Convention of 19 September 1979 on the Conservation of European Wildlife and Natural Habitats (Bern Convention; SR 0.455)
[40] United Nations Framework Convention of 9 May 1992 on Climate Change (UNFCCC; SR 0.814.01)
[41] United Nations Convention to Combat Desertification (UNCCD)
[42] Food and Agriculture Organization (FAO) of the United Nations
[43] For example, the International Treaty on Plant Genetic Resources for Food and Agriculture
[44] United Nations Forum on Forests (UNFF)
[45] International Tropical Timber Organization (ITTO)
[46] World Intellectual Property Organization (WIPO) of the United Nations
[47] United Nations World Tourism Organization (UNWTO)
[48] World Trade Organization (WTO)
[49] International Union for Conservation of Nature (IUCN)
[50] A globally active not-for-profit organisation that works to conserve and restore wetlands
[51] Global Environmental Facility *http://www.bafu.admin.ch/dokumentation/umwelt/09249/09375/index.html?lang=en*
[52] World Bank www.worldbank.org
[53] United Nations Development Programme (UNDP)
[54] The Reducing Emissions from Deforestation and Forest Degradation programme. In return, incentives (i.e. payments) are offered.
[55] Food and Agriculture Organization (FAO) of the United Nations
[56] For example, it is involved in their activities within the European Environment Agency (EEA) and the European Network of Heads of Nature Conservation Agencies (ENCA) and as part of its membership of UNECE. In fact, the EEA published a dense synthesis report on the state and outlook of the environment in Europe in 2010.
[57] EU Green Infrastructure, ECONNECT and the Ecological Network of the Alpine Convention, the ALPARC Network, Ramsar sites, Natura 2000, the Emerald Network including Important Bird Areas (IBA)
[58] Pan-European Biological and Landscape Diversity Strategy (PEBLDS)
[59] Ministerial Conference on the Protection of Forests in Europe (Forest Europe). www.foresteurope.org

3.4 Strategic Plan for biodiversity

Together with other member states of the CBD, in 2012 Switzerland adopted the goal "of achieving by 2010 a significant reduction in the rate of biodiversity loss at the global, regional and national level".[60] At the Tenth Meeting of the Conference of the Parties to the Convention on Biodiversity in October 2010 in Nagoya, Japan, it was determined that none of the countries had succeeded in reaching this goal. It was pointed out that the individual countries were unable to take concrete steps because the objectives were too abstractly formulated.[61]

Strategic Plan to 2020

As a result, efforts were made in Nagoya to draw up globally applicable, clearer and more comprehensible objectives for the period after 2010 that would encourage the states to take action. A Strategic Plan was adopted that consists of a vision, a mission, long-term objectives and 20 goals to be achieved by 2020. In accordance with the decision of the Ministerial Conference in 2010 in Bogis-Bossey, Switzerland, the Strategic Plan became the standard for all national and international biodiversity-related conventions. Accordingly, the Strategic Plan should serve as an overarching framework for promoting the implementation of the goals at national and regional levels.[62]

Long-term goals of the strategic plan

The Strategic Plan pursues the following long-term strategic goals:

- Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
- Reduce the pressures (the direct impacts/negative influences) on biodiversity and promote sustainable use
- Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
- Enhance the benefits to all from biodiversity and ecosystem services;
- Enhance implementation through participatory planning, knowledge management and capacity building.

Aichi Biodiversity Targets – concrete goals for Switzerland too

All of the abovementioned long-term strategic goals are individually assigned to concrete goals to be achieved by the parties to the convention by 2020. The Biodiversity Convention labelled these goals as a package as the "Aichi Biodiversity Targets" (Nagoya is located in the Aichi prefecture). In those areas that concern Switzerland, the Aichi Biodiversity Targets must be taken into account in the formulation of Switzerland's strategic goals and adapted to our country's specific characteristics. The strategic plan was given concrete form at EU level with the publication of the EU Biodiversity Strategy to 2020[63] on 3 May 2011 by the EU Commission. Member States endorsed it on 21 June 2011 and issued recommendations for its implementation on 19 December 2011.[64] The European Parliament announced the strategy in the first semester of 2012.

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[60] 6th Conference of the Parties, Convention on Biodiversity, April 2002, COP Decision VI/26, B. Mission, Art. 11

[61] Botschaft von Japan: Die Ergebnisse der COP10 des Übereinkommens über die biologische Vielfalt. www.de.emb-japan.go.jp/naj/NaJ1101/cop10.html

[62] Strategischer Plan (Strategic Plan for Biodiversity 2011–2010 and the Aichi Targets). www.cbd.int/doc/strategic-plan/2011–2020/Aichi-Targets-EN.pdf

[63] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Our life insurance, our natural capital: an EU Biodiversity strategy to 2020, Brussels, 3.5.2011. Adopted by the Council on 21 June 2011.

[64] "EU biodiversity strategy to 2020", Council Conclusions of 21 June 2011, http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/envir/122950.pdf
"EU biodiversity strategy to 2020 – towards implementation", Council conclusions of 19 December 2011, http://consilium.europa.eu/media/1379139/st18862.en11.pdf
See also the public brochure on the EU biodiversity strategy

4 The Status of Biodiversity in Switzerland

Biodiversity in Switzerland is shaped by its topography, which has huge variations in elevation, geological diversity, heterogeneous rainfall distribution, and a longstanding tradition of agricultural land and forest management.

Soil – a scarce resource

The mostly terrestrial ecosystem processes that sustain life on earth (soil fertility, nutrient and greenhouse gas cycles, pollutant degradation etc.) are based on the interaction between soil biological and photosynthetic processes. Soil life plays a central role in these processes. Natural soil is the basis of biodiversity. Soil is a scarce, non-renewable resource. Quantitative soil loss, sealing, compacting, eutrophication, pollution and loss of organic matter[65] are major problems that lead to the decline in biodiversity in and above the soil in Switzerland.

Biodiversity in Switzerland has suffered huge losses since 1900. The habitats of many once plentiful species have shrunk, and population sizes have fallen; numerous native species now exist merely in a few decimated stocks. Habitats such as alluvial zones, mires and dry meadows and pastures, near-natural springs and watercourses have lost much of their area. In the last 20 years, the decline in the populations of several species and quantitative area losses of specific habitats have been stalled but not halted. Furthermore, the ecological quality of most habitats is poor and continues to deteriorate. The expansion of settlements and transport infrastructure, the increase in tourism and recreational activities in previously undisturbed regions, the development of renewable energies, the increasingly intensive agricultural use of the most desirable areas in mountain regions,[66] the direct and indirect effects of climate change, and the introduction of invasive species are likely increase the pressure on biodiversity in the future. This means that an upward trend is inconceivable under the current conditions.[67]

4.1 Ecosystems and habitats

Diverse habitats

Biodiversity needs space. It is everywhere – from mountainous, forest and agricultural areas to settlement areas, and even along infrastructure systems such as railways.[68] In the last millennia, a wide range of habitats and ecosystems with typical species evolved in the area of modern-day Switzerland. Today there are over 230 different types of habitats.[69]

Approximately two-thirds of Switzerland's territory lies in the Alps. Switzerland is particularly responsible for the high concentration of diverse habitats found in this geographical space and the species inhabiting them with their high degree of genetic diversity.[70] As a central country located in the middle of Europe, Switzerland plays an important role in connecting Alpine habitats. Important European rivers have their

[65] Bundesamt für Raumentwicklung/Bundesamt für Umwelt (Hrsg., 2007): Landschaft unter Druck. 3. Fortschreibung 1989–2003. Bern, and Lachat T. et al. 2010: Wandel der Biodiversität in der Schweiz seit 1900. Ist die Talsohle erreicht? Zürich Bristol Stiftung; Bern, Stuttgart, Vienna: Haupt

[66] Stöcklin J. et al. 2007: Landnutzung und biologische Vielfalt in den Alpen. Fakten, Perspektiven, Empfehlungen. Synthesebericht II, NFP 48. Zurich: vdf

[67] Lachat T. et al. 2010: Wandel der Biodiversität in der Schweiz seit 1900. Ist die Talsohle erreicht? Zürich Bristol Stiftung; Bern, Stuttgart, Wien: Haupt

[68] MacArthur R.H., Wilson E.O. 1967: The Theory of Island Biogeography. N.J.: Princeton University Press: Species diversity is closely linked to the size of an area. Species diversity grows in step with the area and shrinks with it too. The distance to other habitats of a similar type also affects species diversity: Extremely isolated habitats are home to fewer species than well connected habitats, and the vitality of the populations decreases.

[69] Delarze R., Gonseth Y. 2008: Lebensräume der Schweiz. Ökologie – Gefährdung – Kennarten. h.e.p. Ott Verlag

[70] Stöcklin J. et al. 2007: Landnutzung und biologische Vielfalt in den Alpen. Fakten, Perspektiven, Empfehlungen. Synthesebericht II, NFP 48. Zurich: vdf

sources in the Swiss Alps. Tourism and sports activities, as well as sports infrastructures, the use of hydropower, the abandonment of remote pastures and meadows, the intensive use of desirable Alpine areas, and climate change have caused Alpine habitats to come under increasing pressure.

Forest in the Alpine region

Switzerland's forest area has grown continuously since 1850 (from approximately 0.7 million[71] ha to 1.3 million[72] ha in 2006). Thanks to protected areas, near-natural silviculture and species conservation programmes, the proportion of threatened species in forests is lower than in other habitats. For this reason, the forest area makes a decisive contribution to the conservation of biodiversity. However, as the forest area grows, certain aspects of biodiversity can also vanish, especially in mountain regions where the abandonment of agricultural activity results in meadows and pastures becoming forests.

Wetlands, watercourses and water bodies

Wetlands such as raised bogs and fens, stagnant small bodies of water, springs, lakes and watercourses are home to a wide variety of special habitats and provide important ecosystem services, such as protection against floods, regulation of the hydrological balance and CO_2 sequestration. The expansion of this habitat has slowed considerably, especially in the densely settled areas of the Central Plateau. From 1900 to 2010, 36% of alluvial zones and 82% of mires were lost. Many small bodies of water also disappeared as a result of drainage or culvertisation. Since 1990, the loss of alluvial zones and mires has been halted to a large extent with the help of appropriate federal inventories and effective legislation. However, preserving the quality of wetland habitats remains a huge challenge. Most mires have a complex hydrology and are threatened in the long term by eutrophication, desiccation and vegetation encroachment.[73] Alluvial zones continue to lack their natural dynamic. The situation could deteriorate in the future if the precipitation pattern changes dramatically due to climate change.

The increase in settlement and agricultural areas, damming and the use of watercourses to generate energy have had a huge influence on typical aquatic habitats and the species that depend on them. Of 65,000 kilometres of rivers and streams, 14,000 kilometres are significantly degraded, entirely artificial or culverted. Control structures, insufficient water quantities and major variations in flow severely hinder the continuity of the watercourses. A change in trend occurred not too long ago in relation to watercourses: with the revised waters protection legislation, extensive revitalisation projects are being planned that should improve aquatic habitats. Due to the construction of wastewater treatment works from the 1960s, the organic contamination of watercourses has declined markedly, which is why the species diversity in some areas has been able to rebound. Today, micropollutants (e.g. substances containing active hormones, active agents in medication) in the water pose a challenge. The extent to which they influence biodiversity has not yet been sufficiently researched.

Dry habitats

Dry habitats such as meadows and pastures lost 95% of their area from 1900 to 2010. Over the last 20 years, the remaining areas lost around one fifth more of their area as a result of use intensification or the abandonment of agriculture, and housing developments.[74] Dry pastures and meadows in Switzerland definitely became significantly less species rich over the past century,[75] and the species composition in dry pastures and meadows in lower and middle-altitude areas are becoming increasingly similar or more

[71] Bisang K. 2001: Historische Entwicklung der institutionellen Regime des Waldes zwischen 1870 und 2000. Reihe "Ökologie und Gesellschaft", Band 17. IDHEAP

[72] Brändli U.B. 2010: Schweizerisches Landesforstinventar. Ergebnisse der dritten Erhebung 2004–2006. Birmensdorf, Forschungsanstalt für Wald, Schnee und Landschaft WSL. Bern, Bundesamt für Umwelt BAFU

[73] Klaus G. 2007: Zustand und Entwicklung der Moore in der Schweiz. Bern: BAFU

[74] Urech M., Eggenberg S., pro seco 2007: Inventarvergleiche. Interner Bericht. Bern: im Auftrag des Bundesamt für Umwelt

[75] Rechsteiner C. 2009: Wiesen der Schweiz – vor 120 Jahren und heute. Masterarbeit. Universität Zürich

monotone.[76] Thanks to the Ordinance on Ecological Quality[77] of 2001, as well as the inventory of dry pastures and meadows, which led to the enactment of the Dry Meadows Ordinance[78] in 2010, the loss of this habitat has been partially decelerated.

Settlement areas

Intensive uses in settlement areas have led to habitat fragmentation, sealing, compaction of soils and to air and water pollution, and thus greatly affect biodiversity. However, urban conditions also accommodate diverse habitats that often serve as a refuge for species that have lost their natural habitat. Biodiversity in settlement areas is important to conserve these species. Insufficient open and green spaces in settlement areas, as well as the emergence of invasive species, pose a threat to urban biodiversity.[79]

4.2 Species diversity

Threatened species diversity

Between 1900 and 1990, drastic areal losses and dwindling populations of many once common species caused around one-third of all known species in Switzerland to become threatened based on current knowledge.[80] Many native species now exist in isolated and decimated populations or only a few individuals have survived.[81] Species diversity has decreased, especially in the Central Plateau region, to such an extent that it is questionable whether the ecosystem services are secure in the long term.

Since the 1990s, the decline in the populations of a few species has slowed. A positive development has occurred in a few isolated cases. Projections until 2020, however, show that a real change in trend is not possible given the current conditions. Even if the area of valuable habitats can be stabilised at the current level, species losses are still a threat, since the populations of many rare species are very small and would barely be able to survive.

The species composition of habitats is becoming increasingly similar, as noted by Biodiversity Monitoring Switzerland with regard to pastures and meadows.[82] This is due not only to increasingly standardised management methods, among other things, but also to the nutrient input, which greatly benefits several already common species. Even the different types of habitats resemble each other more and more. For example, due to nutrient input and drainage, plants from fertile meadows are growing in mires while the number of mire specialists is decreasing.[83] Accordingly, the number of species in mires may generally rise in the short term, but the distinctiveness of these habitats and their dissimilarity to other habitats will be lost.

Invasive alien organisms

The number of intentionally and unintentionally introduced species in Switzerland has grown in conjunction with global connectivity. Most of these species disappear again after a few years or integrate inconspicuously in our ecosystems. However, a few are able to spread widely at the expense of native species and achieve such high population

[76] Biodiversity Monitoring Switzerland: Diversity of Species Communities (Z12) *www.biodiversitymonitoring.ch/en/data/indicators/z/z12.html*

[77] Ordinance of 4 April 2001 on the Regional Promotion of the Quality and Connectivity of Ecological Compensation Areas in Agriculture (Öko-Qualitätsverordnung, ÖQV), SR 910.14

[78] Ordinance of 13 January 2010 on the Protection of Dry Meadows and Pastures of National Importance (Trockenwiesenverordnung, TwwV), SR 451.37

[79] Lachat T. et al. 2010: Wandel der Biodiversität in der Schweiz seit 1900. Ist die Talsohle erreicht? Zürich Bristol Stiftung; Bern, Stuttgart, Wien: Haupt

[80] Baur B. et al. 2004: Biodiversität in der Schweiz: Zustand, Erhaltung und Perspektiven. Grundlagen für eine nationale Strategie. Bern: Forum Biodiversität Schweiz (Hrsg.) and BAFU (ed.) 2010: Implementing the Biodiversity Convention. Abriged Version of Switzerland's Fourth National Report. Federal Office for the Environment, Bern

[81] Gefährdete Arten in der Schweiz, Synthese Rote Listen, Stand 2010, Bundesamt für Umwelt BAFU, Bern, 2011

[82] Bühler C. Roth T. 2011:Spread of common species results in local-scale floristic homogenization in grassland of Switzerland. Diversity and Distributions 17 (6), 1089–1098

[83] Klaus G. 2007: Zustand und Entwicklung der Moore in der Schweiz. Ergebnisse der Erfolgskontrolle Moorschutz. Umwelt-Zustand Nr. 0730, Bundesamt für Umwelt, Bern (Red.)

densities that the biological diversity and its sustainable use can be affected as a result. These so-called invasive alien species can cause a variety of ecological damage by eliminating or hybridising native species, changing the ecological factors or the functions of native ecosystems or transferring illnesses and parasites to native species. Furthermore, health problems can be caused to humans by toxic or allergenic substances. Considerable economic losses can occur in agriculture or infrastructure, e.g. additional costs for the maintenance of rails, streets and shores. Nonetheless, such species continue to be introduced.

4.3 Genetic diversity

The survival and evolutionary opportunities of species and their populations also depend on their genetic diversity. Genetically uniform species face a higher risk of extinction since they are less able to react to the changing environmental conditions. For this reason, the depletion of genetic diversity can result in the extinction of species.

Genetic resources in Switzerland

At the same time, the decline in genetic diversity also causes a loss of important or potentially important resources for humans. In fact, domestic and foreign genetic resources serve as starting material for research and the development of new medicines and active agents, and also form the basis of all plant varieties and livestock breeds and tree species in forestry. The specific diversity of livestock and crops in the Alpine region and the many years of agricultural activity are an important source of genetic resources for Switzerland that should be conserved and sustainably used. The 39 livestock breeds, 63 potato varieties, 3,000 fruit varieties, 250 vegetable varieties, 240 feed plants, 160 aromatic and medicinal plants, and 141 vine varieties[84] are a valuable resource that contributes a great deal to the security of our food supply and are also a valuable cultural and historical asset.

However, not much is known about the genetic diversity of wild species. Isolated knowledge does exist on the genetic diversity of reintroduced species like the ibex. The progressive fragmentation of habitats is increasingly leading to the isolation and genetic depletion of populations of wild species. The study and conservation of the genetic diversity of wild species should be given special attention in the context of species conservation.

The genetic diversity in the soil is especially valuable and has not been studied a great deal up until now: more than one billion microorganisms, including bacteria, fungi, algae and single cell organisms, live in one gram of soil. And hundreds of thousands to millions of soil animals, such as worms, mites, woodlice and insect larvae, live underneath one square meter of soil. Many medicines, e.g. most antibiotics, are based on the genetic diversity of forms of life in the soil.

Genetic resources abroad

Despite the great diversity of wild species and of livestock breeds and crop varieties, a large portion of the genetic resources used in Switzerland are acquired abroad. For this reason, it is important for industry, research and agriculture that genetic resources be conserved around the world and for access to these resources to be safeguarded abroad. The fair and equitable sharing of benefits arising from the use of genetic resources creates an important basis for this.

[84] National database for the conservation and sustainable use of plant genetic resources for food and agriculture (PGRFA). www.bdn.ch

5 Previous Biodiversity Conservation

Switzerland has a long tradition of biodiversity conservation. Its beginnings date back to the second half of the 19th century. The initial focus was on habitat protection through the enactment of the Nature and Cultural Heritage Act, and landscape protection was introduced at a later stage.[85] In addition to the environmental value of habitats, this act was based on human perception and evaluation, as well as on culture, tradition, aesthetics and custom, and promoted the sustainable interplay between natural and cultural elements, e.g. through parks of national importance, mire landscapes of national importance and outstanding beauty, and the federal inventory of landscapes and natural monuments of national importance. Specific components of landscape policy, such as natural scenery, the cultural and historical value of the landscape and the design of buildings and infrastructure, go beyond the issue of biodiversity conservation.

Successful cooperation in the area of nature conservation

Nature conservation in Switzerland is a responsibility that is shared by various public institutions and private actors. The resulting joint responsibility is assumed actively and with commitment by all partners. In that respect, the major efforts of the cantons and nature conservation organisations contribute a great deal to the conservation of biodiversity. Many successes have also been achieved thanks to the extensive voluntary work by civil society actors.

If, as is the case with nature conservation, the Confederation and cantons are both entrusted with and responsible for these tasks, the Swiss Federal Constitution[86] often defines these tasks more specifically. For example, Article 78 (1) of the Federal Constitution states that the cantons are essentially responsible for the protection of nature, while Article 78 (4) states that the Confederation shall legislate on the protection of animal and plant life and on the preservation of their natural habitats and their diversity, in addition to protecting endangered species from extinction. The Confederation has full federal jurisdiction in this area, which means it can take any measure that appears necessary to achieve the goal of protecting species and habitats.

In accordance with the powers set out in the Federal Constitution, under articles 18 ff. of the Federal Act on the Protection of Nature and Cultural Heritage,[87] the Confederation, cantons and communes are required to preserve habitats and sites deserving of protection which include ecological connection elements, and to counteract, in particular, the extinction of native wildlife using appropriate measures. Spatial planning instruments are primarily used for that purpose at all levels, including the federal, cantonal and communal levels. An important condition for protecting species and habitats is sufficient funding for conservation and maintenance measures, and the Confederation concludes programme agreements with the cantons (see, in particular, articles 18d and 23c of the NCHA) to that end.

The existing joint responsibility for the protection of nature shared by the Confederation, cantons and communes also arises from the constitutional principle of sustainability, according to which the Confederation and the cantons continuously endeavour to achieve a balanced relationship between nature and its capacity to renew itself, on the one hand, and the demands placed on it by the population, on the other (art. 73 Cst.). Consequently, the basic principle of sustainability applies to the goals set out for the

[85] The Swiss Landscape Concept (Landschaftskonzept Schweiz LKS) is the binding text for the protection of nature and landscape within the federal government's responsibilities.
[86] Federal Constitution of the Swiss Confederation of 18 April 1999 (Cst.; SR 101).
[87] Federal Act of 1 July 1966 on the Protection of Nature and Cultural Heritage (NCHA; SR 451).

areas listed under articles 73 to 79 of the Federal Constitution (environment, spatial planning, water, forest, nature and cultural heritage, as well as fishing and hunting) so that the corresponding goals for the protection of habitats and their functional management are developed in accordance with the principles of precaution and sustainability. The constitutional division of powers in the area of nature conservation has proven effective and shall not be changed.

5.1 Habitat protection

Protected areas

Up to now, habitat protection in Switzerland has been marked by the long-term securing of important areas for biodiversity. Swiss game reserves[88] were the first areas to be marked with a federal perimeter[89] as part of a legal framework in 1875. At that time, roe deer, European red deer and Alpine ibex had been almost or completely wiped out due to excessive hunting. In 1914, the Swiss National Park[90] was founded. In the 1990s, specific areas were secured for species and habitats for the long term. Starting in 1991, there were waterfowl and migratory bird reserves[91] and biotopes of national importance.[92] In 1991, the Raised Bog Ordinance[93] came into force. The Alluvial Zone Ordinance[94]followed in 1992, the Fen Ordinance[95] in 1994 and the Mire Landscape Ordinance[96] in 1996. In 2001, the Federal Council enacted the Federal Inventory of Amphibian Spawning Sites of National Importance[97] as the first inventory dedicated to protecting the habitats of a zoological species group. In 2010, the Dry Meadows Ordinance[98] was passed. Today, there are numerous areas in the cantons and communes in Switzerland, such as forest reserves, which enjoy long-term protection. Other areas are often privately owned (e.g. nature conservation organisations) and are thus protected by private law.

In addition to the traditional reserves, areas that are managed to promote biodiversity with the aid of financial incentives also make an important contribution to habitat protection.

Legislative provisions for the protection of habitats

Legislative provisions that protect habitats exist in the areas of waters protection, hydraulic engineering, forestry, spatial planning, chemicals, environmental protection and agriculture. More specifically, the Swiss Forest Police Act enacted in 1876 not only secured forest areas, but also created a decisive basis for the conservation and promotion of biodiversity. The Forest Act of 1991, which is currently in force, not only seeks to protect forest areas, but is also explicitly aimed at the qualitative protection of the forest as a near-natural community. The Hydraulic Engineering Act and the Waters Protection Act (both from 1991) combine the issue of flood protection with efforts to secure the ecological functions of watercourses. With the revision of the Waters Pro-

[88] Ordinance of 30 September 1991 on Federal Game Reserves (VEJ; SR 922.31)
[89] Nationally designated areas
[90] Federal Act of 19 December 1980 on the Swiss National Park in Canton Graubünden (Nationalparkgesetz; SR 454)
[91] Ordinance of 21 January 1991 on Water Birds and Migratory Birds of International and National Importance (WZVV; SR 922.32)
[92] Article 18a of Federal Act of 1 July 1966 on the Protection of Nature and Cultural Heritage (NCHA; SR 451), inserted in 1987 as an indirect counter proposal to the Rothenthurm initiative (protection of mires)
[93] Ordinance of 21 January 1991 on the Protection of Raised Bogs and Transitional Bogs of National Importance (Hochmoorverordnung; SR 451.32)
[94] Ordinance of 28 October 1992 on the Protection of Alluvial Zones of National Importance (Auenverordnung; SR 451.31)
[95] Ordinance of 7 September 1994 on the Protection of Fens of National Importance (Auenverordnung; SR 451.33)
[96] Ordinance of 1 May 1996 on the Protection of Mire Landscapes of Special Beauty and of National Importance (Moorlandschaftsverordnung; SR 451.35)
[97] Ordinance of 15 June 2001 on the Protection of Amphibian Spawning Sites of National Importance (Amphibienlaichgebiete-Verordnung, AlgV; SR 451.34)
[98] Ordinance of 13 January 2010 on the Protection of Dry Meadows and Pastures of National Importance (TwwV; SR 451.37)

tection Act (in force since 1 January 2011), efforts to revitalise watercourses and mitigate the negative impacts of the use of hydropower will be significantly intensified in the future.

Functionality of protected areas not always ensured

However, even the establishment and long-term safeguarding of protected areas has not been enough to halt the decline in biodiversity in Switzerland up to now. Studies show that the existing areas are inadequate, often too small, not well connected and of very poor quality.[99] In most cases, habitat improvements and regeneration are required so that the areas dedicated to the conservation of biodiversity are able to fulfil their functions. Since these areas are greatly impaired by humans, natural processes often fail to unfold there. Functional areas are crucial to the safeguarding of habitats, species and connectivity.

Reasons for area and quality deficits

Area and quality deficits are partially due to the lack of enforcement of currently applicable laws. The reality is that the cantons and Confederation have insufficient means to carry out the associated enforcement duties in a satisfactory manner. A distinction must be made between the Confederation and the cantons in this regard, however. The Confederation is perceived as being a rather impeding force as the cantons have already shown their willingness to invest at least 50 %[100] more in these joint tasks, despite budget cuts. A comparison of the estimated maintenance costs of biotopes of national importance with current expenditures for protecting nature and landscapes shows that about twice as much funding than is currently available to the Confederation and cantons would be needed to protect and maintain the biotopes. In addition, one-time investments are required to improve and regenerate biotopes, which will cost CHF 1.2 billion on average.[101] Finally, the failure to comply with and implement the applicable legislation often goes unsanctioned.

Adaptation of habitats to climate change

The adaptation of habitats to climate change will represent an enormous challenge in the decades to come. On 2 March 2012, the Federal Council passed the first part of its national adaptation strategy,[102] which includes adaptations in the area of biodiversity. One important aspect of this strategy is that current and future protected and connection areas will be structured so that habitats can adapt to climate-induced changes.

National Ecological Network (REN), the vision for connected habitats across Switzerland

The Confederation demonstrated its vision for habitat connection across Switzerland with the establishment of the National Ecological Network (Réseau Ecologique National REN) project[103] in 2004. The project uses detailed maps to highlight important geographical areas for the protection of rare and threatened habitats and species and their connecting axes. In doing so, both the current situation and the potential of the landscape were taken into consideration. The results of this project indicate that more areas will have to contribute in the future in order to guarantee biodiversity and its functions. An update of the data shall provide more detailed information about the specific spatial requirements.

Action fields for habitat protection

The long-term qualitative and quantitative securing of space is necessary for the conservation of ecosystems and their services. To this end, soil sealing must be reduced

[99] Klaus G. 2007: Zustand und Entwicklung der Moore in der Schweiz. Bern: BAFU and FOEN 2010: Switzerland's Fourth National Report under the Convention on Biological Diversity. Bern

[100] This involves calculated sums based on the cantons' declared willingness to invest in the areas of nature and landscape conservation and biodiversity in forests.

[101] Ismail S. et al. 2009: Kosten eines gesetzeskonformen Schutzes der Biotope von nationaler Bedeutung. Technischer Bericht. Birmensdorf: Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL, Basel: Pro Natura, Bern: Forum Biodiversität. www.wsl.ch/dienstleistungen/publikationen/pdf/9625.pdf

[102] Anpassung an den Klimawandel in der Schweiz – Ziele, Herausforderungen und Handlungsfelder. 1.Teil der Strategie des Bundesrates vom 2. März 2012 (First part of the Federal Council's Strategy on adaptation to climate change)

[103] Réseau Ecologique National (REN). www.bafu.admin.ch/schutzgebiete-inventare/09443/index.html?lang=de

and the fragmentation of habitats avoided insofar as possible. In addition, the sustainable use of habitat types that is specifically adapted to their distinctive characteristics must be promoted in all areas (settlement areas, agricultural areas, forest, aquatic environments).

In order to ensure that species have long-term chances of survival, their habitats must be large enough, of good quality and usefully distributed throughout the national territory.[104] Therefore, the future priority areas for the continued management of habitat conservation are the following:

- Existing protected areas must be properly maintained and, where necessary, regenerated. Existing protected areas must be enlarged as required, while new protected areas shall be created and connected. In doing this, Switzerland should consider its responsibility for the representative conservation of all its various habitats. Furthermore, the adaptability of the ecosystems to climate change must be guaranteed.
- Spatial planning policy instruments must be improved because their coordination function gives them a decisive influence over spatial development and its role in biodiversity. The further development of the REN should also provide the actors in the sectors relevant to biodiversity with fundamental spatial data, on which actions for the conservation and promotion of biodiversity can be based.
- The reduction of micropollutant inputs into watercourses and water bodies from urban drainage and other diffuse sources, such as agriculture, poses a new challenge for water management. As a result of the more intensive promotion of renewable energies, watercourses – including those previously unused for this purpose – are under increasing pressure due to the growing use of hydropower. For this reason, a cross-sectoral approach should gradually replace the sectoral approach with integrated watercourse management.

5.2 Species protection

Species promotion programme

In Switzerland, species are mainly protected through habitat protection instruments. A small selection of species is also supported by the Confederation and cantons through species promotion programmes. These programmes are specially designed for species or species groups that cannot be effectively conserved through habitat protection efforts, and thus benefit from specific supplementary measures. Species promotion programmes exist for several species from various organism groups such as vertebrates, invertebrates, plants, lichens, algae and fungi. The Swiss Bird Species Promotion Programme (Artenförderung Vögel Schweiz), which incorporates several national action plans for priority species, and the Swiss Action Plan for Crayfish (Aktionsplan Flusskrebse Schweiz) and the promotion projects of various actors for priority butterfly species, amphibians, reptiles, bats and individual plants are particularly worthy of mention here. Species that have been successfully reintroduced in Switzerland include the ibex, beaver, lynx and bearded vulture.

National concepts exist for bears, lynx, wolves and beavers. These concepts prioritise population management so that damage can be limited and eliminated where necessary. In the area of watercourses, action plans also exist for fish and crayfish.

Red Lists[105] have been officially enshrined in the Nature and Cultural Heritage Act since 1991. These lists show the extent to which animal, plant and fungi species are

[104] Lawton, J.H. et al. 2010: Making Space for Nature: a review of England's wildlife sites and ecological network. Report to Defra
[105] Act of 16 January 1991 on the Protection of Nature and Cultural Heritage (NCHA; SR 451.1)

threatened. The also present possible protective measures for their conservation. The Red Lists are updated periodically.

Action fields for species protection

In the area of species promotion, approximately one quarter of the some 46,000 known native species are threatened.[106] Up to now, the priorities for species protection programmes have often been developed on the basis of the status of scientific knowledge and the financial and human resources of organisations that are active in the area of species protection. The status of knowledge on species must be expanded in the future. Moreover, overarching goals and principles are required in order to set priorities and deal with conflicts of interest. National priority species should be the focus of species conservation programmes (species that are threatened in Switzerland and for which Switzerland is particularly responsible). However, species that are common or widespread at this time should still be promoted through habitat conservation and improvement. More specifically, species settlement and resettlement and invasive alien species management need to be regulated. Finally, a comprehensive concept for conserving and restoring naturally and culturally formed species diversity is also required.

5.3 Protecting genetic diversity

Knowledge lacking on genetic diversity

The genetic diversity of wildlife species and microorganisms in Switzerland is still only rudimentarily known today. To date, few efforts have been undertaken to consider and sustainably use the genetic resources provided by wild species in Switzerland. One exception is tree species, which are studied in detail in the context of forest management and use. More is also known about the diversity of plant varieties and livestock breeds in agriculture than about their wild relatives.

In the absence of knowledge about genetic diversity, it can neither be protected nor sustainably used, which can lead to depletion and undetected losses. By conserving wildlife species and their natural ranges, the genetic diversity of these species and their potential as resources for future generations can be guaranteed in most cases. However, supplemental measures such as gene banks, reference stocks, botanical gardens etc. are required. In order to determine which species in Switzerland should be conserved, it is important to learn more about the genetic diversity of the country's plants, animals and microorganisms.

Previous efforts

Up to now the work on the conservation of genetic resources was specifically based on the relevant articles of the CBD and the Bonn ABS guidelines.[107] In the area of microorganisms, the Confederation is contributing to the development of a national gene bank for microorganisms.[108] The majority of botanical gardens in Switzerland have joined an international plant exchange network. The Swiss Academy of Sciences (SCNAT) has been conducting an awareness-raising programme concerning the use of genetic resources in academic research for several years. In addition to most natural regeneration possible of forest stands, forest genetic resources in Switzerland are conserved through the use of local reproductive material for artificial regeneration, the targeted conservation of rare tree species and the designation of forests of specific genetic interest.

[106] Cordillot F., Klaus G. 2011: Gefährdete Arten in der Schweiz. Synthese Rote Listen, Stand 2010. Umwelt-Zustand Nr. 1120: 111 p. Bundesamt für Umwelt, Bern

[107] Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of Benefits Arising Out of Their Utilization. www.abs.bfn.de/fileadmin/ABS/documents/Bonn-Guidelines_englisch-deutsch_Druckfassung.pdf

[108] Culture Collection of Switzerland (CCOS). www.ccos.ch

In the area of agriculture, the conservation and sustainable use of plant genetic resources and their related wild species is supported by the National Action Plan (NAP[109]). In addition, the International Treaty on Plant Genetic Resources for Food and Agriculture[110] came into force in 2004 and set the goal of achieving the conservation, sustainable use and fair and equitable sharing of benefits in accordance with the CBD. A concept for conserving livestock breed diversity was developed for animal genetic resources. Private initiatives, such as ProSpecieRara,[111] also make important contributions to the conservation of plant varieties and livestock breeds. Finally, Switzerland signed the Nagoya Protocol on ABS on 11 May 2011, and the Federal Council mandated the DETEC with the formulation of a ratification dispatch.

[109] National Action Plan for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture (NAP-PGREL). www.cpc-skek.ch/deutsch/nap_projekte/infos.html
[110] International Treaty on Plant Genetic Resources for Food and Agriculture, SR 0.910.6
[111] ProSpecieRara: Swiss foundation for the historic and genetic diversity of plants and animals. www.prospecierara.ch

6 Previous Biodiversity Promotion in Relevant Areas

The protection and sustainable use of biodiversity poses an immense social, economic and technical challenge. It is clear that it cannot be successfully tackled using traditional nature conservation instruments alone. Biodiversity is shaped by land use and affected by buildings, facilities and infrastructure, and diffuse pollutants; managing biodiversity depends on the current status of knowledge and available information. The sustainable use of biodiversity and the related safeguarding of ecosystem services can only be achieved if the various sectoral policies include biodiversity as a future field for action. The following sections discuss how the various areas influence biodiversity and benefit from it.

6.1 Spatial planning and settlement development

Growth and urban sprawl

In Switzerland, population and economic growth as well as new housing, recreation and mobility demands have led to the massive expansion of settlement and transport areas. Current spatial planning instruments such as sectoral, structure and land-use plans are insufficient for sustainable spatial planning. The uncontrolled development, fragmentation of landscapes and habitats, and increasing pressure on ecologically valuable areas (sealing, pollutant inputs, intensive use etc.) cannot continue. Aspects of nature and landscape conservation must be better coordinated with different land uses and their issues should be integrated (especially connectivity, habitat improvement, space requirement). Spatial planning has a particularly large responsibility in this context, which it has only assumed in part to now. As previously mentioned in the dispatches on the landscape initiatives[112] and the partial revision of the Spatial Planning Act,[113] the reasons for this are the general lack of expertise and enforcement of the limitation and control of settlement development in addition to the inadequate coordination of spatially significant activities related to biodiversity, the implementation of compensation and replacement measures that are insufficiently binding, and the inadequate consideration of biodiversity factors (in the Confederation's requirements of cantonal structure plans) in spatially relevant activities.

Swiss Spatial Concept: more space for biodiversity

One of the goals of the draft Swiss Spatial Concept (Raumkonzept Schweiz)[114] is to create space for biodiversity. Spatial planning should make a key contribution to achieving that goal. The Confederation develops the principles of spatial planning and is responsible for its coordination beyond the cantons. The main responsibility for spatial planning is borne by the cantons and communes. This is why it is so important for the Spatial Concept, which has been developed jointly by the Confederation, can-

[112] See dispatch concerning the "Raum für Mensch und Natur (Landschaftsinitiative) ("Space for People and Nature") national initiative of 20 January 2010, SR 10.018, p. 1037: "The development that has occurred since the coming into force of the SPA on 1 January 1980 shows that the applicable statutory regulation has shortcomings and fails particularly to stop the fragmentation of the landscape. The constitutional goal of economical soil use has not been achieved in recent decades as had been hoped. The reasons are manifold: The planning authorities assumed that there would be large population growth, which has led to oversized construction zones. The demand was mostly in communes and not at the regional or cantonal level, which is why a general approach was lacking. Non-planning motives, such as the restructuring of communal finances and the support of the local building industry, promoted zoning for construction. For landowners, the financial incentive of letting their land be zoned for construction is also worth considering, given the large difference in value between land in construction zones and land outside the construction zones. Non-construction zoning is much more difficult to implement politically than construction zoning and was therefore not consistently done in the past because compensation claims from landowners were feared."

[113] Dispatch concerning a partial revision of the Spatial Planning Act of 20 January 2010, SR 10.019. See also Federal Office for Spatial Development (2005), spatial development report 2005

[114] Raumkonzept Schweiz (draft). www.are.admin.ch/themen/raumplanung/00228/00274/index.html?lang=de

tons, communes and cities, to be implemented in conjunction with the stakeholders, and that priority be given to the goal concerning the space required by biodiversity.

Action fields for spatial planning

Sufficiently large, good quality and connected habitats need to be secured and also designated in settlement areas as green and open spaces. Because settlements have expanded considerably in recent decades, new measures are required for economical soil management and to promote diversity in settlement areas. Soil sealing and the qualitative degradation of soil fertility are major problems resulting from improper management and construction activity that widely disregard a multifunctional use for biodiversity. When soils are sealed or damaged, soil biological processes and the related ecosystems (food and wood production, drinking water supply etc.) cannot take place. It is also important for biodiversity and ecosystem services conservation to avoid additional sealing and the pollution of naturally grown soils as much as possible.

Biodiversity in settlements

Today, 75% of the Swiss population live in cities and urban agglomerations. Even in the cities, approximately 40% to 50% of areas are used as habitats for animals and plants, in addition to other overlapping uses. Such areas are very important for the development of nationally connecting habitats because they contribute a great deal to the quality of life in settlements, encourage the population to identify with their natural surroundings and allow recreational and leisure activities. In addition to experiences and activities in nature, they promote awareness of the environment and foster a sense of responsibility for biodiversity. Open and green spaces in settlements can also relieve other areas from increasing pressure by attracting recreation-seekers.

Urban settlement area has meanwhile also become a refuge for species and habitats that are now rare. This has occurred as a result of two developments: first, rare biotopes such as dry meadows still exist as relics in settlement areas; second, rare species that have been displaced due to agriculture are finding a substitute home in abandoned lands and places in the urban environment. The dynamic related to new housing developments and remodelling can accommodate extraordinary habitats for rare species when biodiversity is intentionally taken into consideration. The appropriate areas – particularly unsealed areas – must be legally protected (green and open spaces).

A variety of good examples of how biodiversity can be promoted in settlement areas can be found in the cities and communes. Furthermore, the cantons and communes have effective approaches for dealing with nature and landscape using spatial planning instruments such as structure plans and use plans. However, the aspects of biodiversity are still not sufficiently considered and implemented in all spatial planning instruments. New policies, programmes and instruments, such as the agglomeration policy with its programmes and model projects, offer innovative approaches since they are conceived on the basis of an integrated and holistic approach.

6.2 Forestry

Diverse forests and forest ecosystem services

The forests of Switzerland are very diverse thanks to the climate and geological variations. Over 100 natural forest communities have been identified and are home to more than 60% of the existing plants, animals, fungi and microorganisms in our country. The diverse use of the forest in the past has also contributed to the high degree of species diversity and provided for, among other things, much light, warmth and oligotrophic sites. The various ecosystem services of the forest, such as its protective, use and welfare functions, are directly connected to its specific biodiversity.

Increase in forest area and improvement in the ecological quality of forests

Switzerland's forest area has grown steadily since 1850, especially in the Alps and the Southern Alps. Forest management throughout Switzerland is now completely sustainable and extremely near-natural, as required by the Forest Act. Overall, the percentage of threatened species in forests is lower than in other habitats. The ecological quality of the forests has improved in recent decades. Several corresponding indicators show a positive trend: structural diversity is increasing, forest regeneration is largely occurring more and more naturally, and the proportion of deadwood has increased.[115]

Action fields for the forestry sector

Nevertheless, there are deficits in the area of forest biodiversity. Furthermore, these are due to the under-representation of varied structures, e.g. graded forest edges, open forests, wet sections of forest, wooded pastures[116] and groves,[117] and a lack of old growth and deadwood, particularly in areas of the Central Plateau and the Jura. These deficits are causing a decline in rare and threatened light and warmth-loving species as well as in the habitat specialists of biologically older development phases. In addition, forest reserves are still not being sufficiently designated at this time. The imbalances in the food supply due to inputs from the air (primarily nitrogen) also pose a comprehensive threat to forest biodiversity. Climate change also has a major influence on forest biodiversity.

Forest Policy 2020

The Confederation's forest policy is guided by the Forest Policy 2020 (Waldpolitik 2020). This is a political declaration of intent by the Federal Council, which lays the foundations for concrete measures to be carried out in accordance with an action plan. The Forest Policy 2020 defines long-term visions (to 2030) concerning the desired state of the forest, the resulting quantified goals for the period from 2010 to 2020 and the strategy to achieve them. The main goal of the Forest Policy 2020 is to ensure sustainable forest management. Accordingly, the forest shall be managed in such a way that it can fulfil its functions and services sustainably and effectively. These are: the development of landscape, the protection of natural resources, the supply of wood and other forest products, the promotion of species diversity and habitats, protection against natural hazards, and the provision of space for recreation and leisure.

The Confederation promotes biodiversity in the forest in the form of programme agreements with the cantons. Thus, it supports the creation of forest reserves and islands of old growth as well as the targeted promotion of priority animal and plant species and their habitats (forest edges, groves, wooded pastures, coppices with standards). In addition to sustainable forest conservation and the promotion of biodiversity, a comprehensive near-nature forest management approach is also needed for the other forest resources.

6.3 Agriculture

Valuable habitats – created by agriculture

For centuries, humans have contributed to the conservation of the diversity of habitats and the species connected to them through agriculture. The wetlands and dry meadows and pastures that have been created and conserved through agricultural management are home to a large proportion of Swiss species diversity.

[115] Brändli U.B. 2010: Schweizerisches Landesforstinventar. Ergebnisse der dritten Erhebung 2004–2006. Birmensdorf, Eidg. Forschungsanstalt für Wald, Schnee und Landschaft WSL. Bern, Bundesamt für Umwelt BAFU

[116] Wooded meadows are used both as forest and meadow. They are legally defined as forest and are subject to the Forest Act.

[117] Groves are the well-known European chestnut stands and the rather rare walnut tree stands that occur mainly in the cantons of Valais, Ticino and in the Südbünden area. They are traditionally used for wood harvesting and fruit production, but are also grazed and/or mown.

Biodiversity – the basis for functional agriculture

There are many ecosystem services that are essential for agriculture. They include pollination, biological pest control and the formation and conservation of fertile soils. Biodiversity in the soil ensures fertile soils, in which organic waste materials are transformed into simpler inorganic components which are then supplied to plants as food. The genetic diversity in livestock breeds and crops, as well as in the wild species related to them, is an important resource. They offer the possibility of adapting future agricultural production to different market, production and environmental conditions.

Loss of biodiversity due to the intensification of agriculture

After the Second World War, agricultural policy was focused on increasing production and rationalisation. Thanks to extensive public involvement, it was possible to achieve an increase in the food supply. The intensification of use, the expansion and harmonisation of parcels of land, the abandonment of agriculture in difficult-to-access areas, the increasing use of fertiliser and crop protection products, the mechanisation of agriculture, and the drainage of numerous wetlands have caused biodiversity losses in agricultural areas since the middle of the last century. Near-natural structures which made agricultural management more difficult were removed: bushes, individual trees, borders, hedges, piles of stones, ponds and topographical unevenness were eliminated, forest edges were straightened and streams culverted. As a result, many species lost their habitats and disappeared locally and regionally or become rare. The ecological quality of grasslands changed considerably due to a marked intensification of farming in the Central Plateau. Since the end of the last century, this development has increasingly spread to easily accessible and easy to manage areas in the mountain region. In general, pastures and meadows in Switzerland became noticeably species-poor in the last century. Due to the increasing use of machinery, the characteristic species of traditionally used meadows and pastures declined in particular. In addition to the direct influence that types of use have on biodiversity, agricultural production also influences biodiversity indirectly, for example through pesticide and nutrient inputs in biotopes, particularly due to the insufficient buffer strips. Nitrogen inputs from the air are an especially significant negative factor in general biodiversity, but particularly in forest, water and wetland ecosystems.[118]

[118] Bobbink R. et al. 2011: Review and revision of empirical critical loads and dose-response relationships. Proceedings of an expert workshop, Noordwijkerhout, 23–25 June 2010. Netherlands: National Institute for Public Health and the Environment

Diversity of crop varieties and livestock breeds

The diversity of crops and livestock breeds is also part of biodiversity in agriculture. As agricultural productivity rose during the post-war years, many locally adapted national varieties and breeds became less important. They were replaced across Switzerland by a few high-yield varieties and high-performance breeds. As a result, some of these disappeared permanently, particularly among the arable crops. Trade, the processing industry and wholesalers also contributed to this phenomenon by focusing exclusively on a few varieties.

Direct payments

Starting in the mid-1980s, agricultural policy reacted to unwanted developments by separating price and income policy and introducing direct payments. These were associated with regulations and incentives for environmentally-friendly production and the promotion of biodiversity. The developments during the war and post-war period that are now perceived as negative have been corrected since the 1990s through the adaptation of focus areas and use of supplementary instruments for land improvements, while the spatial needs of ecology (ecological compensation, watercourse rehabilitation and restorations) have been integrated in the improvement measures and specifically promoted through financial incentives.

Ecological compensation

With the instrument of ecological compensation on agricultural land, the Confederation created an incentive in 1993[119] to counteract the depletion of landscapes and the decline in species. The goal of ecological compensation in areas used for agriculture is mainly to conserve and promote biological diversity in agricultural areas and contribute to the conservation of typical landscape structures and elements. The Confederation uses direct payments as an incentive for farmers to develop and maintain ecological compensation areas. In addition, support is provided to farmers in the form of consultancy.

In 1996, the multifunctional role of agriculture was enshrined in the Swiss Federal Constitution.[120] The conservation of life-sustaining natural resources and biodiversity has since been included in the core tasks of agricultural policy. In accordance with the Federal Constitution, the Confederation is tasked with promoting forms of production that are especially close to nature and environmentally-friendly through economic incentives.

Agricultural Act and the Ordinance on Ecological Quality

Since the new Agriculture Act came into force in 1998,[121] in order to obtain direct payments in agriculture as part of the proof of ecological performance, 7% of agricultural land (3.5% for special crops) must be designated as biodiversity priority areas (ecological compensation areas). Since these areas were not equally relevant for biodiversity everywhere, in 2001 a preliminary step was taken to create incentives to improve the quality of the areas and effectively connect them by introducing the Ordinance on Ecological Quality. Furthermore, since 2008, projects that promote the sustainable use of natural resources can also obtain financial support for a period of six years. In 2008, environmental targets for agriculture[122] based on legal principles and international requirements were published by the Federal Office for the Environment and the Federal Office for Agriculture. These provide the basis for the definition of goal-oriented measures for the conservation and promotion of biodiversity in areas used for agriculture.

[119] At the time in the Ecological Contributions Decree (OeBV) of 1993, now in the Federal Act of 29 April 1998 on Agriculture (Landwirtschaftsgesetz, LwG; SR 910.1)
[120] Swiss Federal Constitution of 18 April 1999 (BV; SR 101)
[121] Federal Act of 29 April 1998 on Agriculture (Agriculture Act, AgricA; SR 910.1)
[122] Umweltziele Landwirtschaft (environmental targets for agriculture). www.bafu.admin.ch/publikationen/publikation/00097/index.html?lang=de

Countless initiatives, programmes and projects were and are also being developed at private level in order to combat the loss of biodiversity in agricultural areas.[123]

Action fields for agriculture

Due to the measures previously taken, environmental impacts have successfully been reduced by agriculture and the decline in biodiversity has been partially decelerated. Additional efforts are still needed to conserve and promote biodiversity. One future challenge is to use sustainable food production to contribute to food security for the population. In order to harmonise the conservation and promotion of biodiversity in agricultural areas with efficient food production, concerted action that takes local site conditions and production potential into consideration is required. Regional, qualitative and quantitative target values must be developed. The quality criteria and spatial requirements can be deduced from the scientific knowledge provided by various case studies.[124] These must be qualitatively and quantitatively specified for the various production regions in Switzerland so that the species and habitats that are dependent on agricultural use are specifically promoted and conserved in their distribution area. In mountain regions, the requirements depend greatly on the intensity of the land use. The need to secure areas as biodiversity priority areas (ecological compensation areas) varies, depending on the development of the intensity of arable farming. Furthermore, additional efforts are needed to continuously reduce the use of plant protection products, veterinary drugs, and nitrogen and phosphorus inputs.

The concrete design of the further development of the direct payment system under the Agriculture Policy 2014-2017, which is still under development, is also important for the promotion of biodiversity. Another important factor is the education and motivation of farmers. Ecological problems and contexts, as well as the significance of biodiversity for agricultural production and commercial opportunities for promoting biodiversity, should be given more consideration in the policy.

6.4 Hunting and fishing

Sustainable hunting and fishing

Hunting and fishing are based on the principle of sustainability in that protected and useful species, close seasons, catch/shooting quotas, size/age requirements etc. are defined in the federal and cantonal legislation. Federal law has separate laws for hunting and for fishing, the Hunting Act[125] and Fishing and Fisheries Act[126] and the associated ordinances. A series of concepts and implementation tools have been devised based on this legislation.

Management of hunting and fishing

The hunting and fishing concepts are designed so that the age and gender structure and the naturally evolved social system in the hunted and fished populations, as well as the genetic diversity of all used species, are conserved in the long term. The cantons are responsible for restricting the use of populations of hunted or fished species when they are in decline. However the cantons are also required to regulate populations of wild ungulates to ensure that they do not hinder natural regeneration of forest.

In order to ensure the sustainable protection of species that can be hunted, the Confederation designated a network of Swiss wild bird and waterfowl reserves as well as

[123] For example, the private IP Suisse label imposes ambitious requirements on its some 20,000 members concerning the quality and the connection of ecological compensation areas on their premises and thus promotes biodiversity in the private sphere.
[124] For example, Oppermann R., Gujer H.U. 2003: Artenreiches Grünland bewerten und fördern – MEKA und ÖQV in der Praxis. Stuttgart: Ulmer
[125] Federal Act of 20 June 1986 on the Hunting and Protection of Wild Mammals and Birds (Hunting Act, HuntA; SR 922.0)
[126] Federal Act of 21 June 1991 on Fish and Fisheries (FFA; SR 923.0)

populations of national importance with important spawning sites. This network is being expanded by the cantons through the addition of numerous other wildlife conservation areas and sanctuaries.

Action fields for hunting and fishing

It is important for the future to restore the connection of habitats on land and in the water for wild animal and fish species that require large connected areas. Another challenge involves dealing with species that are part of native species diversity but come into conflict with human interests in cultural landscapes; wolves and lynx can prey on farm animals, red deer can cause damage to forests.

6.5 Tourism, sport and leisure

Biodiversity offers a great deal of potential for experiencing nature, recreation, sport and tourist activities, promoting exercise, and protecting health, which is why it is of prime importance to Switzerland as a tourist destination. These services shall continue to be conserved in the long term through sustainable use. Forest and pastures, rivers, ravines and cliffs are well developed in Switzerland and easily accessible for recreational, sport and tourism activities.

Impacts of tourism, sport and recreational activities on biodiversity

However, tourism, sport and recreational activities also have a wide range of environmental impacts. As superimposed uses, they usually increase the intensity of land use of a given location. In addition, these activities are often connected to the development of infrastructure (land use, fragmentation and destruction of habitats) and direct or indirect impacts on flora and fauna (e.g. disturbance), which can result from the connection of skiing areas, extensive snow production and levelling of slopes, and the installation of ski areas at higher altitudes.

Due to developments in recent decades and despite industry efforts, such as in the area of environmentally-friendly tourist transport facilities, the pressure on biodiversity has mounted continuously.

Action fields for tourism, sport and recreation

The stronger integration of long-term biodiversity goals in sport and tourism policies and the assurance of coherent cross-sector cooperation, as set out in Switzerland's landscape concept (sectoral goal 3A), in the Federal Council's tourism strategy[127] and in the implementation programme for the Tourism Strategy 2012–2015,[128] are important for the future. Accordingly, local recreation areas in settlement areas are of critical importance. Sport and tourism should contribute to the protection of biodiversity through sustainable services and infrastructure. This requires educational and information measures and the stronger control of tourism, sport and recreational activities, which should be developed in collaboration with the actors involved.

6.6 Transport

Fragmentation of the landscape

The fragmentation of the landscape and related habitats greatly increased in the Central Plateau and in the valleys in the last 30 years. The construction of transport infrastructure and the expansion of settlement areas have also destroyed large areas of near-natural habitats, which could only be replaced in part. The continuous fragmentation of the generally shrinking area of near-natural habitats is causing the fragmentation of animal and plant populations into isolated and small populations. A few years of high

[127] Wachstumsstrategie für den Tourismusstandort Schweiz (growth strategy for Switzerland as a tourism destination), 18 June 2010, Schweizerischer Bundesrat
[128] Under development.

mortality or poor reproductive success can be enough to wipe out these small populations. The impacts of transport also have a negative effect by killing many animals and polluting habitats.

Yet, it is worth noting that the extensively maintained embankments of railways and motorways are very important in the deficiently structured and intensively used Central Plateau, since they offer a habitat and possibilities for ecological connection. The same applies to the sometimes very large areas at civil airports, which are often extensively maintained and can hence play an important role in ecological compensation in a region.

Action fields for the transport sector

The avoidance of new separation effects is important. Therefore, priority should be given at the planning stage to upgrading existing transport infrastructure instead of building new infrastructure.

Action is desperately needed to minimise the separation effect of individual infrastructures and to improve the passability for wild animals, amphibians, reptiles and small mammals. In order to guarantee the measures in the area, spatial planning instruments need to be increased and aligned with each other.

In order to prevent the further deterioration of the current situation, the consistent implementation of legally prescribed upgrade and replacement measures is also important in infrastructure projects that interfere with habitats worthy of protection.[129] These measures are qualitatively and quantitatively designed for habitats that are degraded by such interference and should be applied based in accordance with substantive requirements to suitable sites for biodiversity from a national and cantonal perspective.

Near-natural[130] maintenance of transport infrastructure embankments makes it possible to conserve biodiversity, create new habitats and promote functional connection axes for flora and fauna. Since transport infrastructures often provide the axes, from which invasive neophytes spread, embankment maintenance must also include invasive organism control and response measures.

6.7 Renewable energies

Energy Strategy 2050 – power supply security without nuclear power

The Federal Council wishes to continue to provide a highly secure power supply in Switzerland, but without nuclear energy in the medium term. It decided this on 25 May 2011 as part of the new Energy Strategy 2050 and submitted the decision to parliament for debate. The existing nuclear power plants shall be decommissioned at the end of their service life and not replaced with new nuclear power plants. In order to ensure a secure power supply, the Federal Council is banking on greater efficiency (energy efficiency), the development of hydropower and new renewable energies, as well as fossil-fuel-based electricity production (cogeneration plants, gas-fired combined cycle plants) and imports, if required. In addition, the power grids shall be rapidly expanded and energy research increased.

In its first extraordinary session concerning nuclear and alternative energies (Official Bulletin 11.9008), the Federal Council decided on 8 June 2011 to phase out nuclear

[129] Federal Act of 1 July 1996 on the Protection of Nature and Cultural Heritage (NHG; SR 451), art. 18 para. 1to and 1st

[130] "Near-natural maintenance" refers to a method of maintenance that is adapted to a site's specific biodiversity and is characterised, among other things, by mowing instead of mulching, the removal of clippings, the selective trimming of shrubs and hedges, the consideration of animals in the selection of cutting height, and the absence of herbicide, pesticide and fertiliser use.

energy. The use of renewable local energies was considered an important alternative to nuclear energy.

Use of renewable energies and biodiversity

The use of renewable energies is often linked to biodiversity. Renewable energies can have positive impacts on biodiversity, e.g. CO_2 neutrality in the use of wood energy, zero emissions in the use of wind energy and positive local effects, such as the thinning of a forest canopy through wood harvesting. However, it is also possible that the use of renewable energies could ultimately lead to conflict with biodiversity. This would result from the need for space, the building of structures for energy generation, their operation modus, disturbances and indirect influences, such as required site developments. While hydropower generation, for example, has significant impacts on aquatic ecosystems, wind energy plants also pose a threat to birds and bats due the risk of collision. However, existing strategies and recommendations on the use of renewable energies are helping to reduce the conflicts of interest. These include the Swiss Wind Energy Concept (Konzept Windenergie Schweiz) and the Recommendation on the Planning of Wind Energy Plants (Empfehlung zur Planung von Windenergieanlagen), the Recommendations for developing cantonal conservation and exploitation strategies for small hydropower plants, the Swiss Biomass Strategy and the Biomass Energy Strategy (Biomasse-Energiestrategie), as well as contributions currently being developed for the environmental impact assessment handbook (UVP-Handbuch) on the assessment and avoidance of the negative impacts of wind energy plants on birds and bats.[131]

The Confederation is required to find ways of minimising the conflicts with biodiversity issues, particularly also in the context of Energy Strategy 2050.

6.8 Sites, buildings and facilities in federal ownership

The Confederation owns a variety of properties, buildings and facilities, either outright or through shareholdings. The properties of the Swiss Department of Defence, Civil Protection and Sport (DDPS) and the national roads and their central reservations and embankments make it the largest landowner in Switzerland.

Ecologically valuable properties in federal ownership

The properties of the DDPS are often of particular ecological value because they are extensively used, located in remote areas and protected from other uses (e.g. development). Furthermore, military use can activate the dynamic in the landscape necessary to generate specific natural values, such as areas with pioneer vegetation or rare amphibians.

However, due to buildings and facilities, military use (e.g. shooting, roads and other traffic) and military aviation also have negative influences on biodiversity: soil sealing, fragmentation caused by buildings and facilities, such as fencing, soil contamination, and soil and air disturbances.

Action fields for the DDPS

The DDPS has made various efforts in recent years to enhance the current state of operations so that they can be largely viewed as exemplary. As a result, one of the biggest challenges for the future is to maintain these high standards.

[131] See Annex A4: Strategies and Programmes.

6.9 Education und research

Education

The concept of biodiversity and the extensive range of related issues have not been included in Swiss curricula up to now. Education and continuing education courses for teachers are largely lacking on the topic. In connection with the 2010 International Year of Biodiversity, it was confirmed, however, that teaching materials on the topic did exist or were under development.[132] The general goals of the secondary school curriculum[133] show that a foundation already exists for the exploration of this topic in the context of school instruction.

Action fields for education

Along with knowledge about their ecology, the ability to recognise species, describe and classify them plays a central role in the research and conservation of biodiversity and its economic development. In the last two decades, basic education has seriously neglected to impart this knowledge. Professorships in the relevant subject areas (especially systematics, taxonomy and ethology) have been repeatedly eliminated at Swiss universities; the current curriculum offered at Swiss institutes is inadequate in terms of providing an in-depth education in field biology and systematics.[134] Many of the species groups that exist in Switzerland cannot be sufficiently investigated. According to a survey, 20% of the species specialists are older than 60.[135] The lack of a younger generation with in-depth knowledge of species and their ecology has an impact on the medium to long-term possibilities for the monitoring of biodiversity and on the evaluation of the implementation of the measures contained in the Swiss Biodiversity Strategy. It is important for the next generation to be equipped with the ability to identify species and to have a better knowledge of species and their ecology. In general, the education and continuing education programmes required for this need to be firmly established in universities, museums and botanical and zoological gardens. In fact, the potential of existing natural history museums and their reference collections should be better tapped and developed. Priorities and objectives must be defined.

Research

Switzerland performed groundbreaking work at an early stage in the then fledgling field of conservation biology with the Integrated Biodiversity Project in the Environment Priority Programme (SPP) of the Swiss National Science Foundation (1992–2001), and in the context of European research projects. However, Switzerland is relinquishing its international lead in this field due to the lack of large and interdisciplinary research programmes on changes in biodiversity, the causes and consequences of these changes, the role of biodiversity in functional ecosystems[136] and their benefits for society.

Action fields for research

Due to the broad scope and interdisciplinary nature of biodiversity research and its application, close cooperation is required in the identification and exploitation of synergies. However, biodiversity knowledge in Switzerland is currently distributed across several institutions, which are inadequately connected and almost inaccessible. In contrast to the various foreign initiatives, there are no measures for maintaining, producing and distributing biodiversity knowledge in Switzerland. As a result, Switzer-

[132] For example, courses offered by Pro Natura and given to 2,300 classes in Switzerland in 2009

[133] For example, school level curriculum of canton Basel-Landschaft 2009: "Lebensgemeinschaften in einem Lebensraum über einen längeren Zeitraum erkunden, erforschen und dokumentieren. Die Eingriffe des Menschen in die Lebensräume aufzeigen und beurteilen" ("Exploring, researching and documenting communities in a habitat over a longer period of time. Demonstrate and evaluate human intervention in the habitats") www.lehrplan-sek.bl.ch/kk/mensch_umwelt/bio.pdf

[134] Kompetenz Artenkenntnis: Betrachtung des Bildungsangebotes in der Schweiz. ("Species knowledge and expertise: Examination of the educational offering in Switzerland"). Survey conducted in February 2009 and February 2012. www.artenspezialisten.ch/index.cfm/page/geschichte

[135] Akademie der Naturwissenschaften Schweiz (SCNAT) 2006: Die Zukunft der Systematik in der Schweiz. Positionspapier, Bern. www.biodiversity.ch/downloads/Systematik_d_leicht.pdf_d_leicht.pdf

[136] Gamfeldt L. et al. 2008: Multiple functions increase the importance of biodiversity for overall ecosystem functioning. In: Ecology, Vol. 89, No. 5, p. 1223–1231

land does not take sufficient advantage of the existing knowledge and lags behind other countries in the synthesis of biodiversity knowledge in basic research and application.

From a societal and economic view, biodiversity has an intrinsically high exploitation potential. In order to preserve this potential and utilise it, not only are investments in research and development needed, but also institutional incentives. Research on the connections between biology, medicine and technology, as well as their sub-fields, including biomedicine, biochemistry, molecular biology, biophysics and bioinformatics, enables the development of new markets. However, the basis for this is rich biodiversity that is not only statically measured, but also analysed and understood in terms of its dynamics.

6.10 Production, services/trade and consumption

Biodiversity promotion and conservation has a lot to do with the economy: production, services/trade and consumption depend on rich and responsive biological diversity and influence biodiversity in Switzerland and abroad both in helpful and harmful ways (cf. Chapter 3.2).[137] In addition, consumption in Switzerland has grown considerably since the middle of the last century. The increasingly higher consumption and use of resources is a social phenomenon influenced by a myriad of factors.

While the land-related economic sectors (agriculture, forestry etc.) can have direct negative impacts on biodiversity (through pollution, land use etc.; cf. Chapters **Fehler! Verweisquelle konnte nicht gefunden werden.** and 6.3), other sectors influence biodiversity indirectly: through land use, demand for raw materials and other intermediate consumption, the environmental impact of transport and energy demand, and the entire value chain, both upstream and downstream.

In addition to the specific aspects of particular sectors (e.g. forest management, tourism) or particular areas (e.g. transport) in the previous chapters, this chapter focuses on the connections between the economy and biodiversity.

Production and services

The more biodiversity gains in significance for society, the greater the expectations on companies to take responsibility for its conservation and promotion. Investors, financial service providers and consumers are showing greater interest in biodiversity issues.[138] Responsible action toward biodiversity contributes to sustainable development and opens up entrepreneurial opportunities.[139] Many industries and economic sectors can benefit from biodiversity.[140]

Biological diversity offers countless opportunities, which can be availed of by innovative companies, and huge potential for innovation (new technologies and products, new

[137] While, for example, the agro and raw materials industries depend directly on the availability of these goods, companies in other sectors of business profit indirectly from the diversity of species and their uses, such as the wholesale and the construction industries. Moreover, the production of food, medicine and cosmetics is practically unthinkable today without the commercial use of genetic resources. They serve as natural active agents in products or as genetic material in cultivating crops and breeding livestock.
An example of the economic value of ecosystem services: 25 %–50 % of the entire transaction volume of the pharmaceutical product market (approx. USD 640 billion) is derived from genetic resources [see TEEB (2012) The Economics of Ecosystems and Biodiversity in Business and Enterprise, p. 230. Edited by Joshua Bishop. Earthscan, London and New York].

[138] An increasing number of initiatives are now also concerned with the issue of biodiversity and the economy, such as the EU Business @ Biodiversity Platform and the "Biodiversity in Good Company" business and biodiversity initiative.

[139] See also TEEB (2012), The Economics of Ecosystems and Biodiversity in Business and Enterprise, p. 57. Edited by Joshua Bishop. Earthscan, London and New York

[140] This applies, for example, to food corporations, farmers, the fishing industry, the wood processing industry, the energy industry, mining companies, the construction industry, the cosmetic and pharmaceutical industry, the fashion industry, and the financial industry.

markets and branches of business, new revenue sources).[141] The report entitled "TEEB for Business"[142] presents estimates which suggest that the value of sustainability-related global business opportunities in natural resources (energy, forestry, food and agriculture, water and metals) may be in the range of USD 2 to 6 trillion by 2050.

However, the on-going loss of biodiversity harbours various corporate risks for businesses:[143]

- shortages of and increases in the cost of raw materials (impacts on productivity);
- productivity losses due to the absence of natural services (such as pollination);
- indirect new regulations (bans and rules, quota systems, financial instruments, compensation and liability regimes) and unchanged customer demands as greater significance will be attributed to biodiversity due to the extent of its loss;
- reputational risks (risk of reputational damage through the financing of projects with a negative influence on biological diversity).

[141] For example, "biomimicry" or "bio-inspired design" (learning sustainable solutions from nature), sustainable investment in the financial sector etc.

[142] See TEEB – The Economics of Ecosystems and Biodiversity (2010), Report for Business – Executive Summary, p. 10. www.cbd.int/doc/meetings/cop/cop-10/information/cop-10-inf-23-en.pdf

[143] Cf. also the somewhat different typology in World Economic Forum (2010), Biodiversity and Business Risk. A Global Risks Network briefing. A briefing paper for participants engaged in biodiversity related discussions at the World Economic Forum Davos-Klosters Annual Meeting. Prepared by PricewaterhouseCoopers for the World Economic Forum. www3.weforum.org/docs/WEF_AM10_PwC_Biodiversity_BriefingMaterial.pdf

Finance and insurance sector

The finance and insurance sector has indirect yet significant impacts on biodiversity: financial market actors[144] influence the behaviour of other economic actors through capital investments (e.g. pension plan funds, investments), credit awards and risk assessments, and, hence, also influence the impacts of entrepreneurial activities on biodiversity.[145]

In the future, biodiversity will play a more important role in prospective risk management and the development of new business fields: biodiversity issues will be given greater consideration in the insurance of risk and financing of controversial infrastructure projects.[146] In addition, so-called sustainability investments are gaining in importance in asset management ("green funds", sustainability funds etc.). Furthermore, the general entrepreneurial risks of biodiversity loss are also affecting the finance sector.

Trade and international value chains

Economic activities in Switzerland also influence biodiversity globally through trade and international value chains[147] (see Chapter 3.2). As a small, yet highly integrated country, Switzerland has opportunities and the responsibility to make a contribution to conserving and promoting global biodiversity (see Chapter 7.9) at the international institutional level, in development work, throughout international value chains and in official and internationally relevant activities.

Consumption

Resource consumption in Switzerland has grown considerably since the middle of the last century.[148] In order to satisfy this consumption level, raw materials, semi-finished goods and finished products are imported. Therefore, the growing consumption of natural resources influences biodiversity both in Switzerland and in the exporting countries.

In terms of decision-making about consumption, not much is currently known about which products have a positive or negative influence on biodiversity (the same applies to the decisions of institutions and private investors about how and where they will invest their money). As a result, up to now, this aspect has been given little consideration by consumers, be they private individuals or public and private procurement bodies. This situation can be improved through the availability of more transparent and relevant environmental information about products that helps consumers to make purchasing decisions (e.g. labels, declarations, self-declarations), the formulation of product standards[149] and through regulations (e.g. obligation to declare timber), and in

[144] The most important financial market actors are banks and asset managers, insurers and reinsurance companies, social security institutions and life insurers as well as information procurement actors, e.g. rating agencies.

[145] For a more detailed account and description of the impacts of financial markets on the environment, see Brugger E.A et al. (2005), Finanzmärkte und Umwelt, p. 24 ff. Umwelt-Materialien No. 200. Federal Office for the Environment, Forest and Landscape, Bern www.bafu.admin.ch/publikationen/publikation/00322/index.html?lang=de

[146] In the banking sector, at least four strategies are used to deal with biodiversity risks [cf. TEEB (2012), The Economics of Ecosystems and Biodiversity in Business and Enterprise, p. 55. Edited by Joshua Bishop. Earthscan, London and New York]: (1) the red-lining of investments in areas of high biodiversity; (2) the development of sectoral guidelines for environmentally sensitive sectors; (3) restraint in financial sectors in which a bank lacks specialist knowledge; and (4) cooperation with borrowers to improve their environmental performance and avoid negative environmental impacts (for example, Rabobank developed a principle that enabled the exclusion of certain undesirable practices in the palm oil supply chain to promote sustainable processes in this way [cf. TEEB (2012), The Economics of Ecosystems and Biodiversity in Business and Enterprise, p. 59. Edited by Joshua Bishop. Earthscan, London and New York].

[147] The value chain refers to the entire series of processes that create economic value. In the case of production companies, the value chain includes all activities, from research and development, the exploitation of raw materials, the procurement of intermediate services to the production of preliminary, semi-finished and finished products and their distribution to end consumers, in addition to all of the interim transport, storage and administrative operations.

[148] BFS Aktuell 2008: Monitoring der Nachhaltigen Entwicklung. Die Schweiz in einer globalisierten Welt. www.bfs.admin.ch/bfs/portal/de/index/themen/21/22/publ.Document.114903.pdf

[149] For example, Round Table on Sustainable Palm Oil (RSPO). www.rspo.org

the case of public-sector projects using WTO-compatible environmental performance descriptions.[150]

Integrated product policy

In its Sustainable Development Strategy 2012–2015,[151] the Federal Council confirms that it considers resource-related information for market participants as important measures for implementing the Integrated Product Policy (IPP).[152] This was already decided within the context of the Sustainable Development Strategy 2008–2011.[153] One of the goals of the IPP is to promote private and public sector demand for products that meet high social, economic and environmental standards over their entire life cycle.[154] In that way, consumers' decisions on how they spend their money can be influential.

Green economy

In support of its Sustainable Development Strategy, the Federal Council wishes to increase its commitment to a green economy. In its discussion paper on the green economy of October 2010, it confirmed this goal and would like, among other things, to increase the environmental transparency of the market through the availability of better environmental information about products. To this end, it is important that the environmental impact, including biodiversity aspects, be assessed over the entire life cycle of products and for the information to be relevant[155] and comprehensible. Authoritative environmental information on products should be made available to private individuals and procurement bodies so that they can make informed consumption decisions.

Action fields for production, services/trade and consumption

In summary, corporate decisions will need to give greater consideration to biodiversity in the future. Better information and market-based instruments[156] are particularly suited to this task; disincentives that lead to harmful behaviour toward biodiversity should be eliminated if possible. Environmental information about products should be further developed in the context of consumption. Biodiversity requirements also need to be taken into greater consideration in public procurement. Last but not least, other objectives should include greater concern for the impacts of national decisions, sectoral policies and economic strategies on global biodiversity, as well as greater efforts by Switzerland to conserve and promote biodiversity at international level (see also Chapter 7.9).

[150] Environmental performance descriptions are environmental product criteria that are incorporated into invitations to tender either in the form of technical specifications or as additional criteria. The criteria are usually based on internationally recognised ecolabels.
[151] Sustainable Development Strategy 2012–2015, Report of 25 January 2012
[152] Integrated Product Policy (IPP). http://www.bafu.admin.ch/produkte/01967/index.html?lang=en
[153] Strategie Nachhaltige Entwicklung: Leitlinien und Aktionsplan 2008–2011, Bericht vom 16. April 2008
[154] The IPP aims to promote the public and private sector demand for products that meet high social, economic and environmental standards over their entire life cycle.
[155] This means that they allow consumers to choose products that have an important environmental benefit and to avoid others.
[156] See also Simmen H., Walter F. (2007) Landschaft gemeinsam gestalten, NFP48, p. 61.

7 Strategic Goals

"Biodiversity is rich and capable of reacting to change. Biodiversity and its ecosystem services are conserved in the long term." (Federal Council decision of 1 July 2009, cf. Chapter 1.2).

In order to achieve this overall objective, the survival of native species in their natural ranges must be ensured, the genetic diversity of native wild species, utility breeds and cultivars must be conserved, Switzerland's ecosystems must remain functional and their services guaranteed, and Switzerland must contribute to the safeguarding of global biodiversity.

As the previous chapters show, there is a clear need for action in various areas. The ten strategic goals presented below describe the focal points from which national actors shall take direction in the years to 2020[157] so that together they can generate sufficient effects and achieve clear results. The ten goals take the mandates of the Swiss parliament and the Federal Council (Chapter 1.2) into account and take direction from them in order to conserve and promote biodiversity in Switzerland and globally in the long term. The Aichi Biodiversity Targets (Annex A1) and the resulting EU Biodiversity Strategy to 2020 are taken into account to the extent that they are applicable to Switzerland (Annex A2).

The ten strategic goals are coordinated and their implementation is mutually influential in supported. In accordance with the Federal Council's objective these goals shall be pursued as a common set for the conservation and promotion of biodiversity.

7.1 Use biodiversity sustainably

Challenge

A wide variety of sectors have a significant influence on biodiversity and also benefit from numerous ecosystem services. Hence the use, conservation and promotion of biodiversity must be optimally coordinated. This cannot be achieved through nature conservation measures alone. To maintain the ecosystem services, the economic and political sectors must recognise the importance of biodiversity and take it into account in their actions and decisions.

Goal

By 2020, the use of natural resources and interventions involving them are sustainable so that the conservation of ecosystems and their services and of species and their genetic diversity is ensured.

Action fields

The action fields in the most affected sectors are described in greater detail in the individual sections below. Spatial planning (Chapter 7.1.1) with its coordination function assumes a particularly important role here.

[157] In line with the Biodiversity Convention's Strategic Plan for 2011–2020 and with the ongoing work on the conservation of biological diversity in the European Union.

The system of sectoral environmental objectives, which is derived from existing legislation, shall be further developed and substantiated by the FOEN. Sectoral environmental targets have already been published in the area of agriculture and are under preparation in the fields of energy and transport. The sectoral environmental targets create the basis for the reduction of the environmental deficits in the relevant sectors and for the improvement of their services for the conservation and promotion of biodiversity.

7.1.1 Spatial planning

Coordination of spatially relevant sectoral policies

Spatial planning involves, among other things, the spatial coordination of the spatially relevant sectoral policies, for example through the cantonal structure plans and the federal sectoral plans. Moreover, spatial planning also plays an important role in the creation of ecological infrastructure (Chapter 7.2).

In principle, biodiversity shall be taken into account throughout the country in interventions involving buildings and facilities in the context of projects relating to all spatially relevant and active sectoral policies, specifically infrastructure policies. It shall also be taken into account in the energy sector in relation to the generation and transport of energy, in national defence and in agriculture and forestry. To ensure the functionality of habitats, the focus shall be placed on both quantitative and qualitative conservation. The current and, in part, best practice in the areas of planning, implementation and maintenance shall be retained and promoted where necessary. Synergies with the topic of landscape, such as good design and the effect of interventions on the landscape, shall be exploited.

Spatial Planning Act

Hence, as part of the second stage of the revision of the Spatial Planning Act, it is intended to define the requirements in relation to spatial planning instruments – sectoral and structure plans – for the cantons and communes in the area of nature and landscape in greater detail. The aim here is to ensure that both landscape and biodiversity are systematically dealt with, both on the level of the cantonal structure plan and in the context of land-use planning, and that the necessary areas are secured.

Planning and design of infrastructure

In the planning and design of infrastructure, the measures in favour of biodiversity shall be taken into account and implemented using the spatial planning instruments that correspond to the relevant planning phase of the project in question. In particular, the progression from the federal sectoral plan to the cantonal structure plan and, if applicable, the regional level (partial structure plans, cantonal sectoral and development plans) and, finally, the level of communal land-use planning shall be implemented consistently and without gaps. (The specific action fields for the promotion of biodiversity in settlement areas are described in greater detail in Chapter 7.8).

Restoration and compensation measures

The legal obligation for the restoration and compensation of degraded habitats deserving of protection [158] must be given comprehensive consideration to guarantee the conservation and improvement of the biological and landscape values and functions, and to ensure the ecological balance. Measures shall be implemented in locations suitable for biodiversity in a way that they replace the degraded habitats qualitatively and quantitatively, eliminate separation effects and improve ecological connectivity.

[158] Federal Act on the Protection of Nature and Cultural Heritage of 1 July 1966, SR 451, Art. 18, para. 1. Definition of “compensation”, cf. Glossary

Other improvements can be achieved through increased coordination in the area of spatial planning in relation to biodiversity and a greater focus on biodiversity issues in the training of spatial planners.

7.1.2 Forestry

Forest Policy 2020: Conserve biodiversity in the forest

Switzerland's Forest Policy 2020 (Waldpolitik 2020) defines the conservation and targeted improvement of biodiversity in the forest as one of its objectives. The activities referred to below concur with the objectives and strategic directions of the Forest Policy 2020.[159] These were defined in coordination with the key forestry actors. The following strategic directions are being followed in the implementation of the policy:

Develop near-natural silviculture further

Forest management in all managed forests will be directed at implementing the legally enshrined principle of near-natural silviculture. This is a component of the sustainable use of the resource forest in that it makes a crucial contribution to the productive and performance capacity of the forest, the resilience of the forest ecosystem, and the provision of sufficient habitat space and tranquillity for wild animals. As part of the detailed development of the Forest Policy 2020, it is intended to develop further the basis for the requirements of near-natural silviculture. The following aspects shall be taken into account in particular:

- Natural regeneration where possible: the forest's capacity for natural regeneration is conserved or improved. Natural regeneration is a priority.
- Regeneration suited to local conditions: the mix of tree species is tailored to the location in such a way that its ecological characteristics are not negatively affected.
- Consideration of the existing structural diversity: the possibilities for conserving and promoting the diversity of the forest habitat are availed of in the course of silvicultural interventions.
- Soil-conserving wood harvesting: the natural fertility of the soil is not impaired either chemically or physically (no extensive vehicle use) through forest management.

New insights from research on adaptation to climate change are constantly taken into account in the further development of forest management strategies.

Forest reserves, species promotion, deadwood and varied structures

Additional biodiversity-specific measures will be implemented. These will be based on the regionally differentiated qualitative and quantitative biodiversity goals still to be defined by the Confederation and, in the case of additional costs or reduced yields, shall form a basis for the remuneration of the services provided by forest managers for biodiversity. Existing finance mechanisms will be incorporated into this mechanism. The most important action fields are:

- Forest reserves: with an area of around 610 square kilometres, forest reserves today account for a good 5 % of Swiss forest area.[160] In accordance with the Forest Policy 2020, this share shall be increased to 8 % by 2020. The ultimate aim, as agreed by the Confederation and the Conference of Cantonal Forest Directors in 2001, is that 10 % of forest area will consist of forest reserves in 2030. Half of this shall be designated as natural forest reserves, that is reserves that are not subject to any intervention. Large interconnected areas for natural cycles shall be distributed in sufficient number throughout all of Switzerland's major regions.

[159] Waldpolitik 2020 (Forest Policy 2020). http://www.bafu.admin.ch/wald/01152/11490/
[160] GIS evaluation and FOEN assessment, status end of 2011

- Deadwood and varied structures: these shall be available – in ecologically sufficient volume and quality – in all of Switzerland's major regions. Sufficient density in relation to old biotope trees is also required.
- Species promotion: in locations in which habitat protection is insufficient, specific species promotion measures shall protect and promote forest-related species.

Ensure ecological connection

The connection of forests with each other and with the ecosystems of the open countryside should be ensured as an important precondition for the long-term conservation of biodiversity and in terms of establishing an ecological infrastructure.

7.1.3 Agriculture

Increase the quality of existing ecological compensation areas and their connection Agricultural Policy 2014–2017

The fulfilment of the "Environmental Targets for Agriculture" ("Umweltziele Landwirtschaft") is imperative for the conservation of biodiversity in the agricultural landscape. In the area of biodiversity, the environmental targets shall be regionally quantified, qualified and implemented on a coordinated basis. The conservation of areas that are still species-rich today, the enhancement of the ecological quality of existing ecological compensation areas, their improved interconnection and, where necessary, the creation of additional ecological compensation areas (to be known henceforth as biodiversity priority areas) are important for the promotion of biodiversity in agriculture.[161] The incentives provided for services for the promotion of biodiversity shall be increased, the synergies (e. g. promotion of beneficial species and buffer function) with agricultural production and the necessary associated self-initiative of farmers shall be exploited, and the recognition of ecosystem services and their valorisation in the different agricultural production processes shall be intensified.[162]

With the Agricultural Policy 2014–2017,[163] the Federal Council aims to strengthen agricultural production and improve farm incomes. The core element of the policy is the further development of the direct payments system. The direct payment instruments are clearly based on the objectives enshrined in the Swiss Federal Constitution. If the Agricultural Policy 2014-2017 can be implemented as planned, a major contribution will be made to the conservation of biodiversity in agriculturally used areas.

Optimise proof of ecological performance

As is also planned in accordance with the Agricultural Policy 2014-2017, as a precondition for the receipt of direct payments, the proof of ecological performance shall be optimised in relation to the requirements for fertilisation, soil protection, plant protection and ecological compensation.

Reduce ammonia emissions

Due to their far-reaching ecological impacts, the reduction in ammonia emissions is a matter of urgency and also an objective of the Agricultural Policy 2014–2017. Different instruments and incentive systems shall be used here in combination. Additional incentives for resource efficiency in the context of the direct payments for the promotion of targeted technical measures shall be discussed as an important policy instrument.

[161] In the dispatch on the Further Development of Agricultural Policy in the Years 2014–2017 (Agrarpolitik 2014–2017) of 1 February 2012, it is planned to change the Agriculture Act so that ecological compensation areas located on agricultural land shall be renamed biodiversity promotion areas.
[162] Umweltziele Landwirtschaft (Environmental Targets for Agriculture) www.bafu.admin.ch/publikationen/publikation/00097/index.html?lang=de
[163] Agrarpolitik 2014–2017 (Agricultural Policy 2014-2017). www.blw.admin.ch/themen/00005/00044/01178/index.html?lang=de

Develop agricultural consultancy services and research

Agricultural consultancy and research shall contribute to the optimal promotion of biodiversity as a component of sustainable agriculture. The benefit of a high level of biodiversity in the agricultural landscape and the importance of the ecosystem services it provides (e.g. pollination, soil fertility, pest control) shall be demonstrated and constitute an integral part of agricultural training and consultancy.

7.1.4 Hunting and fishing

Retain, verify and adapt sustainability

The sustainability of the use of land for hunting and fishing must be improved in a targeted way. The use of species should be periodically checked and adapted, if necessary, in relation to natural forest regeneration, climate change and artificial genetic selection through the disproportionately high removal of certain elements of populations.[164]

Promote supra-regional thinking, planning and action

The administrative areas of responsibility for many animal species are too small. Thinking, planning and acting on the basis of supra-regional wildlife areas and surface water catchment areas (instead of at communal or cantonal areas) shall be promoted through ordinances and incentives.

Issue instructions for the cantons

In the event of implementation deficits or difficulties in the attainment of a regional balance between forest and wild animals, the Confederation shall issue instructions for the cantons for the safeguarding of natural forest regeneration and the most important wildlife habitats. The target-oriented regulation of wild ungulate populations and the upgrading of habitats at cantonal level are important measures here.

Promote quiet zones for wild animals

For the protection of mammals and birds living in the wild, the Confederation supports the cantons in the designation of quiet zones for wild animals and in targeted species and habitat promotion projects. The network of protected areas and quiet zones for wild animals which is currently being developed should be incorporated into spatial planning processes as part of the ecological infrastructure (cf. Chapter 7.2).

Improve fish habitats

The habitats of fish shall be improved so that the complicated stocking measures for young fish can be phased out. Priority habitats for fish reproduction shall be defined and incorporated into the ecological infrastructure (cf. Chapter 7.2). As part of the connection of the aquatic habitats, the passability of watercourses, in particular from lakes to streams, shall be improved through ascent and descent devices for fish.

Guarantee species protection and population regulation to minimise damage

The management of the spread of protected species in the cultural landscape, which can lead to conflicts (e.g. lynx and wolf), necessitates the development of new concepts that will guarantee both the protection of the species and, if necessary, population regulation to minimise damage. The prevention of damage and measures for the promotion of acceptance should constitute a central pillar of these concepts.

7.1.5 Tourism, sport and leisure

Integrate biodiversity into sport and tourism policy

Biodiversity is central to tourism value creation and should also be able to be used for tourism, sport and leisure in the long term. For this reason, biodiversity should be increasingly integrated into sport and tourism policy and intersectoral cooperation

[164] Coltman, D.W. et al. 2003: Evolutionary consequences of trophy hunting. In: Nature, 426, p. 165–172

should be guaranteed.[165] Tourism, sport and leisure should contribute to the protection of biodiversity through nature-compatible services and infrastructure.

The possible ways in which measures for the promotion of biodiversity can be achieved here shall be explored on all political levels and in cooperation with the sport and tourism sector.[166]

Control tourism, sport and leisure activities

Tourism, sport and leisure activities shall also be more clearly controlled. Conditions for dealing with species diversity in important areas (e.g. spatial planning measures for the designation of refuge areas/quiet zones for wild animals) shall be defined, visitor numbers in ecologically sensitive areas managed and information provided.

Protect remote areas from disturbances

Remote and sparsely visited areas will be protected against large visitor flows and hence against the associated disturbances through the conservation and creation of sufficiently attractive local recreational areas.

7.1.6 Transport

Avoid new separation effects

The creation of new separation effects must be avoided. Hence, the development of existing transport infrastructure should be given priority at the planning stage over the construction of new infrastructure facilities. If the construction of a new building is unavoidable, habitats deserving of protection should be safeguarded if possible.

Connect habitats and populations

The studies being carried out on the elimination of the separation effect of individual infrastructure and the improvement of passability for wild animals, amphibians, reptiles and small mammals shall be continued. The extensive connection of habitats and populations will require a package of measures. The elimination of separation effects and the improvement of the passability of transport infrastructure for fauna shall be achieved through the construction of new wildlife passages or improvement of existing structures. All structural measures shall be safeguarded in the long term through the incorporation of wildlife corridors into structure and zone plans. The aim of providing guidance systems for fauna and establishing replacement habitats in coordination with agriculture, the forestry sector and the construction of housing developments should also be adopted. The maintenance of structural measures should be guaranteed. Care should be taken to ensure that all embankments are managed on a near-natural basis and that measures are undertaken for the control and eradication of invasive organisms.

7.1.7 Renewable energies

Coordination with Energy Strategy 2050

The Federal Council's decision to implement a gradual withdrawal from nuclear power and its implementation as part of the new Energy Strategy 2050[167] shall be taken into account in the development of an action plan. Energy generation shall be planned on a large spatial scale (supra-cantonal) and on a substantively comprehensive basis with the incorporation and evaluation of all energy sources and their specific potential. The impairment of biodiversity shall be minimised as far as possible in this process. Conflicts of interest with biodiversity shall be resolved where possible through existing strategies and recommendations. Where necessary, the Confederation will examine the possibility of developing additional enforcement aids. Moreover, the Confederation would like to support the cooperation between the cantons and in this way facilitate

[165] Cf. growth strategy for Switzerland as a tourism destination (2010). www.seco.admin.ch/tourismus
[166] Cf, for example Switzerland Tourism's "Die Schweiz ganz natürlich" campaign and the FOEN-SAC "Respektiere deine Grenzen" campaign.
[167] Energy Strategy 2050. http://www.bfe.admin.ch/themen/00526/00527/index.html?lang=en

comprehensive planning. Voluntary arrangements and sectoral solutions could also prove expedient here.

7.1.8 Sites, buildings and facilities in federal ownership

Consideration of biodiversity during use and use conversion

Through their role as Switzerland's biggest landowner, the Confederation and investors have a special responsibility. Hence the various dimensions of biodiversity shall receive greater attention in its use.

In cases in which the Confederation can exert an influence as a landowner, the high ecological values of sites that are no longer needed shall be conserved, also if they are subject to a change in use or sale. With regard to other areas that do not have any major natural value at present, it shall be verified whether they could be made available for ecological connection or as protected areas for biodiversity. The use of these areas as like-for-like compensation for federal buildings and infrastructure projects is also conceivable. In addition to the question as to who should own these areas in future, the guaranteeing of the adapted maintenance or financing of the necessary upgrading measures must be clarified.

7.1.9 Production, services/trade and consumption

The business risk arising from biodiversity loss must be tackled more rigorously and the negative influence of economic activity on biodiversity must be reduced. However, it is equally important to avail of the business opportunities associated with the conservation and promotion of biodiversity and to actively avail of economic expertise in the development of solutions in this area (cf. Chapter 6.10). Foundations (knowledge) and conditions must first be created here so that the negative influence of the economy on biodiversity can be reduced and the private sector can identify the opportunities and risks associated with biodiversity in good time and react suitably to them.

Market-based instruments and incentives

Switzerland is focusing increasingly on market-based instruments and incentives for the conservation and promotion of biodiversity, and for the promotion of economic activities (creation of clear general conditions for business) which are compatible with biodiversity. These include, in particular, the abolition of environmentally harmful subsidies (cf. Chapter 7.5), the reinforcement of the precautionary principle,[168] incentives for investments through communication and information about best practice, the promotion of sustainability standards for the conservation and promotion of biodiversity,[169] the evaluation of current environmental liability provisions in relation to risks for biodiversity, and the evaluation of innovative systems for the remuneration of ecosystem services that cannot be compensated through the market. Moreover, efforts must be made regarding the establishment of agreed rules for the provision of technically sound, relevant and comprehensible environmental product information. Switzerland should specifically promote greater traceability and transparency regarding the impacts of production and consumption on global biodiversity.

Public procurement

Switzerland's public procurement shall be carried out in a sustainable way. As part of this process, sustainability in its entirety, and with the greater consideration of biodiversity, shall be analysed and assessed throughout the entire product life cycle. Sus-

[168] For example, implementation of the REACH (registration, evaluation and authorisation of chemicals) regulation, the elimination of micropollutants from wastewater (which can disturb sensitive aquatic ecosystems) etc.

[169] Incentives for investments in the context of integrated product policy (IPP) and activities associated with the green economy or through communication or information about "good practice", if possible without generating additional costs to the state.

tainable public procurement is also supported at international level (e. g. in the context of the Marrakech Task Force for Sustainable Public Procurement[170]), particularly also through measures adopted in the context of the development cooperation of State Secretariat of Economic Affairs (SECO).

Sustainability in trade, and in investment and economic policy

In the area of national and international trade, Switzerland promotes the development of and compliance with internationally recognised sustainability standards, which also include the consideration of the impacts of trade on global biodiversity.[171] The policy for the establishment and implementation of recognised sustainability standards in international trade is based on federal label strategy. All actors along the value-added chain shall be involved, for example through the promotion of codes of conduct.

Impacts of national decisions on global biodiversity

Switzerland promotes the integration of environmental and sustainability factors into financial market processes through voluntary measures (e.g. through labels for sustainable securities).[172] Insofar as possible, the Confederation and public bodies operate an investment and economic policy that promotes sustainable development. The transparency of financial market actors is also promoted.

Switzerland undertakes to ensure that biodiversity in Switzerland and the impacts on global biodiversity are taken into account in national decisions (e.g. agricultural policy, economic promotion, financial services etc.), and in sectoral policies and economic sectoral strategies (agriculture, forest, tourism etc.). This also includes, for example, the consideration of the extent to which the importation of food and feedstuffs degrades global biodiversity. Furthermore, Switzerland takes the biodiversity goals into account in the follow-up work carried out in accordance with the discussion document on the green economy,[173] the national Cleantech Masterplan and other national strategies (sustainability, climate, energy strategy etc.). Regarding the promotion of sustainable economic growth (economic development), in programmes and projects based on the new regional policy (NRP), it shall be ensured that the existing principle, according to which the requirements for sustainable development shall be taken into account, is implemented consistently.

Risks and opportunities of biodiversity for the economy

The guidelines, tools etc. that currently exist in the area of biodiversity and the economy and were developed by business, NGOs and governments (often working in cooperation and mostly on a voluntary basis) are still too weak. For this reason, national and international initiatives shall be further developed in Switzerland that tackle

[170] Marrakech Task Force for Sustainable Public Procurement (SPP): Promotes and supports the implementation of SPP in both developed and developing countries. www.unep.fr/scp/marrakech/taskforces/procurement.htm

[171] Switzerland already has programmes today that promote, for example, the strengthening of sustainable biodiversity trade, the implementation of ABS, the protection of tropical forests and the establishment of sustainability labels in the international trade in raw materials, in the context of its economic development cooperation.

[172] Cf. Brugger E.A et al. (2005), Finanzmärkte und Umwelt, S. 77 ff. Umwelt-Materialien Nr. 200. Bundesamt für Umwelt, Wald und Landschaft, Bern
www.bafu.admin.ch/publikationen/publikation/00322/index.html?lang=de

[173] Green economy. http://www.bafu.admin.ch/wirtschaft/11350/index.html?lang=en

the issue of improving cooperation in relation to the management of the risks and possibilities of biodiversity for the economy.[174]

The interactions between biodiversity and the economy must be more clearly identified by science (stronger linking of science and business). In addition, information about these interactions should be made more accessible to companies.

7.2 Develop ecological infrastructure

Challenge

Effectively conserved, interconnected and functioning habitats constitute a fundamental prerequisite for a biodiversity that is rich and has the capacity to react to change (e.g. climate change). Existing protected areas must be added to and improved in qualitative terms. Ecological connection areas shall ensure the passability of the landscape between the protected areas.

Goal

By 2020, an ecological infrastructure consisting of protected and connected areas is developed. The state of threatened habitats is improved.

Action fields

By 2020, Switzerland shall develop an ecological infrastructure that shall ensure the fulfilment of all of the important functions of ecosystems and the conservation of all important natural and near-natural habitats. This will necessitate, first, the extension and upgrading of the Swiss system for protected areas and, second, the extension and securing of a system of connected areas throughout the landscape. Protected and connection areas should also ensure the connection with the corresponding areas in neighbouring countries.

Protected areas ensure the long-term safeguarding of so-called hotspots for biodiversity (areas with a high number of specialised species and habitats) through protective provisions. The current Swiss system of protected areas consists of the following legally protected areas: inventories of biotopes of national importance, Swiss National Park, game reserves, waterfowl and migratory bird reserves, Ramsar sites, Emerald Network sites,[175] cantonal, communal protected areas and protected areas governed by private law (including forest reserves).

To conserve important areas for Swiss biodiversity, the Swiss protection system shall be extended and upgraded where necessary. Additional protected areas shall be designated to this end. The endangerment of species, the ecologically representative presence and the endangerment of natural Switzerland's natural habitats will play a central role in their spatial designation. The completion of the Swiss protected areas system

[174] Including, for example:
- the EU Business @ Biodiversity Platform. http://ec.europa.eu/environment/biodiversity/business/index_en.html
- the Business and Biodiversity Initiative "Biodiversity in Good Company" ("A cross-sectoral collaboration of businesses that have committed to protecting and sustainably using biological diversity.") Since the ending of public funding in 2011, the initiative, which has existed since 2008, is being continued as a "company-driven registered association". www.business-and-biodiversity.de)
- the Union for Ethical Biotrade (UEBT, «Non-profit association that promotes the ‹Sourcing with Respect› of ingredients that come from native biodiversity. Members commit to gradually ensuring that their sourcing practices promote the conservation of biodiversity, respect traditional knowledge and assure the equitable sharing of benefits all along the supply chain.» www.ethicalbiotrade.org/)
- the initiative of the private Swiss foundation "Natur & Wirtschaft" ("Nature and Business"), promotion of biodiversity on company premises and around industrial estates. www.natureeteconomie.ch
For a more detailed overview of selected initiatives, guidelines and tools, see TEEB (2012),The Economics of Ecosystems and Biodiversity in Business and Enterprise, S. 243ff. Edited by Joshua Bishop. Earthscan, London and New York

[175] Emerald Network: pan-European network of protected sites for the conservation of endangered species and habitats of European importance. The legal basis for the network is the European Council's Bern Convention.

shall be developed in the framework of an overall concept with the affected actors and implemented by 2020.[176, 177]

The protection in existing protected areas with lower requirements in terms of biodiversity protection (e.g. hunting reserves, aquatic and migratory bird reserves) shall be extended.

In order for the existing protected areas to be able to fulfil their purpose, the management of these areas also needs to be improved. Their management should be better oriented towards the protection objectives. Regeneration measures shall be carried out where necessary to ensure the long-term functionality of the areas. This demands considerable financial and personnel commitment which can only be provided through the joint efforts of the Confederation, cantons, communes, nature conservation organisations and private actors.

The purpose of ecological connection areas is to link the protected areas to each other and to establish connections with the protected areas in neighbouring countries in such a way that species can spread and ecosystems are conserved. Moreover, habitats should also be enabled to adapt to climate-related changes. Connected areas can be ecologically valuable areas consisting of cultivated land, watercourses and water bodies, settlement areas and sites along transport infrastructure.[178]

The connected areas also include artificial connecting elements. These include, wildlife bridges and underpasses, amphibian and small animal passages.

The updating of the REN (National Ecological Network) shall define the exact spatial requirement for connection areas in relation to the protected areas. The aim here shall be to ensure that utilisation and biodiversity are not mutually exclusive in these areas. The REN shall be brought up to date in terms of data and methodology and extended to include habitats in the mountains and in settlement areas. A deficit analysis shall demonstrate the status of ecological connection as compared with the requirements of the REN. The action requirement in relation to new establishment, securing and upgrading of connection areas shall be derived from this and visualised geographically.

Various sectors, for example forestry, agriculture, settlement, transport already make an important contribution to ecological connection today. Eventual adaptations made to management practices or maintenance efforts shall be remunerated in relation to connection functions where necessary. As part of the action plan, it shall be established whether and to what extent parks of national importance, mire landscapes of national importance and particular beauty, and natural monuments of national importance can contribute to the creation of ecological infrastructure.

In addition, as part of the action plan, it shall be examined whether and to what extent an ecological infrastructure consisting of protected areas and connection areas should

[176] Svancara L.K. et al. 2005: Policy-driven versus Evidence-based Conservation: A Review of Political Targets and Biological Needs. In: BioScience, Vol. 55, No. 11, p. 989–995

[177] Desmet P., Cowling R. 2004: Using the species-area relationship to set baseline targets for conservation. In: Ecology an Society, Vol. 9, No. 2

[178] Cultural land: extensively used meadows and pastures, dispersed areas, ecological compensation areas on arable land; wet, undrained areas in grassland; ponds, field margins, hedges and other structural elements.
Forest: forests that are not managed; that have a large stock of deadwood; forests in humid and wet locations; specially harvested forests (e.g. coppices and mixed coppices; chestnut groves); forests, forest edges with wide herbaceous and shrub fringe.
Watercourses and water bodies: near-natural streams, rivers and lakeshores; revitalised watercourses.
Settlement area: suburban open spaces; near-natural managed parks and cemeteries; extensive green flat roofs; natural gardens; unsealed and rarely used niches.
Transport infrastructure: near-natural managed areas along roads and railways and in railway stations.

be designated by means of sectoral plan or concept in accordance with art. 13 of the Spatial Planning Act[179] and in the context of the federal competence arising from art. 78, para. 4 of the Swiss Federal Constitution[180] and in cooperation with the cantons. An instrument of this type could facilitate spatially relevant activities as a basis for the solution of conflicts of interest and for the exploitation of synergies with the tasks of spatially-relevant federal sectoral policies (in particular for coordination with the relevant sectoral planning) in relation to the conservation and promotion of biodiversity, and ensure, in particular, that the biotopes of national importance are adequately connected with each other.

In the international context, Switzerland must fulfil the requirements of the Strategic Plan of the Biodiversity Convention[181] and the European Emerald Network of the Bern Convention.[182] Both of these instruments require the extension of protected areas. The Strategic Plan of the Biodiversity Convention[183] requires that at least 17 % of the country's territory be designated as protected areas and protected. The contribution of the sectors and the potential of the different protected area instruments shall be identified in the context of the action plan with the responsible actors.

7.3 Improve the conservation status of national priority species

Challenge

Individual species or groups of species cannot be promoted sufficiently through habitat protection alone and also need additional specific measures in future to guarantee the survival of their populations. Introduced invasive species can pose a threat to native species and lead to their loss.

Goal

By 2020, the conservation status of the populations of national priority species is improved and their extinction prevented insofar as possible. The spread of invasive alien species with the potential to cause damage is contained.

Action fields

With regard to species promotion, the Confederation gives priority to those native species that are known to be threatened, for which Switzerland has a particular responsibility and whose conservation requires urgent action. This list of national priority species provides a basis for the Confederation's efforts in the area of species promotion. Species that are not yet under threat are promoted through measures for the upgrading of the entire landscape (cf. Chapters 7.1 and 7.2).

In its Swiss Species Promotion Concept (Konzept Artenförderung Schweiz), the Confederation defines the objectives to be pursued by Switzerland in the area of species promotion, how it sets priorities, the basis on which it negotiates, and the strategies and measures implemented to safeguard the species. The overall aim to 2020 is to safeguard the populations of national priority species[184] in Switzerland in the long term.

The promotion of species shall basically be achieved through a package of measures. Priority is given to promotion strategies that are based on existing protection and promotion instruments, exploit synergies with sectoral policies and promote several

[179] Federal Act of 22 June 1979 on Spatial Planning (Spatial Planning Act SPA; SR 700)
[180] Cf. no. 5.
[181] See Annex A1: Aichi Biodiversity Target 11.
[182] Emerald Network: pan-European network of protected sites for the conservation of endangered species and habitats of European importance. The legal basis for the network is the European Council's Bern Convention
[183] See Annex A1: Aichi Biodiversity Target 11.
[184] List of national priority species (in German). www.bafu.admin.ch/publikationen/publikation/01607/index.html?lang=de

priority species at the same time through shared habitats. Species-specific action plans are developed for national priority species, for which habitat protection is insufficient to ensure their conservation.

The Confederation defines the basis for the promotion of species, that is for the guaranteeing of genetic diversity within species, for the settlement and resettlement of species, for the management of the effects of climate change on species, and for conflicts of interest within species and habitat promotion and between species promotion and other sectoral policies.

A national strategy shall be created and implemented to prevent the import and spread of invasive alien species with the potential to cause damage. As part of a monitoring programme, it will be possible to identify threats to the environment and the degradation of biological diversity through invasive alien species at an early stage and verify the effectiveness of the measures implemented. Switzerland also supports the greater exchange of experience at international level in the area of invasive alien species. Awareness will be raised among decision makers and the public through increased educational work on dealing with alien species and their damage potential.

The implementation of species promotion will be carried out through cooperation between the Confederation and the cantons. The Confederation defines the priorities at national level and they are completed at regional level by the cantons. The cantons are responsible for implementation. The programmes and priorities formulated in this way shall be published so as to facilitate the direct participation of non-profit organisations.

7.4 Conserve and promote genetic diversity

Challenge

A high level of genetic diversity enables species to adapt better to altered environmental conditions. It is the basis for the survival of species and maintenance of ecosystem services. It is also a source of genetic resources for agriculture and forestry research and industry.

By 2020, genetic impoverishment is decelerated and, if possible, halted. The conservation and sustainable use of genetic resources, including that of livestock and crops, is ensured.

Goal

Action fields

A concept shall be presented on the conservation of genetic diversity in Switzerland (organisation, documentation, monitoring, role of and financial contributions by the business sectors) to introduce priority measures for the conservation of genetic diversity and the avoidance of genetic erosion. The existing concepts with a thematic link to this area shall be taken into account in this process.

The genetic resources available in Switzerland shall be surveyed so that focal areas can be correctly identified in relation to conservation measures.

The genetic variability of species shall be developed as a criterion and taken into account in the definition of protected or connected areas.

Current measures (e.g. national action plans, gene banks, microbiological culture collections, zoological and botanical gardens) for the conservation and sustainable use of genetic diversity shall be continued and further developed.

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization[185] shall be ratified in Switzerland as soon as possible (cf. Chapter 7.9).

Following the ratification of the Nagoya Protocol on the access to genetic resources and the fair and equitable sharing of benefits arising from their utilisation (access and benefit-sharing), it shall be clarified whether the access to Switzerland's own genetic resources should be regulated in such a way that Switzerland can also partake in the benefits arising from its resources.

7.5 Evaluate financial incentives

Challenge

In addition to incentives that promote biodiversity, today's tax and funding system (subsidies in the broad sense) contains some incentives that have a negative impact on biodiversity.[186] According to one study,[187] around one third of all federal subsidies have a potentially degrading effect on biodiversity and the landscape. As a result, taxes and subsidies must be examined.

Goal

By 2020, the negative impacts of existing financial incentives on biodiversity are identified and avoided, if possible. Where appropriate, new positive incentives are created.

Action fields

Existing incentives in the tax and funding system must be optimised in such a way that they do not run counter to planning requirements but support them. In many cases, corresponding studies are already under way (e.g. agricultural policy, forest policy). The aim is to demonstrate by 2015 the areas in which further need for improved incentives exists. In order to meet the requirements of the Strategic Plan of the Biodiversity Convention,[188] incentives, including subsidies, that are detrimental to biological diversity must be abolished, gradually dismantled or redesigned by 2020 so as to reduce the negative impacts to a minimum or completely avoid them. Hence, possible reports for the revision of the legislation must be compiled by 2020.

For example, the redistribution of animal-related payments in the context of the further development of the direct payments system[189] provides a model for the examination of existing mechanisms. These were used previously to provide an incentive for keeping of more animals per unit of area than would have been appropriate. Existing mechanisms in other areas should also be optimised.

In areas in which market failure is particularly prominent, new incentive mechanisms shall also be examined. Urban sprawl and the associated fragmentation of habitats is an example of a market failure in which the public good of biodiversity is degraded through the use of private goods. The coordinated and careful development of such financial mechanisms is required.

[185] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity. www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf
[186] Cf, for example Waltert F. et al. 2010: Fiskalische Instrumente und Flächeninanspruchnahme. WSL im Auftrag von BAFU und ARE. www.bafu.admin.ch/publikationen/publikation/01558/index.html?lang=de
[187] Rodewald R., Neff C. 2001: Bundessubventionen – landschaftszerstörend oder landschaftserhaltend? Praxisanalyse und Handlungsprogramm. Bern: Stiftung Landschaftsschutz Schweiz
[188] See Annex A1: Aichi Biodiversity Target 3.
[189] Agricultural Policy 2014–2017 (adoption by the Federal Council on 1 February 2012)

Important action fields exist at cantonal and international levels in addition to national level. Positive experience has already been gained in individual cantons with incentive and funding mechanisms for the promotion of the ecosystem services that are not directly marketable. Examples of market-based instruments have also been developed at international level in recent times.[190] What is lacking is a systematic application-oriented exchange at cantonal and communal levels. For the combining of forces, existing successful models at cantonal, national and international level should be availed of for Switzerland or for different cantons.

7.6 Record ecosystem services

Challenge

A healthy environment is crucial for the well-being of a country. Gross domestic product (GDP), the standard measure of growth, does not provide any information on this as it is based on financial transactions; the services provided by ecosystems and hence the importance of biodiversity for well-being are not visible in this form of measurement. To conserve and promote biodiversity, it is important to record ecosystem services using indicators and incorporate these into both public and private decision-making and market mechanisms. The indicators do not have to be monetary, however; the services can also be made visible in the form of bio-physical indicators (e.g. the accessibility of urban recreational areas). In the EU, it is planned that the actual value of natural capital and ecosystem services shall be recorded by public authorities and companies by 2020 at the latest.[191]

Goal

By 2020, ecosystem services are recorded quantitatively. This enables their consideration in the measurement of welfare as complementary indicators to gross domestic product and in regulatory impact assessments.

Action fields

The Confederation commissioned the compilation of a catalogue of 23 ecosystem services that are of particular benefit to the Swiss population. These shall be measured using simple indicators.[192] Work has already commenced on the further development of this set of indicators. The comprehensive conversion of ecosystem services into sums of money will hardly be feasible from the Swiss perspective. The results of the quantitative recording of ecosystem services should provide a basis for the assessment of conflicts of interest in the implementation of the strategy.

In the context of its decision to promote the green economy,[193] in late 2010, the Federal Council mandated the Federal Department of Home Affairs to add suitable indicators for social, economic and ecological developments to gross domestic product. The fundamental information developed by the FOEN on ecosystem services will be incorporated into the studies and the requirements in relation to official statistics and the methods prescribed by international organisations shall be taken into account. SEEA,[194] a corresponding UN standard, shall be revised in relation to ecosystems and ecosystem services by 2013. Switzerland is actively involved in this process. Its im-

[190] The Economics of Ecosystems and Biodiversity. www.teebweb.org. Commissariat général au développement durable 2010: Conservation et utilisation durable de la biodiversité et des services écosystémiques: analyse des outils économiques. www.developpement-durable.gouv.fr/IMG/pdf/Refbiodiv2.pdf

[191] Communication from the European Commission of 20.9.2011, "A resource-efficient Europe – Flagship Initiative under the Europe 2020 Strategy" COM(2011) 571

[192] Staub C. et al. 2011: Indikatoren für Ökosystemleistungen. Systematik, Methodik und Umsetzungsempfehlungen für eine wohlfahrtsbezogene Umweltberichterstattung. Bern: Bundesamt für Umwelt. Umwelt-Wissen Nr. 1102

[193] Six areas of action for a green economy. http://www.bafu.admin.ch/wirtschaft/11350/11721/index.html?lang=en

[194] Handbook of National Accounting: Integrated Environmental and Economic Accounting 2003. http://unstats.un.org/unsd/envaccounting/seea2003.pdf

plementation is based on international standards and a suitable balance between the benefits and costs of the survey process.

In the aforementioned decision on the green economy, the Federal Council also mandated the DETEC to examine in co-operation with the FDEA, the FDJP and the Federal Chancellery the possibility of enshrining the examination of the effects of draft legislation on resource efficiency and compatibility in the guide for the compilation of dispatches (Botsachaftsleitfaden) and in the context of regulatory impact assessment. This decision has already been implemented in the dispatches guide, hence the impacts of legislative changes on the environment, i.e. and on biodiversity, shall be presented more systematically henceforth. The next time the requirements for regulatory impact assessment are revised it shall also be necessary to check how biodiversity can be suitably taken into account.

7.7 Generate and disseminate knowledge

Challenge

Economic and social decision-makers influence biodiversity directly or indirectly through their daily actions. Conversely, they also benefit in a variety of ways from biodiversity as the central basis of life. Detailed knowledge about species, ecosystems and their services, and an understanding of how personal and political decisions influence biodiversity are the basis on which responsibility can be taken for the conservation of biodiversity. The precondition for this the availability of the necessary knowledge and information for the administration, practitioners, politicians and the public.

Goal

By 2020, sufficient knowledge about biodiversity is available to society and provides the basis for the universal understanding of biodiversity as a central pillar of life, and for its consideration in relevant decision-making processes.

Action fields

Information and awareness-raising: through communication activities, the Confederation, cantons and communes shall increase the awareness of all actors from society, policy and the economy as to the consequences of their actions and their consumption on biodiversity and the ecosystem services and how they can contribute to the conservation of both. Environmental product information shall take the entire life cycle into account and hence incorporate all relevant environmental impacts – including biodiversity. There are sufficient opportunities to enable all people to experience and encounter biodiversity and to forge an everyday relationship with it.

Education and consultancy: to reinforce the action competence of school pupils and apprentices, knowledge about the species that live in Switzerland, biodiversity and its value, the services provided by ecosystems, and the possibilities for conserving and promoting biodiversity and using it sustainably shall be enshrined in all curricula at all educational levels in the context of education for sustainable development.[195] The providers of further education and training, and non-school institutions like museums, zoological and botanic gardens, nature conservation centres etc. shall be supported in the planning and implementation of courses in the area of biodiversity. Consultancy services based on state-of-the-art knowledge and information shall be available to professionals from areas that are or could be of relevance to biodiversity.

Research: Swiss biodiversity research carries out cutting-edge basic and applied studies and makes a significant contribution to the resolution of urgent issues. This necessitates

[195] Cf. www.edk.ch/dyn/12048.php

efforts in the areas of data storage, merging and synthesis, and in the formation of theory in biodiversity research, in the implementation of innovative and experimental research on suitable spatial and temporal scales, in the establishment of long-term interdisciplinary research areas and in the networking of researchers to improve the access to new knowledge, methods and technologies and to improve their education and training. The networks and structures for this purpose must be improved. In addition to availing of the standard funding provided by the Swiss National Science Foundation (SNF), researchers should also participate actively in the invitations to participate in new National Centres of Competence in Research (NCCR), and submit proposals for new national research programmes in which the natural and technological sciences, humanities and social sciences and actors from other societal fields collaborate closely.

Knowledge exchange: existing and newly acquired knowledge shall be made available to the different actors in the administration, practice, business and politics. This requires stronger interfaces and an improved exchange of knowledge between science and other areas of society and target-group-appropriate processing, collation and synthesis of research findings.

7.8 Promote biodiversity in settlement areas

Challenge

Biodiversity must also have a place in settlement areas. It fulfils important natural and climate functions, and also promotes good health, recreation and awareness among the population. In the context of the partial revision of the Spatial Planning Act,[196] currently pending in parliament, measures are proposed for the limitation of settlement development and for inward settlement development. Green and open spaces in settlement areas must hence be increasingly secured and connected; above all, their quality must be improved in the interest of their multifunctional use.

Goal

By 2020, biodiversity in settlement areas is promoted so that settlement areas contribute to the connection of habitats, settlement-specific species are conserved and the population is able to experience nature in the residential environment and in local recreational areas.

[196] Revision of the Spatial Planning Act: 10.019 (indirect counterproposal to the Landscape Initiative)

Action fields

The potential offered by spatial planning for ecological connection and for the creation and maintenance of open and green spaces in settlement areas is not fully exploited by current practice. Biodiversity must also be able to fulfil its wide-ranging functions within settlements and in as many areas as possible.

In the context of the further development of agglomeration policy, the Confederation is already examining whether the development of open spaces should be adopted as an action focus in addition to the topics of settlements and transport. This mandate was to be complemented with the evaluation of the question as to the organisational and financial resources green and open spaces in settlement areas can be comprehensively promoted. This would enable the generation of synergies with high quality inward settlement development and the creation of an attraction location factor. One option would be to complement existing agglomeration programmes with a system of financial incentives for biodiversity and the landscape so that measures that go beyond communal and cantonal boundaries can be financed, and private actors can also be motivated to undertake measures in the area of biodiversity. However, new funding would have to be found for this.

With the increasing building densification, green and open spaces will come under greater pressure. Hence the cantonal and communal spatial planning instruments should contribute to designing settlements in such a way that the biodiversity developing there can be improved quantitatively (passability of settlement areas through corridors, individual areas, de-sealing, the greening of buildings) and qualitatively (design and functionality). The cantons and communes and private actors bear a great responsibility here. Near-natural open spaces and connection structures that can be accessed easily and quickly must be created, upgraded and conserved. Watercourses and water bodies, forests and open spaces play an important role here as does the way in which gardens, parks, roofs etc. are managed. The use of these open spaces as areas where people can meet promotes identification and attachment. To conserve the green and open spaces in settlements as a multifunctional network, to which private actors can also contribute, urban and agglomeration communes in particular must bindingly designate green and open space areas in the development areas in their land-use plans. In addition to the quantitative measures, the different actors should also be made aware of and receive further training in qualitative issues.

7.9 Strengthen international commitment

Challenge

In addition to conserving its own biodiversity, Switzerland is reliant on the conservation of biodiversity at global level for its economic and social well-being. The maintenance of the stability of ecosystems at global level is also in the interest of Switzerland. Hence, the efforts made at international level must be strengthened.

Goal

By 2020, Switzerland's commitment to the conservation of global biodiversity at international level is strengthened.

Action fields

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization[197] shall be ratified in Switzerland as soon as possible. This shall create a legal basis that will guarantee compliance with national regulations on the access to genetic resources. This will enable the guarantee-

[197] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity. www.cbd.int/abs/doc/protocol/nagoya-protocol-en.pdf

ing of fair and equitable benefit sharing. In the context of the Biodiversity Convention, the implementation of the Strategic Plan must be measured and supported and the concrete funding requirement for its implementation at global level, and particularly in countries of the South, must be solidly clarified.[198] Switzerland shall be able to provide the necessary finance to cover this funding requirement. Moreover, Switzerland shall support the allocation to the Global Environment Fund (GEF) of the necessary resources in the area of biodiversity and the increased effectiveness of the fund. Within the funding mechanisms and development programmes supported by Switzerland (e. g. World Bank, UNDP, REDD+ etc.), Switzerland shall continue to support sufficient attention being paid to the conservation of biodiversity and its sustainable use. The protection and conservation of biodiversity are also promoted through Switzerland's bilateral development cooperation.

In the area of economic development cooperation, Switzerland promotes projects that benefit biodiversity, and projects with negative impacts on biodiversity may not be supported. In addition, the development of and compliance with sustainability standards is also promoted within the economic development cooperation; this also includes the consideration of the impacts of projects on global biodiversity (cf. also the development of and compliance with sustainability standards in national and international trade in Chapter 7.1.9). [199]

In the context of its economic and trade policy,[200] Switzerland applies model provisions on trade and sustainability in free trade agreements and verifies the inclusion of additional sustainability provisions in investment protection agreements. Within the WTO, Switzerland contributes to the clarification of the relationship between WTO law and environmental law. Through these measures, Switzerland ensures that trade, environment and social standards develop in a mutually supportive way. The awarding of Swiss export risk insurance obliges the Confederation to demonstrate the absence of risk to global biodiversity in accordance with the applicable OECD environmental recommendation "Common Approaches on the Environment And Officially Supported Export Credits".[201] The implementation of environmental impact assessments should also be verified as an additional measure.

In the European context, Switzerland is committed in the context of its contractual relations with the EU and guarantees the compatibility of the measures with the EU's new Biodiversity Strategy.[202] It supports the activities of the European Environment Agency (EEA) and the network of the heads of European Nature Conservation Agencies (ENCA). Through its membership, Switzerland is also involved in the United Nations Economic Commission for Europe (UNECE), the OECD and the Bern Convention (European Council). To ensure the connection of Switzerland's ecological infrastructure with that of neighbouring countries, Switzerland also supports the European ecological connection projects,[203] the pan-Alpine connection of ecosystems

[198] The global financial requirement has not yet been defined. Its clarification is within the mandate of the Biodiversity Convention.
[199] In the context of its economic development cooperation, Switzerland already has programmes, which promote, for example the strengthening of sustainable biodiversity trade, the implementation of ABS, the protection of tropical forests and the development of sustainability labels in the international trade in raw materials.
[200] In particular in the WTO's Doha Round, in free trade agreements and in the area of investments.
[201] Joint approaches in the taking into account of environmental issues in state-supported export credits.
[202] The substantiation of the Strategic Plan at EU level was announced with the publication by the EU Commission of the EU's Biodiversity Strategy to 2020 on 3 May 2011. The Member States supported this plan on 21 June 2011 and defined recommendations for its implementation on 19 December 2011. The European Parliament commented on the Strategy in the first semester of 2012.
[203] For example, the EU's green infrastructure (Green Infrastructure. http://biodiversity.europa.eu/topics/green-infrastructure), the Ramsar Wetlands, the Natura 2000 network/Emerald network and the Important Bird Areas (IBA) etc.

through the ECONNECT[204] project and the Alpine Convention's Ecological Network Platform.

Because the forces of the multilateral institutions must be combined and contradictory resolutions avoided, the cooperation and synergies between the conventions in the area of biodiversity shall be improved.[205] Other multilateral agreements shall also take biodiversity issues into account in their decisions.[206] In particular, biodiversity safeguards[207] must be implemented in the climate sector. In the awareness that spatial concentration is conducive to these efforts, Switzerland supports, where possible, the concentration of biodiversity-relevant institutions in Geneva. Furthermore, Switzerland supports the work of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and affiliated organisations like the GBIF,[208] in the awareness that decision makers and relevant international forums are reliant on independent scientific analyses and reports on the status and development and action options for the promotion of the conservation and sustainable development of biodiversity at global, national and regional levels.

The following action fields, which were already discussed in detail in Chapter 7.1.9 on Production, services/trade and consumption, are also related to Switzerland's international commitment to biodiversity: the support of sustainable public procurement, the promotion of the development of and compliance with internationally recognised sustainability standards, the incorporation of global biodiversity impacts in national decisions and environmental product information.

7.10 Monitor changes in biodiversity

Challenge

The reliable observation of changes in biodiversity in Switzerland must be made possible. Based on the monitoring system that already exists today, a monitoring system shall be developed for all levels of biodiversity (diversity of ecosystems, species and genes). This is an important precondition for the monitoring of the implementation and success of national and sectoral environmental targets and the Swiss Biodiversity Strategy.

Goal

By 2020, the monitoring of changes in ecosystems and in species and genetic diversity is ensured.

Today's monitoring must be further developed substantively into a coherent system and also be guaranteed institutionally and financially.

Action fields

Important data sources are already available today in the context of existing monitoring programmes. These include, inter alia, Biodiversity and Landscape Monitoring Switzerland, the National Forest Inventory (NFI), the Swiss Federal Statistical Office's area

[204] ECONNECT aims to enhance ecological connectivity in the Alpine region. International umbrella organisations associated with the Alpine Convention, scientific institutions and local implementation partners have joined forces for this project. http://www.econnectproject.eu/cms/?q=homepage/en

[205] That is those between the Biodiversity Convention, the Ramsar Convention on Wetlands of International Importance, the Bonn Convention on the Conservation of Migratory Species of Wild Animals, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and UNESCO's World Heritage Convention.

[206] For example, the United Nations Framework Convention on Climate Change (UNFCCC) and the agreements established in the context of the FAO, the UNFF, the United Nations Forum on Forests, the WIPO and the WTO.

[207] Biodiversity safeguards = minimum requirements for the avoidance of obvious risks to biodiversity (Pistorius et al. (2010): Greening REDD+: Challenges and opportunities for forest biodiversity conservation. Policy Paper, University Freiburg, Germany)

[208] Global Biodiversity Information Facility (GBIF). www.gbif.org

statistics, the Federal Office of Agriculture's agricultural environmental monitoring and the Federal Office for Topography Swisstopo's topographical model. The gaps that still exist in the data shall be filled in the context of these programmes. New parameters shall be defined and selected as indicators based on the applicable strategy.

Programmes for the collection, geo-referencing and dissemination of biodiversity data shall be continued and further developed, interconnection of national, cantonal and other data centres shall be intensified and the comparability of the data shall be ensured.

To ensure the international comparability of data, the requirements for existing international reporting obligations are taken into account (e.g. indicators of the OECD, the European Environment Agency and the Ministerial Conference for the Protection of Forests in Europe or the Country Progress Reports submitted to FAO). The relationships with international monitoring and information systems are intensified.

Reporting shall be carried out in the context of existing reports. The results of the monitoring programmes, the evaluation of the success of measures and other instruments should be better combined, made publicly accessible and communicated more clearly. To this end, it is important to define an implement a meaningful set of indicators for biodiversity and its ecosystem services with long-term validity.

8 General Conditions for Implementation

The conservation of biodiversity and its ecosystem services does not represent a new task for either the Confederation or the cantons. They jointly perform this task as stipulated in the legislative acts, for example the Nature and Cultural Heritage Act (NCHA), the Agriculture Act (LwG), the Forest Act (ForA), the Waters Protection Act (WPA), the Hunting Act (HuntA) and the Fishing Act. The Swiss Landscape Concept (SLC) is also relevant to nature and landscape protection. Despite the efforts made up to now and individual positive developments, however, in view of the rapid and unstoppable deterioration in biodiversity, greater commitment on the part of society and, therefore, the Confederation and cantons is urgently required to conserve this fundamental basis of life. It should also be noted that in the view of the cantons, the Confederation has been restricting investment in the area of biodiversity for some years; the cantons would be prepared to increase their investments for the benefit of biodiversity. This fact is confirmed by the range of services offered by the cantons in the context of the programme agreements between the Confederation and cantons.

8.1 Implementing the Swiss Biodiversity Strategy

Development of an action plan through a participative process

Following the adoption of the Swiss Biodiversity Strategy by the Federal Council for the attention of parliament, an action plan shall be developed that describes the attainment of the strategic goals in concrete detail. The task involved in the development of the "Biodiversity Action Plan" is the definition of concrete measures for each of the strategic goals of the Swiss Biodiversity Strategy. Conflicts of interest with other Federal Council objectives shall also be identified and the necessary funding requirement defined. The action plan shall contain not only measures in the Confederation's sphere of responsibility but also activities that involve the cantons and communes and other actors involved in the area of biodiversity (e.g. economic and private actors). With respect to its implementation up to the year 2020, the action plan must also define the action requirement, corresponding targets, responsibilities and deadlines for each measure and estimate the costs associated with the different measures.

The action plan shall be available 24 months after the adoption of the Swiss Biodiversity Strategy by the Federal Council, at the latest. Within the DETEC, the FOEN shall be mandated with the project management for the development of the action plan. The relevant federal authorities shall be responsible for the development of the measures. The cantons and communes and other biodiversity actors shall be involved in the development and subsequent implementation of the action plan. This shall apply both on the level of the overall process, in the form of strategic support and integration, and in relation to the measures to be undertaken in the individual action fields. This will ensure the coherence of federal policies with impacts on biodiversity and, at the same time, the Confederation's strategic cooperation with the other actors will be strengthened during the implementation of the Swiss Biodiversity Strategy. The cantonal authorities will also be involved through their national representative bodies. This approach underscores the division of tasks between the Confederation, cantons and communes that is already applied today in the different areas of biodiversity protection.

With the action plan, the goals of the Swiss Biodiversity Strategy shall be integrated into all of the environment-relevant activities of the Confederation, canton, communes and private actors, and hence be underpinned by all sectoral policies as a joint responsibility for the conservation and promotion of biodiversity.

Legislative amendments

The contents of the Biodiversity Strategy are primarily based on existing legal provisions. These provisions have basically proven effective, however they will have to be adapted in places for the implementation of the strategy. The necessary amendments will be proposed following the authorisation of the action plan. The extent to which legislative amendments are required will be clarified in the context of the action plan. At the same time, as part of ongoing projects with impacts on the legislation, the extent to which the concerns of this strategy can be taken into account will be examined.

Eventual legislative amendments should be examined in the following areas in particular:

- the designation and guaranteeing of sufficient space for biodiversity and its interconnection in the long term «
- the creation of a biodiversity-specific federal planning instrument (sectoral plan or concept) as a basis for the resolution of conflicts of interest and for the exploitation of synergies; this instrument should take particular account of issues concerning ecological connection «
- the obligation of the Confederation and cantons to ensure the functioning connection of protected areas through specific measures (e.g. correspondingly used corridors) »
- the possibility for the financial promotion of species for which habitat protection is insufficient.

8.2 Organisation and cooperation

Implementation by responsible federal authorities

The FOEN shall support the implementation of the Swiss Biodiversity Strategy. The implementation of the measures defined in the action plan shall be carried out by the federal authorities responsible for the relevant sector with the involvement of the corresponding cantonal authorities and, if applicable, in cooperation with the private sector. The responsible federal authorities shall report periodically on the status of the strategy implementation.

Mobilisation of all partners

A policy for the conservation and promotion of biodiversity assumes the sharing of responsibility by the Confederation, cantons, communes, economic sectors and civil society (associations, organisations etc.). The areas influenced by biodiversity are so numerous and diverse that the success of the measures to be implemented will depend crucially on the mobilisation of all civil society partners and all of the responsible authorities.

No new structures

No specific additional structures will be created for the implementation of the strategy. Better use can be made of the existing structures and bodies, however (e. g. the Interdepartmental Working Group for the Implementation of the Biodiversity Convention in Switzerland). The action plan will clearly demonstrate whether and how existing structures and bodies will have to be adapted and modified. Where necessary it will also specify the wide-ranging and shared responsibilities in concrete terms.

8.3 Impacts on the environment, economy and society

Positive impacts of the Strategy on the economy and society

Various international research studies[209] demonstrate the high economic and social benefits arising from the conservation and promotion of biodiversity. The improvements in the area of the environment triggered by the strategy will also have a positive impact on the economy and society in the long term. In the short term, the effects will depend on which measures are actually taken and elements that cannot be definitively assessed at the level of the strategy but will emerge more clearly in the course of the development of the action plan.

The action plan and dispatch shall be evaluated in terms of their impacts on the environment, the economy and society. These studies will provide the basis for the balancing of protection and benefits and for the optimisation of the cost-benefit ratio. In the area of the economy, possible impacts in the sectors shall be evaluated as shall any possible additional financial burden on the state.

8.4 Financial and human resources

Resource requirement

The implementation of the strategy will require additional financial and human resources. The detailed ascertainment of the actual requirements for all participating partners and the definition of the nature of the financing will only be possible in the context of the development of the action plan and any necessary legislative amendments.

8.5 Evaluation of the Swiss Biodiversity Strategy

Interim report

It will have to be ensured that the effectiveness of the implementation of the Strategy can be monitored. To this end, an interim report shall be compiled by 2017 which will enable adaptations to be made to the implementation work if necessary. The interim report should answer the following questions in particular:

- Can the goals be achieved?
- Were the correct implementation strategies defined?
- Are the instruments and measures effective and efficient?
- Which conclusions and recommendations arise for the adaptation of the strategy and the action plan?

Overall evaluation

An overall evaluation regarding the implementation and efficiency of the strategy shall be carried out after 2020 (Art. 170 Federal Swiss Constitution). Both the interim report and the overall evaluation shall take the monitoring of changes in biodiversity into account in their analyses (Chapter 7.10). The Federal Council and the partners involved in the implementation of the strategy shall be informed of the results of all evaluations.

[209] Cf. for example TEEB – The Economics of Ecosystems and Biodiversity. Example: Report for Business – Executive Summary 2010.

Annexes

A1 Aichi Biodiversity Targets

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society

Target 1: By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Target 2: By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

Target 3: By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.

Target 4: By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use

Target 5: By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

Target 6: By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Target 7: By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

Target 8: By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

Target 9: By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.

Target 10: By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.

Strategic Goal C: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity

Target 11: By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Target 13: By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services

Target 14: By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Target 15: By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

Target 16: By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building

Target 17: By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

Target 18: By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Target 19: By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Target 20: By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011–2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.

A2 Consideration of the Aichi Biodiversity Target in the Swiss Biodiversity Strategy

No	Strategic Goal Swiss Biodiversity Strategy	Takes into account Aichi Target no(s)
1	By 2020, the use of natural resources and interventions involving them are sustainable so that the conservation of ecosystems and their services and of species and their genetic diversity is ensured.	4, 7
2	By 2020, an ecological infrastructure consisting of protected and connected areas is developed. The state of threatened habitats is improved.	5, 8, 11, 14, 15
3	By 2020, the conservation status of the populations of national priority species is improved and their extinction prevented insofar as possible. The spread of invasive alien species with the potential to cause damage is contained.	9, 12
4	By 2020, genetic impoverishment is decelerated and, if possible, halted. The conservation and sustainable use of genetic resources, including that of livestock and crops, is ensured.	13, 16
5	By 2020, the negative impacts of existing financial incentives on biodiversity are identified and avoided, if possible. Where appropriate, new positive incentives are created.	3
6	By 2020, ecosystem services are recorded quantitatively. This enables their consideration in the measurement of welfare as complementary indicators to gross domestic product and in regulatory impact assessments.	2, 3, 20
7	By 2020, sufficient knowledge about biodiversity is available to society and provides the basis for the universal understanding of biodiversity as a central pillar of life, and for its consideration in relevant decision-making processes.	1, 19
8	By 2020, biodiversity in settlement areas is promoted so that settlement areas contribute to the connection of habitats, settlement-specific species are conserved and the population is able to experience nature in the residential environment and in local recreational areas.	4, 7
9	By 2020, Switzerland's commitment to the conservation of global biodiversity at international level is strengthened.	6, 10, 16, 18, 20
10	By 2020, the monitoring of changes in ecosystems and in species and genetic diversity is ensured.	17, 19

A3 Designated Biodiversity Areas

Tab. 2 Designated biodiversity areas

Due to incomplete area statistics and the partially deficient quality of available georeferenced area information, it is extremely difficult to produce a precise overview of the protected areas in Switzerland. Overlaps are included in all of the figures presented in the table below.

Designated biodiversity areas	Area (ha)	% of national territory
National park	17 033	0.41
Biotopes of national importance[1]		
• Amphibian spawning areas	13,886	0.34
• Alluvial zones	22,639	0.55
• Raised bogs	1,524	0.04
• Fens	19,218	0.47
• Dry meadows and pastures	21,412	0.52
Aquatic and migratory bird reserves WZVV	22,164	0.54
Swiss game reserves	150,888	3.65
Emerald Network candidate sites	64,245 [2]	1.56
Forest reserves	61,000 [3]	1.48
Biotopes of regional and local importance	51,518 [4]	1.25
Buffer zone biotopes of national + regional importance	20,683 [5]	0.50
Third-party nature conservation areas	41,300 [6]	1.00
Areas designated in accordance with the Ordinance on Ecological Quality	59,000	1.43

[1] Total portion of the area, in the case of overlaps between biotopes of national importance only counted once: 73,296 ha = 1.79%
[2] Almost fully overlapping biotopes of national importance (Exception: Oberaargau)
[3] GIS analysis and estimate FOEN, status: end of 2011
[4] GIS analysis FOEN, data from 1995
[5] Estimate FOEN, 2011
[6] Pro Natura Leistungsbericht, 2010 (www.pronatura.ch/content/data/10_leistungsbericht.pdf)

A4 Strategies and Programmes with Interfaces to the Topic of Biodiversity

Name	Publisher	Website
General strategies and programmes		
Sustainable Development Strategy 2012–2015	Federal Council, ARE	www.are.admin.ch/themen/nachhaltig/00262/00528/index.html?lang=en
Forest		
Waldpolitik 2020 (Forest Policy 2020)	Federal Council, FOEN	www.bafu.admin.ch/wald/01152/11490/index.html?lang=de&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yuq2Z6gpJCGeoR7gGym162epYbg2c_JjKbNoKSn6A--
Agriculture		
Sachplan Fruchtfolgeflächen (Sectoral plan for crop rotation areas)	ARE, FOAG, FONES, FOEN	www.are.admin.ch/themen/raumplanung/00244/02186/02189/index.html?lang=de
Weiterentwicklung Direktzahlungssystem (Development of the direct payment system)	Federal Council, FOAG	www.blw.admin.ch/themen/00006/00514/index.html?lang=de
Water		
Guiding Principles for Swiss Watercourses: Promoting Sustainable Watercourse Management	FOEN, FOWG, FOAG, ARE	www.bafu.admin.ch/publikationen/publikation/00404/index.html?lang=en
Watershed Management – Guiding Principles for Integrated Management of Water in Switzerland	FOEN, SFOE, FOAG, ARE, Water Agenda 21	www.bafu.admin.ch/publikationen/publikation/01576/index.html?lang=en
Measures to reduce micropollutants	FOEN	www.bafu.admin.ch/gewaesserschutz/03716/11218/index.html?lang=en
Gesunde Fische in unseren Fliessgewässern: 10-Punkte-Plan (Healthy fish in our watercourses: 10-point plan)	Eawag, FOEN	www.bafu.admin.ch/publikationen/publikation/00926/index.html?lang=de
Tourism, sport and recreation		
Wachstumsstrategie für den Tourismusstandort Schweiz (Growth strategy for Switzerland as a tourism destination)	Federal Council, SECO	www.evd.admin.ch/themen/00129/01523/index.html?lang=de
Agriculture		
Landschaftskonzept Schweiz (LKS) (Swiss Landscape Strategy)	Federal Council, FOEN	www.bafu.admin.ch/publikationen/publikation/00836/index.html?
Landschaft 2020 (Landscape 2020)	FOEN	www.bafu.admin.ch/landschaft/00524/01676/01688/index.html?lang=de
Transport		
Sachplan Verkehr (Sectoral plan for Transport)	Federal Council, ARE, FEDRO, FOT	www.are.admin.ch/themen/raumplanung/00240/01406/index.html?lang=de
Settlement		
Agglomerationsprogramm (Agglomeration programme)	ARE	www.are.admin.ch/themen/agglomeration/00626/index.html?lang=de
Energy		
Energy Strategy 2050	SFOE	www.bfe.admin.ch/themen/00526/00527/index.html?lang=en
Konzept Windenergie Schweiz (Swiss wind energy strategy)	SFOE, FOEN, ARE	www.news.admin.ch/NSBSubscriber/message/attachments/18670.pdf

Name	Publisher	Website
Empfehlung zur Planung von Windenergieanlagen (Recommendation on the planning of wind energy plants)	SFOE, FOEN, ARE	www.bfe.admin.ch/themen/00490/00500/index.html?lang=de&dossier_id=04426
Switzerland's hydropower use strategy	SFOE	www.bfe.admin.ch/themen/00490/00491/index.html?lang=de&dossier_id=00803
Biomasse Strategie Schweiz (Swiss biomass strategy (takes precedence over the biomass energy strategy))	SFOE, FOAG, ARE, FOEN	www.bafu.admin.ch/biomasse/11126/index.html?lang=de
Biomasse-Energie-Strategie – Strategie für die *energetische* Nutzung von Biomasse in der Schweiz (Biomass energy strategy – strategy for the *energy* use of biomass in Switzerland)	SFOE	www.bfe.admin.ch/themen/00490/00496/index.html?lang=de&dossier_id=00726
SwissEnergy 2011–2020 – detailed concept	SFOE	www.bfe.admin.ch/energie/index.html
Energiestrategie Schweiz – Bericht zur Energieaussenpolitik der Schweiz – Umfeld, Herausforderung und Strategie (Swiss energy strategy – report on Switzerland's foreign energy policy – environment, challenges and strategy)	DETEC, FDFA, FDEA	www.news.admin.ch/NSBSubscriber/message/attachments/13414.pdf
Electricity Transmission Lines sectoral plan (SÜL)	SFOE, ARE	www.bfe.admin.ch/themen/00544/00624/index.html?lang=de
Concept and legislation for cost-covering remuneration for feed-in to the electricity grid	SFOE	http://www.bfe.admin.ch/themen/00612/02073/index.html?lang=en
Recommendations for the development of cantonal conservation and exploitation strategies for small hydropower plants	BAFU, BFE, ARE	www.bafu.admin.ch/publikationen/publikation/01593/index.html?lang=en
Sites, buildings and facilities in federal ownership		
Sachplan Militär (Military structure plan)	DDPS	www.vbs.admin.ch/internet/vbs/de/home/documentation/SPM.html
Education and research		
Fischer et al. 2010. Zukunft Biodiversitätsforschung Schweiz: Herausforderungen, Potenziale, Visionen, Roadmap: Ein Strategiepapier zuhanden der Schweizerischen Forschungsförderung, Forum Biodiversität der Akademie der Naturwissenschaften SCNAT, Bern (The Future of Biodiversity Research in Switzerland: Challenges, Potential, Visions, Roadmap)	SCNAT	www.biodiversity.ch/d/publications/position_papers/
Biodiversitätsdeklaration von Villars-sur-Glâne (Biodiversity declaration of Villars-sur-Glâne)	SCNAT	http://kongress10.scnat.ch/d/jahreskongress/praesentationen/documents/Deklaration Biodiversitaet-d-Layout.pdf
Consumption		
Integrated Product Policy (IPP) strategy	FOEN	www.bafu.admin.ch/produkte/01967/index.html?lang=en
Habitats		
REN (National Ecological Network)	FOEN	www.bafu.admin.ch/publikationen/publikation/00540/index.html?lang=de
Species		
Rote Listen	FOEN	www.bafu.admin.ch/tiere/07964/index.html?lang=en
Swiss Bird Species Recovery Programme	FOEN, SVS/BirdLife Switzerland, Swiss	www.bafu.admin.ch/publikationen/publikation/00083/index.html?lang=de

Name	Publisher	Website
	Ornithological Institute Sempach	
Lynx management	FOEN	www.bafu.admin.ch/tiere/09262/09327/09329/index.html?lang=de
Bear management	FOEN	www.bafu.admin.ch/tiere/09262/09285/09288/index.html?lang=de
Wolf management	FOEN	www.bafu.admin.ch/tiere/09262/09413/09415/index.html?lang=de
Biber-Konzept Schweiz 2004 (Swiss beaver concept)	FOEN	www.bafu.admin.ch/tiere/09262/09281/index.html?lang=de
Aktionsplan Flusskrebse Schweiz (Swiss crayfish action plan)	FOEN	www.bafu.admin.ch/publikationen/publikation/01600/index.html?lang=de
List of national priority species	FOEN	www.bafu.admin.ch/publikationen/publikation/01607/index.html?lang=de

Genetic diversity

Nationaler Aktionsplan zur Erhaltung und nachhaltigen Nutzung der pflanzengenetischen Ressourcen für Ernährung und Landwirtschaft (NAP-PGREL) (National action plan for the conservation and sustainable use of plant genetic resources for food and agriculture)	FOAG	www.cpc-skek.ch/deutsch/nap_projekte.html
Genetische Ressourcen bei den landwirtschaftlichen Nutztieren (Genetic resources for agricultural livestock)	FOAG	www.blw.admin.ch/themen/00233/00234/00247/index.html
Recommendations on the production and use of wild flower seed	SKEW	www.cps-skew.ch/english/recommendations_cps/recommendations_for_wild_flower_seed.html
ABS programme of the Swiss Academy of Sciences (SCNAT)	SCNAT	http://abs.scnat.ch/
Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising Out of Their Utilization	Convention on Biodiversity (CBD)	www.cbd.int/doc/publications/cbd-bonn-gdls-ge.pdf

Strategies and programmes under development

Massnahmenplan der Waldpolitik 2020 (Forest Policy Action Plan 2020)	DETEC, FOEN	This action plan, which explains the implementation of the Forest Policy 2020, is under development.
Agrarpolitik 2014–2017: Für eine produktive und nachhaltige Landwirtschaft (Agricultural Policy 2014–2017: For a productive and sustainable agriculture)	FOAG	www.blw.admin.ch/themen/00005/00044/01178/index.html?lang=de
Nationale Wasserstrategie (National water strategy)	FOEN in collaboration with the main users	www.parlament.ch/d/suche/seiten/geschaefte.aspx?gesch_id=20103533
Wasserversorgung 2025 (Water supply 2025)	FOEN (SGWA, cantons)	The main study is currently under development. The preliminary study was published as offprint no. 1511 from *Gas-Wasser-Abwasser* (2009).
Wasserentsorgung 2025 (Wastewater disposal 2025)	FOEN (Eawag, VSA, cantons)	The preliminary project began in 2011. The results are not yet available.
Raumkonzept Schweiz (Swiss spatial concept)	ARE (in consultation)	www.are.admin.ch/themen/raumplanung/00228/00274/index.html?lang=de
Room for People and Nature	WSL	http://www.wsl.ch/info/organisation/fpo/raumanspruch/index_EN
Suburbane Freiraumentwicklung (Suburban recreational spatial development)	ARE	www.are.admin.ch/themen/agglomeration/04191/index.html?lang=de
Bodenstrategie Schweiz (Swiss soil strategy)	FOEN	www.aramis.admin.ch/Default.aspx?page=Texte&projectid=27304
National adaptation strategy for climate change	FOEN	http://www.bafu.admin.ch/org/organisation/09477/09479/index.html?lang=en
Green economy	FOEN	http://www.bafu.admin.ch/wirtschaft/11350/index.html?lang=en

Acronyms and Abbreviations

ABS	Access and Benefit Sharing
AgricA	Agriculture Act
ARE	Federal Office for Spatial Development
BDM-CH	Biodiversity Monitoring Switzerland
CBD	Convention on Biological Diversity
COP	Conference of the Parties
Cst.	Federal Constitution
DDPS	Federal Department of Defence, Civil Protection and Sport
DETEC	Federal Department of the Environment, Transport, Energy and Communications
EEA	European Environment Agency
EU	European Union
FAO	Food and Agriculture Organization
FCh	Federal Chancellery
FDEA	Federal Department of Economic Affairs
FDJP	Federal Department of Justice and Police
FFA	Fish and Fisheries Act
FOAG	Federal Office for Agriculture
FOEN	Federal Office for the Environment
ForA	Forest Act
GEF	Global Environment Facility
HuntA	Federal Act on the Hunting and Protection of Wild Animals and Birds
IBA	Important Bird Areas
IPP	Integrated Product Policy
IUCN	International Union for Conservation of Nature
LKS	Swiss Landscape Concept
NCHA	Nature and Cultural Heritage Act
OECD	Organization for Economic Co-operation and Development
OEQ	Ordinance on Ecological Quality
REDD	Reducing Emissions from Deforestation and Degradation
REN	National ecological network (Réseau Ecologique National)
SECO	State Secretariate for Economic Affairs
SFOE	Swiss Federal Office of Energy
SPA	Spatial Planning Act
TEEB	The Economics of Ecosystems and Biodiversity
UN	United Nations Organization
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNECE	Economic Commission for Europe
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
UNO	United Nations Organization
UNWTO	World Tourism Organization, a United Nations agency
WIPO	World Intellectual Property Organization, a United Nations Agency
WPA	Waters Protection Act
WTO	World Trade Organization

Glossary

Abiotic environment	All environmental factors that do not involve living organisms. These include the climate, atmosphere, rock, water, heat, temperature and light.
Access and Benefit-Sharing (ABS)	ABS concerns access to genetic resources and the fair and equitable sharing of benefits arising from their use. The essential features of this mechanism are specified in the Convention on Biological Diversity and were further substantiated with the adoption of the Nagoya Protocol on ABS.
Aichi Biodiversity Targets	Twenty biodiversity targets for the period 2011–2020, which were adopted as a follow-up plan to the Convention on Biological Diversity in October 2010 at the Tenth Meeting of the Conference of the Parties to the CBD in Nagoya, Aichi Prefecture, Japan, (Aichi Biodiversity Targets). This plan specifies the current global targets for all international agreements and the requirements of the United Nations in relation to biodiversity.
Alien species	Species that also arise outside their natural ranges following the discovery of America in 1492. → Invasive alien species
Allergen	Substance that can trigger an overreaction of the immune system (allergy).
Alluvial zones	Habitats, in which the water from glaciers, rivers and lakes at lower altitudes come into intensive contact with land. Variations in the water level are typical of these areas. A distinction is made between lowland alluvial zones – riverine zones, deltas and lacustrine zones – and Alpine alluvial zones – glacier forelands and Alpine floodplains. Because the dynamics of the alluvial zones create a variety of different habitats, numerous animal and plant species are found in these ecosystems.
Ammonia, ammonia emission	Ammonia (NH_3) is an air pollutant. It is a major contributor to the acidification and nutrient enrichment of soil. Ammonia is mainly produced through the decomposition of organic substances. After agriculture, transport is identified an important source of ammonia emissions. Atmospheric ammonia can also contribute significantly to the particular matter in the air.
Aquatic	In biology, organisms whose lives are based in water, for example fish, some invertebrates and amphibians, and plants, are referred to as aquatic.
Bern Convention	International convention on the conservation of European wildlife and natural habitats. Forty-two European states, four African states and the European Community have ratified this binding international legal agreement of the Council of Europe (Switzerland in 1982; SR 0.455).
Biodiversity	Biodiversity incorporates species (→ species diversity), the diversity of their genes (→ genetic diversity), the diversity of ecosystems and the interactions within and between these individual levels.
Biological diversity	→ Biodiversity
Biomass	All organic material arising from or generated by plants, animals, people and other organisms. Biomass can be used as a both a primary (food, fibres, construction wood) and secondary (energy generation from wood and agricultural residues) raw material.
Biotope	Habitat of a biotic community with typical environmental conditions. According to the Federal Act on the Protection of Nature and Cultural Heritage (NCHA; SR 451) also a synonym of → Habitat.
Biotope trees	Trees with a particular significance for flora and fauna as they present natural holes and woodpecker caves, crown deadwood, fungal infestation and other damage. Hence they provide habitats for specialised animal, moss and lichen species. Biotope trees are often old trees.
Biotopes of national importance	Alluvial zones, mires, amphibian spawning sites, mire landscapes, and dry meadows and pastures. The inventories of biotopes of national importance are an important cornerstone of Swiss federal

	biodiversity policy.
Bonn Convention	International treaty of 1979, i.e. Convention on the Conservation of Migratory Species of Wild Animals (CMS), which was ratified by Switzerland in 1995 (SR 0.451.46). The Convention secretariat is located in Bonn and is operated under the auspices of the United Nations Environment Programme (UNEP).
Breeding	Controlled, targeted pairing of selected animals or plants with the aim of passing on desired characteristics to their offspring.
Buffer zone, buffer strip	Areas with considerably reduced intensity of land use which border a sensitive, semi-natural habitat (e.g. fens, oligotrophic grassland). Ideally, they absorb diffuse nutrient inputs before they can reach the sensitive habitat.
Cartagena Protocol	International agreement on biosafety named after the location of its final negotiation, Cartagena, Colombia. A supplementary agreement to the Convention on Biological Diversity (SR 0.451.431), the Cartagena Protocol entered into force in 2003 and bindingly regulates the cross-border transport, handling and treatment of genetically modified organisms at international level for the first time.
Climate	All weather conditions that can arise in a location, including their typical sequence and daily and seasonal fluctuations.
Climate change	Change in the climate over the course of time that can be identified on the basis of a change in the mean value or fluctuation range of its characteristics, and which endures for an extended period, typically decades or even longer. Climate change can arise due to internal natural fluctuations, external forces or permanent anthropogenic changes in the composition of the atmosphere or land use. The consequences of climate change include temperature increase, extreme rainfall and persistent drought.
Climate protection	Umbrella term for all efforts undertaken to counteract climate change.
Compensation for degradation of habitats deserving of protection	The creation of a new habitat in a different location to replace an degraded or destroyed habitat. Compensation may be considered as appropriate in accordance with Art. 18 Section 1ter NCHA if the new habitat is ecologically equivalent to the degraded one. The compensation habitat is located in the same area as the intervention, and is typical of the area and ecologically sound in terms of the affected natural or cultural area. In this context, the compensation measure is primarily based on the nature and function of the degraded object. The temporal gap between the intervention and the functioning of the compensation habitat should be taken into account.
Conference of Parties, COP	Political body and decision-making instance of the Convention on Biological Diversity → Convention on Biological Diversity (CBD)
Connection	→ Ecological connection
Convention on Biological Diversity, Biodiversity Convention (CBD)	This international legally binding treaty on the protection of biological diversity, which was opened for signature at the Earth Summit in Rio de Janeiro, the United Nations Conference on Environment and Development (UNCED), was ratified by Switzerland in 1994 (SR 0.451.43). → Earth Summit Rio
Crop	Plant species systematically cultivated by humans and subject to harvesting or breeding.
Cultural landscape	Landscape formed through its use by humans over the course of history, shaped by the forms of use and characterised by predominantly anthropogenic ecosystems (unlike natural landscape).
Direct payments	Direct payments constitute a central component of Swiss agricultural policy. They enable the separation of price and income policy and compensate for the services that society requires agriculture to provide. A distinction is made between general and ecological direct payments.
Dry meadow/pasture	Dry, nutrient-poor and species rich meadows and pastures. They are frequently mowed for hay production but also arise naturally in alluvial zones and in the rock steppes of the Inner Alps. In some cases they are also used for autumn grazing. If they were not farmed, these areas in Central Europe would mainly be under forest

	cover.
Ecological compensation in accordance with the NCHA	Umbrella term for measures implemented for the conservation and rehabilitation of the functions of habitats and their interconnection in intensively farmed or densely populated cultural landscapes. The aim of ecological compensation is to promote natural species diversity. The term has been enshrined in the Ordinance on the Protection of Nature and Cultural Heritage (NCHO) since 1991.
Ecological compensation on agricultural lands in accordance with AgricA, now known as biodiversity priority areas	Measure aimed at conserving and promoting the biodiversity of the cultural landscape through the provision of financial incentives for the creation of ecological compensation areas on agricultural lands, for example wildflower strips, hedges, extensive meadows or extensively farmed areas. The term originates from the Ecological Contributions Ordinance, (Öko-Beitragsverordnung, OeBV) of 1993.
Ecological connection	Ecological connection refers not only to the creation of a few connection axes for some large wild mammals but also to a system of linked habitats, in which all species that may be present in a location can form at least one → Metapopulation.
Ecological infrastructure	Extensive network of protected and connected areas that extends throughout the country and links areas with a high number of specialised species and habitats with each other. It guarantees the distribution of species and this, in turn, maintains the functionality of ecosystems. The ecological infrastructure is integrated into a general Europe-wide network which ensures the connection with protected areas near borders and ecological corridors abroad.
Ecological succession	The natural process by which plant communities or vegetative phases change and develop: grass phase – shrub phase – bush phase – tree phase.
ECONNECT	Project that aims to achieve an ecological continuum across the Alps. International umbrella organisations associated with the Alpine Convention, scientific institutions and local practitioners have joined forces for the implementation of the project.
Ecosystem	Dynamic complex consisting of a community of flora, fauna and microorganisms and their inanimate environment which interact with each other. → Habitat → Biodiversity
Ecosystem service	The components of biodiversity provide services either themselves or through their interaction, without which human life would be inconceivable and which contribute to human well-being. Examples of ecosystem services include the water supply, the formation of fertile soil, pollination and pest control, erosion control, avalanche protection by forests, recreation through the provision of recreational areas in urban and remote areas, and the provision of valuable landscapes for commercial use in tourism. Part of the ecosystem services are referred to as → Landscape services.
Emerald Network	Pan-European network of protected areas for the preservation of endangered species and habitats of European significance. Based on the Council of Europe's Bern Convention. → Natura 2000
Emission	Release of substances (gases, particulate matter) and energy (heat, radiation, noise) into the environment. The released substances are also known as emissions.
Endangered species	A species that is at risk of extinction on the basis of the crucial criteria for its survival (e.g. IUCN 2001, 2003). → Red Lists
Endocrine disruptors	Non-endogenous substances which, due to their structure and functioning, affect living organisms like hormones or influence their hormonal balance. Even very small volumes of these substances can have an enormous impact.
Environment	A very general term which is used to refer to everything external to a certain point of reference – usually an organism – that affects it.
Environmental policy integration principle	Environmental policy can only be effective if its requirements are considered and taken into account in the context of other policies (transport, foreign trade, energy etc.).
Erosion	Removal of soil due to the effects of wind and water. The natural process of erosion can be intensified through human soil management activities (in particular arable farming and forestry).

	Genetic erosion arises on the level of the genetic diversity of bred varieties or breeds (vascular plants, fish, breeding birds etc.).

Extensification	Reduction in the use of yield-boosting inputs (e.g. fertiliser, pesticides) or reduction in intensity (e.g. stocking density per ha) and/or work per unit of area.
Extensively managed, extensively used	→ Extensification
Fauna	Animal world
Fish passability	A watercourse is fish passable if fish are provided with a means of overcoming obstacles (weirs and waterfalls) in the course of fish migration.
Flora	Plant world
Fragmentation	Active anthropogenic fragmentation of habitats through linear interventions in the landscape (e.g. road and rail construction, energy lines, construction). More, usually isolated, habitats arise through the fragmentation of a previously contiguous habitat (and of the species that live in it).
Gene	Information unit within the genetic code (DNA) that contains information about the inheritance of an organism's characteristics.
Genetic diversity	Diversity within species and hence the genetic variability between individuals and populations of the same species. Genetic diversity and exchange between individuals is the basis for the emergence and adaptability of species (evolution). → Biodiversity, → Species diversity
Genetic resource	Genetic material of actual or potential value. Genetic material is all material of plant, animal, microbial or other origin containing functional units of heredity.
Geothermal energy	The heat stored in the accessible part of the earth's crust. This heat is used as a regenerative energy source.
Global warming	The warming of the earth's climate due to the increasing concentration of carbon dioxide and other gases in the atmosphere mainly arising from the combustion of fossil fuels and global forest loss.
Grassland	Agriculturally used land, on which grass and herbaceous plans grow as permanent crops and which is either grazed or mowed is referred to as grassland.
Habitat	Community of flora, fauna and microorganisms and their non-living environment, excluding the interactions between them. → Ecosystem, → Biotope
Habitat improvement	Habitat improvement is an umbrella term used to described temporary measures resulting in the improvement of the current state of a habitat (e.g. biotope). The improvement may be measured on the basis of both the state of the habitat and the processes that arise within it. Habitat improvement can also be considered as the "ecological enhancement" of a habitat (e.g. the creation of a new amphibian pond in an alluvial zone) and does not necessarily aim to re-establish a former state, unlike → Renaturation.
Habitat specialists	Species that rely on certain habitats for their survival (e.g. mires, springs, ponds).
Hybridisation	The crossing of genetically different subspecies, species or genuses.
Ecological connection	Ecological connection refers not only to the creation of a few connection axes for some large wild mammals but also to a system of linked habitats, in which all species that may be present in a location, can form at least one → Metapopulation.
Invasive alien species	Species that are introduced intentionally or unintentionally into areas outside their natural range and are capable of becoming established there and supplanting native species. They have undesired effects on other species, biotic communities and habitats and can also cause health problems or transmit diseases. Invasive alien species are characterised by an efficient spreading capacity and very high adaptability and competitive superiority. They often have few natural enemies in new habitats. → Alien species.
Landscape	Landscape includes all areas as we perceive and experience them. Landscapes spatially form the living and experienced environment of humans and enable both individuals and societies to fulfil their

	physical and psychological needs. Landscapes fulfil a wide range of functions as a resource. They provide living, working, recreational and identificational space of humans; settlement areas and habitats for humans, animals and plants, wide-ranging recreational and identificational space and a spatial expression of the cultural heritage. They also contribute to the creation of value. Landscapes are dynamic interactive structures and constantly develop on the basis of natural factors and through their use and shaping by human beings.
Landscape protection	Landscape protection incorporates all measures aimed to conserve, promote and shape elements of the landscape that are natural, man-made and perceived as beautiful, both in their typical regional manifestation and in their interaction.
Landscape services	Landscape services are landscape functions that benefit humans (e.g. as economic and location factors, for identity and cultural heritage, recreation and health) and provide a spatial basis for biodiversity and the regenerative capacity of natural resources.
Livestock	Animals that do not live in the wild, are accustomed to humans to a greater or lesser extent and whose value is predominantly associated with their commercial purpose (e.g. cows as milk suppliers).
Market-based instruments	For example: taxes, subsidies, tradable certificates, a polluter-pays liability and property law regime and, more generally, voluntary agreements and labels.

Metapopulation	Group of subpopulations with a limited gene exchange between them. Such subpopulations may become extinct.
Microorganisms	Microscopically small organisms that are not usually visible as individuals to the naked eye. They include, inter alia, bacteria, viruses, single-celled algae and many fungal species.
Monitoring	Type of direct systematic recording, observation or monitoring of a process using technical tools or other monitoring systems.
Nagoya Protocol on ABS	International agreement for regulating the access to genetic resources and the benefits arising from their use which was adopted in October 2010 at the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity. → Access and Benefit-Sharing (ABS)
Native species	Species whose natural range or regular migratory area is (or was historically) located within a country or extended naturally into a country.
Natura 2000	Coherent network of nature protection areas that is being established within the European Union under the provisions of the Habitats Directive. Its objective is to provide protection at European level to endangered, wild, native animal and plant species and their natural habitats. In Switzerland, Natura 2000 corresponds to the → Emerald Network.
Natural	An original state determined by nature and unaltered by human intervention.
Natural diversity	Term previously used for → Biodiversity.
Natural forest regeneration	Establishment of a new tree stand without planting but through seeding from old trees.
Natural landscape	Landscape that has remained untouched by direct human activities and is based solely on the interaction of currently prevailing natural ecological factors.
Natural resources	Natural raw materials which provide inputs for the economic system and are made available by nature or the environment.
Nature conservation	Nature conservation is understood as all methods implemented with the aim of conserving and promoting natural goods and the values assigned to them throughout the landscape for ecological, economic, ethical, historical, aesthetic and emotional reasons. These natural values include biodiversity as defined by the → Rio Earth Summit (→ Biodiversity Convention) and the diversity of inanimate natural phenomena.
Near-natural intervention	Responsible intervention in nature or management of a natural resource to ensure that its ecological sustainability is guaranteed.
Near-natural silviculture	Near-natural silviculture steers forest development with the aim of sustainably fulfilling economic, ecological and social objectives while being based on natural processes.
Nutrient cycle	Nutrients are part of a permanent cycle. For example, many plants absorb nutrients from the soil through their roots and use them for their metabolism. If these plants are eaten, if they die or lose their leaves in autumn they are eventually mineralised by soil organisms. In this way, the nutrients are made available again for other organisms.
Ordinance on Ecological Quality (EQO)	Legal basis for the establishment of high quality and connected compensation areas.
Parasites	Animals or plants that exist at the cost of another organism, usually by withdrawing nutrition from them internally or externally, or obtain other services from them. Well known parasites, include fleas.
Physiological race	A group of individuals from an animal species which has characteristics that differ from a different group from the same species. Cross-breeds within a physiological race are possible. Physiological races arise through regional isolation (geographical race) and through different basic needs (ecological race). → Subspecies, → Variety
Pioneer flora	A plant species that colonises a previously uncolonised area. It has special capacities to adapt to the colonisation of new areas that are not yet colonised, e.g. high and rapid rate of seed production, wind

	dispersal of seeds, tolerance to extreme environmental conditions. Typical pioneer species are uncompetitive and tend to be superseded by other species in the course of biological succession (sequence of plant communities in a site).
Pioneer vegetation	→ Pioneer flora
Polluter-pays principle	The principle whereby the cost of actions that cause damage to biodiversity should be borne by the person or persons who caused the damage and not by the community.
Population	All of the individuals of a given species that live in a habitat (the degree of self-containment of which may vary) and constitute a natural reproductive community.
Precautionary principle	Principle whereby potential threats and damage to biodiversity should be prevented, if possible, or at least minimised through early and anticipatory action.
Priority species	Priority species are designated on the basis of the following criteria: degree of vulnerability, rarity, Switzerland's responsibility for the survival of the species in question and the suitability of the instruments used for its protection.
Protected area	A geographically defined area that is defined and protected on the basis of the implementation of certain conservation objectives and is subject to biodiversity-specific management.

Public goods	Goods, for which consumption by additional users cannot be excluded (non-excludability) and for which an additional user does not generate additional costs (lack of rivalry in consumption), for example clean ambient air and quiet.
Ramsar Convention	International Convention on Wetlands of International Importance especially as Waterfowl Habitat. An international treaty signed in 1971, the Convention is one of the oldest international treaties on environmental protection. It was ratified by Switzerland in 1976 (SR 0.451.45).
Red Lists	Red Lists indicate the current category of endangerment of native fungus, plant and animal species. The Red Lists are compiled by experts in accordance with internationally binding and objectively demonstrable criteria. They provide a basis for nature conservation and provide an overview of the changes in species diversity and the situation with regard to species endangerment. Red Lists are a legal instrument of nature conservation. Red List species must be taken into considerations in all activities with an impact on nature.
Regeneration	A form of → Renaturation. Measures (e.g. deactivation of drainage systems, retention systems) for the re-establishment of wetland-forming and long-term self-regulating hydrological processes in raised bogs and fenlands.
Renaturation	Return of an anthropogenically altered habitat to a near-natural state; re-establishment, in principle. Unlike → Habitat improvement, renaturation mostly involves structural measures. Depending on the habitat, the term used for such measures is renaturation (e.g. small flowing watercourses), → revitalisation (alluvial zones) or → regeneration (mires).
Réseau Ecologique National (National Ecological Network) (REN)	The aim of the Swiss National Ecological Network project is to connect populations and habitats and to provide a planning aid and instrument for the protection of species diversity and the landscape. Using detailed maps, it indicates ecological priority areas and their interconnection axes.
Resilience	Capacity of an ecosystem to tolerate disturbance without collapsing in a way that results in the emergence of a qualitatively altered systemic state in the long term.
Resources	Stocks of a material and immaterial nature, the availability of which is usually limited. Natural resources are referred to as natural goods.
Revitalisation	A form of → Renaturation. Measures (e.g. dismantling of control structures) for the restoration of the dynamic water and sediment processes in impaired alluvial zones. The cantons are obliged to undertake the revitalisation of watercourses and water bodies in accordance with the waters protection legislation.
Rio Earth Summit	United Nations Conference on Environment and Development (UNCED). Among other things, the → Convention on Biological Diversity (CBD) was passed at the Conference of 1992 which took place in Rio de Janeiro.
Sectoral environmental objectives	Project of the Federal Office for the Environment, in which environmental objectives are defined in cooperation with the relevant sectors.
Sectoral plan for crop rotation areas	Crop rotation areas are part of the areas suitable for agriculture. They include arable farmland, to begin arable land and artificial pasture in rotation, and arable natural meadows. The Sectoral Plan for Crop Rotation Areas came into force in 1992 and is intended to protect the most suitable agricultural land from development and ensure the long-term supply.
Soil functions	Services that soil can provide based on its various characteristics. Soil fulfils wide-ranging existential functions for microorganisms, flora, fauna and people, and also for the energy, water and mass balance.
Soil sealing	Covering of land surfaces (e.g. by asphalting, concreting, construction) which results in the loss of natural soil functions (habitat, water and nutrient cycles, filtration and buffer characteristics).
Spatial planning	Coordination of activities that affect space and their control over a

	extended periods. Spatial planning encompasses all public planning processes at all state levels.
Species diversity	Synonymous with number of species. A component of biodiversity (→ Biodiversity).
Species promotion	The conservation and promotion of priority, usually threatened or rare species in terms of their genetic diversity, spatial distribution and population density through specific measures that go beyond biotope protection measures.
Subspecies	Systematic unit designating individuals within an animal or plant species from a certain region with conspicuously similar features. → Physiological race → Variety
Sustainable development	A development is sustainable if it guarantees that the needs of today's generation are satisfied without limiting the possibilities available to future generations.
Sustainable use	The use of components of biodiversity and other natural resources in a way and on a scale that do not lead to a long-term decline in biodiversity and/or natural resources.
Terrestrial	Living or arising on the land
Toxic	Poisonous
Typical species	A species that is representative of a certain habitat. Such species constantly arise in this habitat and form part of its spatial delineation criteria.
Urban sprawl	Increasing mosaic-like interspersion of a contiguous landscape area due to human settlement activity (e.g. with residential settlements, agricultural area and infrastructure).
User-pays principle	Principle whereby the user of an environmental resource pays compensation to the person who conserves (or improves) the quality of a resource and suffers loss of income or benefits by refraining from using the environmental resource in question.
Variety	Group of individuals in a plant species which differ from other groups from the same species. → Physiological race, → Subspecies
Wildlife corridor	Wildlife corridors are "traffic routes" prioritised by wildlife for migration and bounded by areas of human land use. Within a species range they act as a kind of large-scale link between circumscribed and isolated habitats of populations or parts of populations and, hence, also for genetic exchange. Of the approximately 300 wildlife corridors of national importance in Switzerland, only around one fifth can be used free of disturbance. The main obstacle to the passability of the corridors is their intersection with the human mobility network.
Wildlife passage	Wildlife passages are structures that are built to bypass existing or planned transport routes and through which the migration options for wild animals can be conserved or re-established. They also play a role in traffic safety.