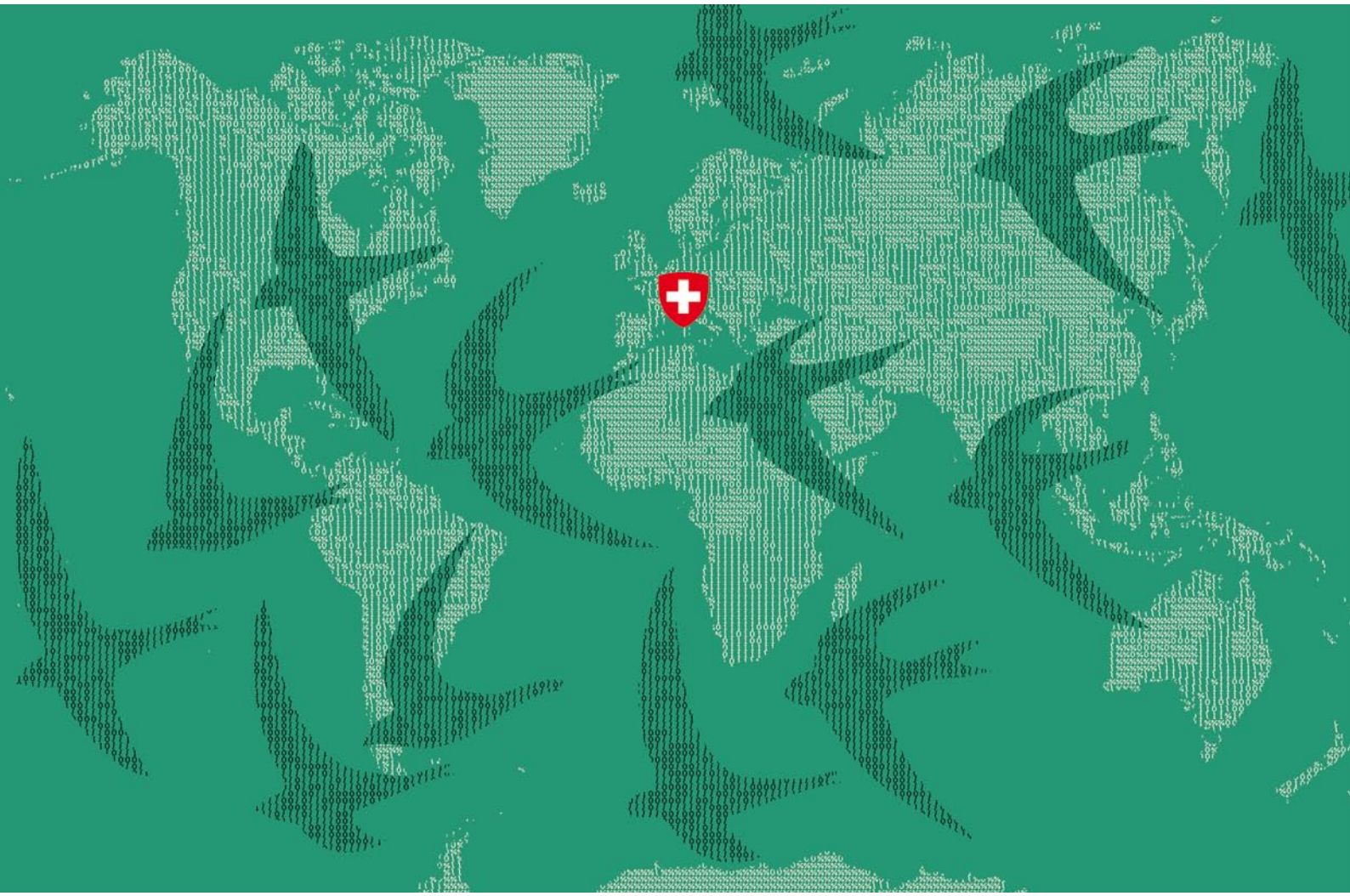
Switzerland's Fourth National Report under the Convention on Biological Diversity



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Executive Summary

Our landscapes are subject to continuous processes of change. Changes in ecosystems, the growth of settlements, globalisation and climate change are an expression of such change and in part also its cause. Our efforts to support biodiversity are showing initial signs of success, especially in forests. The most important goal, however, is to halt the general loss of biodiversity. That goal has not yet been achieved. Especially in the Alps, with their, in many respects, outstanding natural assets, it is vital that emerging negative developments be averted.

Status and trends in Switzerland's biodiversity

Agricultural biodiversity

There has been some progress in agricultural ecosystems in terms of working towards the environmental objectives recently set out by the Swiss Confederation. 11.4 % (121 000 ha) of the utilised agricultural area was transformed to ecological compensation area. However, the overall result still needs to be improved. In the plains, 72 % of extensively farmed grasslands and 80 % of low intensity farmed grasslands fulfil the basic requirements as ecological compensation but fall short of the additional quality targets aimed by the Ecological Quality Ordinance.

Biodiversity Monitoring Switzerland has recorded a slight increase in mean species richness in Swiss meadows since 2001. First analyses show that this increase is mostly due to the continued spread of common plant species of fertilised meadows. One actual aim of the Confederation is to promote characteristic, rare or endangered species on agricultural lands, especially by improving the quality of ecological compensation areas.

Forest biodiversity

Almost one-third of the country’s area is covered by forests. However, there are large regional differences. Whilst only about 24 % of the Central Plateau is forest covered, forests cover more than 40 % of the land on the southern side of the Alps and on the Jura.

About 400 km2 of forest areas are declared as protected forest areas, which corresponds to 3.2 % of Switzerland’s forested area. In addition to the protected areas, in 18 % of Swiss forest area, no harvesting operations or human interference took place in the last 50 years, which adds to the undisturbed natural forest area. However, areas of forest wilderness are rare, since 90 % of the Swiss population regularly hike in forests, especially during summertime

Forest biodiversity is also influenced by under-exploitation. In Switzerland the stock of wood increased by 13 % between 1983/1985 and 1993/1995, and by 3 % between 1993/1995 and 2004/2006 due to lack of exploitation and the increase of forest area. As a result, many forests have become denser and

darker. An analysis confirms that these forests are less diverse than more intensively managed forests. Therefore, forest exploitation adapted to the local conditions can be important for the conservation of biodiversity.

Nevertheless, it can already be noted that Swiss forests are developing in the direction set out in the Swiss Forest Programme for 2004–2015 (WAP-CH) and in other programmes for biodiversity conservation and promotion. Further steps on the path towards biologically more diverse forests have been completed successfully.

Inland waters

With abundant freshwater resources, Switzerland can be considered as part of the water reservoir of Europe. Inland waters are of particular importance for conservation in Switzerland as they include a high diversity of habitats and species.

It is estimated that 35 000 km (or 54 %) of Switzerland's watercourses are in an eco-morphologically natural/near-natural state (Figure 11). A total of 14 000 km of watercourses are classified as insufficient with, among other adverse factors, 101 000 artificial barriers higher than 50 cm strongly affecting the rivers' ecological functions. The proportion of rivers with insufficient eco-morphological status varies between regions, with 15 % in the Alps, 36 % in the Jura, 38 % on the Central Plateau. This rate is highest in the densely populated alpine valleys below 600 m asl. (46 %).

Significant progress has been achieved in limiting the input of nutrients into Swiss lakes, especially phosphorous. The benefits for biodiversity might, however, be at risk due to increased pollution from pesticides, pharmaceutical residues and other micropollutants, but also due to the warming of Swiss watercourses as a consequence of global change and, last but not least, the heavy invasion of alien species, as observed in the Rhine River.

Dry and subhumid lands

Even though Switzerland is situated outside the delineated areas of the global drylands, patches of dry and subhumid meadows and pastures exist all over the country. These meadows and pastures are species-rich habitats developed from extensive agricultural use.

The Federal Office for the Environment has drawn up an inventory of dry meadows and pastures of national importance and established an instrument to secure the conservation of the sites, which mainly consists of contracts between farmers and competent cantonal authorities. By February 2010, a total of 2 934 sites covering 21 398 ha are protected by law.

Mountain biodiversity

The Alps are of outstanding importance for biodiversity in Switzerland, especially the high altitude zones. Despite modern developments, the Alps have maintained most of their biodiversity, not least due to their extreme topography. The species

richness of meadows and pastures as well as forests in the subalpine and alpine zones clearly stands out from those at lower altitudes. And nowhere else but in the Alps can such expanses of largely natural habitats be found: rocks and boulder fields, dwarf-shrub communities, peatlands and forests, all largely free of human intervention. Not only individual ecosystems but whole landscapes in the Alpine regions host greater species diversity than the Central Plateau, at least as far as vascular plants and butterflies are concerned.

Switzerland has a special responsibility for the Alps as a biodiversity hotspot. Alpine plants and animals often have a more limited distribution than species of lower altitudinal zones, and are therefore generally at greater risk of extinction. While there are very few plant and animal species that exclusively occur in Switzerland, about a quarter of the range of some 150 vascular plant species endemic to Central Europe lie on Swiss territory. These endemic species are predominantly mountain plants that grow at high and highest altitudes. They occur on both farmed and natural sites.

Switzerland's approach to biodiversity conservation and sustainable use

Change is an inherent part of life and human culture. Man‘s influence on the environment has been evident for thousands of years. Only in recent times have we begun to reflect upon the consequences of our actions on nature and to influence outcomes through targeted actions. This has resulted in new acts and ordinances such as the Swiss Forests Act (Waldgesetz), the Nature and Cultural Heritage Protection Act (Bundesgesetz über den Natur- und Heimatschutz, NHG), federal habitat protection schemes and the Federal Inventory of Landscapes and Natural Monuments of National Importance (Bundesinventar der Landschaften und Naturdenkmäler von nationaler Bedeutung, BLN). Conservation efforts have intensified considerably over the past 15 years. Examples of such efforts include ecologically focused direct payments to farmers, organic farming, the NHG-based contributions system for habitat protection, the Landscape 2020 programme, Biodiversity Monitoring Switzerland (BDM) and the forest programme for 2004–2015. As outlined in the sections on forests and agriculture in this report, positive impacts of these measures have become evident. However, economic conditions continue to fundamentally shape the type and intensity of land use to a greater extent than the mostly governmental steering measures. It is these economic conditions that explain the differences in the state of biodiversity in farmland and forests.

Outlook

The Convention plays an important role in raising awareness of biodiversity, especially regarding the determined efforts to mainstream biodiversity concerns not only at the international and regional level, but also at the national level. In recent years, new national instruments were developed and a national

biodiversity strategy is currently being detailed. However, all these instruments will need time to have an effect on biodiversity.

Based on experience and an assessment of the threats to biodiversity in Switzerland, priority fields of concern can be identified, including:

- Raising awareness of the role of biodiversity for our existence;
- Accounting for ecosystem services within the policy framework;
- Strengthening the mainstreaming of biodiversity, especially in the private and the producing sector;
- Securing adequate and good quality space for biodiversity;
- Strengthening the commitment for international biodiversity conservation, sustainable use and the sharing of benefits arising out the utilizations of genetic resources among all relevant national stakeholders.

Contents

1 BIODIVERSITY STATUS, TRENDS AND THREATS

1.1 An Overview

Switzerland is a landlocked country in the heart of western Europe with a total area of 41 290 km^2 and with 7.6 million inhabitants. The country consists of 279 095 ha of settlements and urban areas, 1 525 119 ha of agricultural areas, 1 271 645 ha of wooded areas and 1 052 617 ha of unproductive areas such as lakes, rivers, unproductive vegetation, bare land, glaciers etc.[1]

Topographically, Switzerland is characterised by the Central Plateau lying between the Jura mountains in the north and the Alps in the south. This results in important altitudinal differences, ranging from 195 m asl (Lake Maggiore) to 4 634 m asl (Dufourspitze).

The Alps significantly influence climatic conditions by dividing the oceanic climate in the northern part of the country from the continental climate in the central alpine valleys and from the insubric climate in the south of the country.

The complex topography together with the various climate types allow for six distinct biogeographic regions to be discerned (Figure 1). The six regions form the basis for biodiversity analysis at the national level.

Figure 1: Biogeographic regions of Switzerland (Source: Biodiversity Monitoring Switzerland).

1.1.1 Overview of ecosystems and habitats

Switzerland is characterised by a high diversity of natural habitats. The observed diversity is in part due to the spatial and climatic variability as well as the diversity of bedrock and soil properties (see section 1.1), but is also a

1 FOEN / FSO (eds.), Swiss Environmental Report 2007,Berne and Neuchâtel, 148 pages.

result of human activity. Especially in mountainous regions, traditional extensive agricultural practices have created a multitude of microstructures (e.g. dry stone walls) and biotopes (e.g. hay meadows) that provide habitats for many species.

A national habitat survey[2] identifies 230 basic habitats, classified according to nine ecosystems (i.e. inland waters; riverine and wetland habitats; glaciers, rocks and screes; grasslands; edges, eutrophic tall herbs and brushwoods; forests; pioneering flora; plantations; and cropland) and a further 39 categories of structurally related units. The survey includes for each habitat a description of the structural and biological properties, the anthropogenic influence, an overview of phytosociology, an illustration of its actual and potential fate, and the distribution in Switzerland. Out of the 230 habitats, a total of 77 are protected by virtue of the Ordinance on the Protection of Nature and Cultural Heritage (see section 2.2) and 38 require conservation measures according to resolution No. 4 (1996) of the Standing Committee of the Bern Convention.

The methodology used for the national habitat survey allows for the interlinking of Switzerland's habitats with the regional classification systems CORINE, developed by the European Union.

1.1.2 Overview of species diversity

Within Europe, Switzerland has one of the highest species diversities on a local scale. Indeed, approximately 19 000 species of plants and fungi are recorded in Switzerland (Table 1), as well as an estimated 40 000 animal species (Table 4). The degree of endemism, however, is rather low with three plant species (*Draba ladina*, *Arenaria ciliata*, and *Tulipa grengiolensis*) and 51 animal species (see Appendix II).

From 1900 to 2000, the overall number of free-living species in Switzerland monitored by Biodiversity Monitoring Switzerland (BDM) remained constant. While breeding bird species (+17) and mammal species (+6) registered a distinct increase, the number of reptile species increased by merely one. However, species numbers of grasshoppers (-2), cyclostomes (-1) and butterflies (-2) declined. As regards amphibians, fish and dragonflies, old species lost were made up for by new species gained, resulting in an overall balance.

Between 1970 and 1990, species numbers increased the most, only to remain virtually constant between 1997 and 2007 (Table 3). All in all, new arrivals were in the most part offset by disappearances. The changes observed involve either very rare species reaching their maximum geographical or ecological boundaries in the country, or alien species released into the wild on purpose or by accident. At a regional rather than a national level, however,

2 Delarze R, Gonseth Y 2008: Lebensräume der Schweiz: Ökologie - Gefährdung - Kennarten. 424 S. Ott-Verlag, Bern.

species numbers underwent more marked changes. The Eastern Central Alps, for example, are noteworthy for gaining four additional breeding bird species.

Species diversity is heterogeneously distributed within Switzerland (Figure 2). Species diversity in the various landscapes depends on the diversity and quality of the habitats they comprise: the more varied a landscape, the more species will find a suitable habitat. Particularly high species diversity is observed on the northern and southern edges of the Alps[3], where important differences in altitude offer numerous habitats for plants and animals. Species diversity is low in the Central Plateau, much lower than, for example, in the Jura, despite a similar ecological potential. This indicates that the large-scale intensive cultivation of the Central Plateau has destroyed valuable habitats. Today, many arable land species are red listed.[4]

BDM has released its second report on the state of Switzerland's biodiversity[5]. The results show that the mean number of vascular plants has slightly increased, especially in the Northern Alps and the Jura. However, this increase is due to species growing on nutrient-rich soils. Already widespread, and banal from an ecological point of view, these species continue to propagate. As a consequence, plant communities become uniform. The homogenisation of Switzerland's plant communities is not a positive development, even though the result is an increase in the total number of species.

The number of species occurring in different habitats is largely determined by the type and intensity of land use, a fact that particularly applies to habitats shaped by man, such as grasslands, arable lands, and forests. BDM indicator Z9 records the mean species numbers (arithmetic mean) in 10 m^2 sampling areas with a 95 % confidence interval for vascular plants, molluscs and mosses in various habitats (Table 5). The highest number of species is observed in alpine pastures whereas arable land bears the lowest.

3 Structure de coordination du Monitoring de la biodiversité en Suisse 2006 : État de la biodiversité en Suisse. État de l'environnement nº 0604. Office fédéral de l'environnement, Berne. 67 p.

4 Biodiversity Monitoring Switzerland: Actualities http://www.biodiversitymonitoring.ch, Status February 2009.

5 Bureau de coordination du Monitoring de la biodiversité en Suisse 2009: Etat de la biodiversité en Suisse. Synthèse des résultats du Monitoring de la biodiversité en Suisse (MBD). Etat: mai 2009. Etat de l'environnement nº 0911. Office fédéral de l'environnement, Berne. 112 p. (download: pdf, 5522 kB, http://www.bafu.admin.ch/publikationen/publikation/01035/index.html?lang=fr, languages: fr, de).

Table 1: Estimated number of species of plants, lichens, fungi and algae (Source: FOEN: ENVIRONMENT 3/2006).

Plants and Fungi	
Ferns and Flowering Plants	3 000
Bryophytes (species and subspecies)	1 030
Lichens	1 660
Fungi	9 000
Algae	4 000
Total (rounded)	**19 000**

Table 2: Development of animal species diversity as monitored by BDM (indicator Z3).

Taxonomic Groups	Species numbers in 1900	Numbers of species permanently occurring from 1900 to 2000	New arrivals	Disappearances	Species undergoing several status changes	Net species numbers in 2000
Mammals*	51	49	8	2	0	57
Breeding birds	160	152	19	5	8	173*
Reptiles	14	14	1	0	0	15
Amphibians	18	16	1	0	2	18
Fishes**	53	49	3	3	1	53
Cyclostomes	2	1	0	1	0	1
Butterflies	191	188	1	3	0	189
Grasshoppers	105	102	1	3	0	103
Dragonflies	65***	62***	3	3	0	65
Total	**659**	**634**	**37**	**20**	**11**	**674***

* The total number of species registered in 2000 differs from the number listed for that year in the table below comparing annual data as of 1997 due to the fact that there was not enough conclusive evidence to classify four breeding bird species in the period of 1900-2000. As opposed to the table below, the European Green Toad (*Bufo viridis*) is not included in the total number of amphibian species in 2000, since according to BDM criteria, it only occurred in Switzerland in 1999 and 2000 rather than during the whole decade of 1991 to 2000.

** Even though the European Eel (*Anguilla anguilla*) spends a considerable part of its life cycle in this country, it is excluded from this table because it is a migratory species that does not breed here. As a rule, such migratory species are not covered by the Z3 indicator.

*** It is very likely that the Sedgling (*Nehalennia speciosa*) permanently occurred during the monitoring period. Nevertheless, this dragonfly has not been included in the count for the time being.

Table 3: BDM indicator Z3: Species numbers of vertebrates, butterflies, dragonflies and grasshoppers living wild in Switzerland have changed little since 1997 (Source: BDM indicator Z3, status April 2009).

Switzerland	?	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Changes from 1997 to 2007
Mammals*	0	57	57	57	57	57	57	58	59	59	59	59	2 newcomers
Breeding birds	0	178	176	177	177	177	176	175	174	175	175	177	3 disappearances, 3 newcomers 1 unstable species
Reptiles	0	15	15	15	15	15	15	15	15	15	15	15	no change (n.c.)
Amphibians	0	18	18	19	19	18	18	18	18	18	18	18	1 unstable additional species
Fishes	0	52	52	53	53	53	53	53	53	53	54	54	2 newcomers
Cyclostomes	0	1	1	1	1	1	1	1	1	1	1	1	n.c.
Butterflies	0	189	189	189	189	189	189	189	189	189	189	189	n.c.
Grasshoppers	0	103	103	103	103	103	103	103	103	103	103	103	n.c.
Dragonflies	0	65	65	65	65	65	65	65	65	65	65	65	n.c.
Total	**0**	**678**	**676**	**679**	**679**	**678**	**677**	**677**	**677**	**678**	**679**	**681**	

? species that cannot be classified yet, *excluding bats

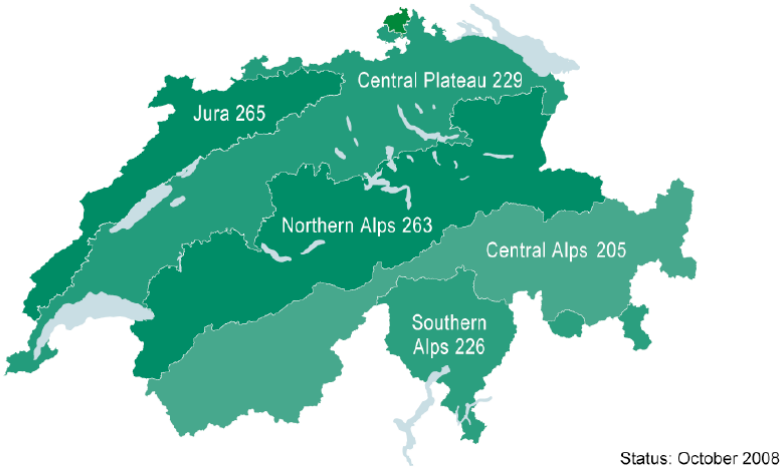

Figure 2: BDM indicator Z7: Mean numbers of vascular plant species on areas of 1 km^2 (Source: BDM indicator Z7, status December 2008).

Table 4: Animal species numbers of the phyla or classes occurring in Switzerland (Source: Biodiversity Monitoring Switzerland)[6].

Phylum/class	Known	Estimated
Sponges (Porifera)	**6**	**6**
Cnidarians (Cnidaria)	**6**	**6**
Hydrozoans (Hydrozoa)	6	6
Flatworms (Plathelminthes)		**2600**
Eddyworms (Turbellaria)		150
Trematodes (Trematoda)		1750
Tapeworms (Cestoda)		700
Ribbonworms (Nemertini)		3
Roundworms (Nemathelminthes)		**3175**
Gastrotrichs (Gastrotricha)		50
Rotifers(Rotatoria)		600
Threadworms (Nematodes)		2500
Horsehair worms (Nematomorpha)		25
Molluscs (Mollusca)	**270**	**280**
Snails (Gastropoda)	244	250
Bivalves (Bivalvia)	26	30
Segmented worms (Annelida)		**225**
Bristleworms (Polychaeta)		4
Clitellates (Clitellata)		221
Bear animalcules (Tardigrada)		**60**
Arthropods (Arthropoda)	**19 590**	**33 700**
Insects (Insecta)	16 600	30 000
Arachnids (Arachnida)	2 375	3 000
Crustaceans (Crustacea)	415	500
Myriapods (Myriapoda)	200	200
Chordates (Chordata)	**351**	**351**
Fish and Cyclostoma	54	54
Amphibians (Amphibia)	18	18
Reptiles (Reptilia)	15	15
Birds (Aves)	175	175
Mammals (Mammalia) excluding bats	59	59
Bats	30	30
Total		**40 406**

6 Biodiversity Monitoring Switzerland: Knowledge, Species numbers, http://www.biodiversitymonitoring.ch, status June 2009.

Since 1991 the Federal Office for the Environment (FOEN) has published the Red Lists of endangered species of Switzerland. The lists are regularly updated and completed according to the programme described in section 2.3.4.

In Switzerland, 224 animal and plant species have become or are presumed to have become extinct over the last 150 years. Since 1960, the rate of human-induced extinction has clearly exceeded the natural rate. Today, 40 % of the animal species evaluated in the country are included on the Red Lists. Almost a third (34 %) of Switzerland's flowering plants and ferns have disappeared or are threatened; for fungi, bryophytes and lichens the proportion is 32 %, 42 % and 41 %, respectively. If species that are “near threatened” are also taken into account, the proportion of Switzerland’s flora and fauna requiring support rises to 50 %. An overview of Red List species in Switzerland is provided in Appendix II.

Table 5: Mean species numbers in 10 m^2 sampling areas of different agricultural habitats in Switzerland (Source: BDM indicator Z9, status December 2008).

	Forests	Grassland	Arable land	Settlements	Alpine pastures	Mountains*
Vascular plants	21 ± 1	35 ± 1	15 ± 1	19 ± 3	42 ± 3	21 ± 2
Mosses	15 ± 1	6 ± 1	1 ± 0**	5 ± 1	19 ± 2	13 ± 1
Molluscs	9 ± 1	9 ± 1	3 ± 1	6 ± 1	3 ± 1	3 ± 1

* “Mountains” refers to areas not subject to alpine farming, such as scree plant communities, turf, and dwarf shrub heath, excluding glaciers and inaccessible rocks.

** The low species numbers recorded for mosses on arable land are at least partly caused by Z9 surveying methods. Farmland mosses are short-lived, only starting to develop in late summer. If arable land is surveyed before that time, mosses frequently cannot be spotted.

1.1.3 An overview of genetic diversity

The Alps and the Jura mountain range have also had a strong impact on genetic diversity in Switzerland. The diverse landscape, the numerous valleys and remote areas, and the many small-scale differences among habitats in Switzerland have promoted the development of a high genetic diversity, especially of cultivated and domesticated species. The genetic diversity in agriculture increased until the 20th century, However, due to the intensification of agricultural practices and the selection of highly productive breeds and varieties, a substantial decline of this diversity is observed.

Today, numerous traditional breeds and varieties are threatened with extinction, since they are no longer used in intensive farming. In order to prevent the extinction of these breeds and varieties, special efforts are being undertaken; for instance, raising awareness of the importance of these breeds at special occasions, in arc farms or with typical products. Additionally,

alternative purposes are introduced like landscape management or financial support for specific programs resulting in an increase of population size in traditional breeds in Switzerland (Table 6). Despite these efforts, the fundamental problem of insufficient use of traditional breeds in commercial agriculture persists.

In 2002, Switzerland's federal government prepared a report on livestock breed diversity in Switzerland for the Food and Agriculture Organisation of the United Nations (FAO). Based on data collected in 1996, the report also covers poultry and rabbit breeds (Table 7).

Table 6: The number of livestock breeds for cattle, pigs, sheep and goats (1999 – 2007) (Source: BDM indicator Z1, status August 2008).

	Number of herdbook-registered breeds									
	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**Notes**
Cattle	19	20	21	21	21	22	22	25	25	Salers as of 2000, Luing as of 2001, Pinzgauer as of 2004, Yellow Cattle, Zebu Cattle and Shorthorn as of 2006
Pigs	5	5	5	6	6	6	6	6	6	Large White Sire Line as of 2002
Sheep	14	14	14	14	15	17	17	17	17	Dorper as of 2003, Ile de France and Suffolk as of 2004
Goats	10	10	10	10	11	11	11	12	12	Anglo-Nubian as of 2003, Capra Grigia as of 2006
Total	**48**	**49**	**50**	**51**	**53**	**56**	**56**	**60**	**60**	

Table 7: The number of chicken, pigeon and rabbit breeds (1996) (Source: BDM indicator Z1, status August 2008).

Livestock species	**Number of registered breeds in 1996**
Chicken	87
Pigeons	90
Rabbits	36

The status of conservation of the varieties is assessed within the framework of the National Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture (NPA-PGRFA, see section 1.1).

Genetic diversity is not only of interest for agriculture, but also plays an important role in forestry. As part of the Swiss strategy to foster forest biodiversity, forests of special genetic interest (SGI forests) have been designated for the conservation and sustainable use of genetic resources of forest trees and shrubs (see section 1.1.3).

Regarding genetic diversity of wild species, data are rather scarce. Recent research shows that, in general, small and isolated populations of wild plant species have lower genetic diversity than large populations and that this leads to reduced plant fitness. In Switzerland, this has been shown both for rare and

more common species[7],[8],[9]. Accordingly, crossing genes into smaller populations increases both genetic diversity and fitness, and this effect persists beyond the first generation[10]. Fragmentation also affects the potential to adapt to changing environments[11]. This is in line with a meta-analysis of international studies demonstrating that small plant populations are not able to adapt locally, whereas large populations are[12].

1.1.4 Challenges to biodiversity from climate change

A report of the Swiss Advisory Body on Climate Change (OcCC) analysed the possible impacts of climate change on the most vulnerable areas of the environment, economy and society in Switzerland, as a result of greenhouse gas emissions expected up to the year 2050[13].

From an environmental point of view, the report concludes that the species composition of ecosystems will change in the long run because different species react differently to climate change. Flora and fauna will continue to approximate those at lower elevations and in more southern areas. Heat-sensitive species will move to cooler areas at higher elevations. This hypothesis has been validated by results from BDM. Less mobile species will be radically reduced or will disappear. The productivity of forests and agriculture, as well as the availability of clean water, may be affected by the combination of high temperatures and low precipitation. At higher elevations, the productivity of forests and permanent grassland will be somewhat enhanced by warming; at lower elevations it will be constrained by summer drought. In the future, water resources will also be of increasing importance to ecosystems, in particular to those situated in valleys and hill country.

Long-term development in the second half of the 21st century crucially depends on emission reduction measures implemented within the next years and decades; the consequences of a business-as-usual scenario would be much more severe. Moreover, there are many countries in the world, in particular developing countries, which will not only be hit by more serious consequences but will not possess the financial resources to adapt. The

7 Fischer M, Matthies D. 1998: Effect of population size on performance of the rare plant Gentianella germanica. J of Ecology 86,195–204.
8 Pluess AR, Stocklin J. 2004: Genetic diversity and fitness in Scabiosa columbaria in the Swiss Jura in relation to population size. Conservation Genetics 5,145–156.
9 Galeuchet DJ, Perret C, Fischer M. 2005: Microsatellite variation and structure of 28 populations of the common wetland plant, Lychnis flos-cuculi L., in a fragmented landscape. Molecular Ecology 14 p 991–1000.
10 Willi Y et al. 2007: Genetic rescue persists beyond first-generation outbreeding in small populations of a rare plant. Proc. R. Soc. B 274,2357–2364.
11 Bowman G et al. 2008: Habitat fragmentation and adaptation: a reciprocal replant-transplant experiment among 15 populations of *Lychnis flos-cuculi* L. J of Ecology 96,1056–1064.
12 Leimu R, Fischer M. 2008: A Meta-Analysis of Local Adaptation in Plants. PLoS ONE 3(12), e4010.
13 OcCC (2007) Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html)

emerging geopolitical developments may well have consequences for Switzerland.

The costs of the adaptations and measures are currently being estimated. This estimation will provide an important input to the national adaptation strategy as well as to the national biodiversity strategy, both of which are currently being drawn up.

1.2 Agricultural Biodiversity

The multiple tasks of agriculture are anchored in the Federal Constitution. They include a major contribution towards ensuring food supplies for the population, maintaining the landscape and helping to preserve social structures in rural areas. Further, production methods are to be used that ensure future generations have fertile soils and clean drinking water. Therefore, ecological standards are an important pillar of agricultural policy. A diverse landscape is a basis for a high quality of life for the population and, at the same time, for the conservation of biodiversity.

1.2.1 Characteristics of the agricultural area

Switzerland's Utilised Agriculture Area (UAA) amounts to 1 065 200 ha or 25.8 % of the national territory (2006) and is composed of permanent grasslands (744 900 ha, 69.9 %), arable land (285 000 ha, 26.8%), lands under permanent crops (22 900 ha, 2.2 %) and other cultures (11 800 ha, 1.1%). Additionally alpine pastures amount to 500 000 ha (2010), but they do not account for UAA. Within a twelve year period (1979/85 – 1992/97), Switzerland's UAA decreased by 3.1 % or 48 200 ha. Since 1996, however, the decrease has been less pronounced with 18 000 ha (1.6%) lost up to 2006.The loss of agricultural area is due to increased urbanisation and to land abandonment, as well as to increased forest coverage. The latter two points are of special concern in low income areas, i.e. in the mountain zone and the alpine pastures zone respectively.

Agricultural areas managed according to the provisions of organic farming steadily increased after 1996 to approach 1 200 km^2 in 2003, this is equivalent to 11 % of the utile agricultural area. The proportion of organically managed land area remains constant from 2003 to 2009 but the total surface of organically managed land is slightly shrinking since agricultural area is slightly decreasing (Figure 3).

Organically managed farms are predominantly found in mountainous regions, where pastoral farming is best represented and where conversion to organic farming requires less effort than in areas with intensive crop production; for instance, on the Central Plateau.

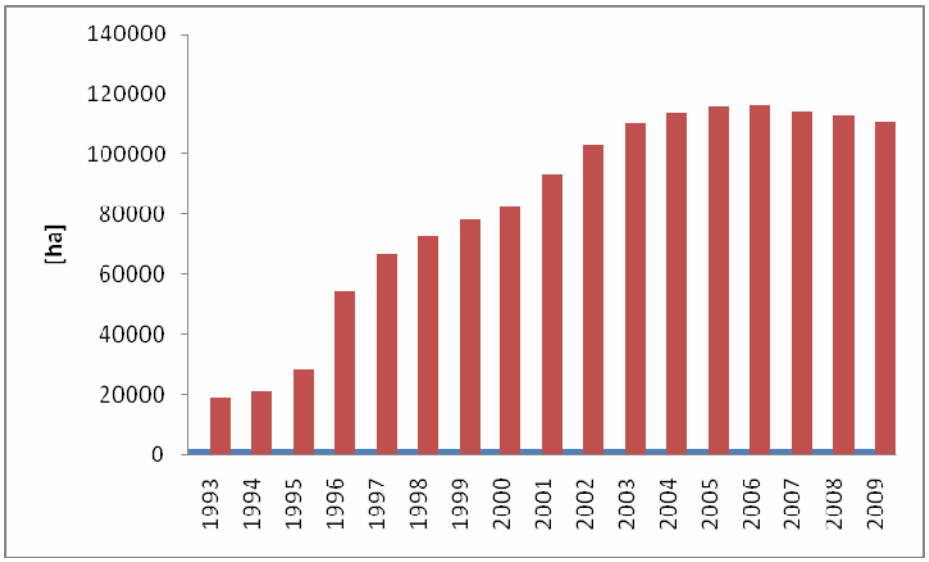

Figure 3: Development of organically farmed area in Switzerland (Source: OFAG).

1.2.2 Habitats in agro-ecosystems

In order to increase food production and to foster a more efficient and economic land management, biodiversity-important structures were lost in traditional small-scale agricultural land (e.g. stonewalls, hedgerows, ditches, mires). Further negative impacts on species and habitat diversity are caused by the use of pesticides and fertilizers as well as by other unsustainable management methods, that can pollute adjacent ecosystems, or cause soil compaction. Intensively managed agricultural areas, such as arable land, are therefore generally characterized by a lower level of biodiversity. In order to counteract the loss of habitats, Ecological Compensation Areas (ECAs) were introduced, i.e. areas that are managed so as to contribute to species diversity and a varied countryside. While in 1993 some 20 000 ha of agricultural land were treated as ECAs, the area had increased by a factor of six by 2006, when approximately 120 000 ha were managed as ECAs. Unsustainable consumption of biological resources and pressures from habitat loss, land-use change and degradation have been significantly reduced by this new policy based on the Swiss agricultural legislation. Today, each farm has to allocate at least 7 % of UAA for ecological compensation.

While intensive agriculture adversely affects biodiversity, sustainable agricultural practices may have a beneficial effect on biodiversity by creating species-rich habitats, such as dry meadows and pastures (see section 1.5). However, these habitats are threatened due to abandonment of land and changing land-use practices (e.g. biodiversity-rich meadows are no longer mowed).

In order to further mainstream environmental considerations in agriculture, general objectives for biodiversity and landscape, climate and air, water and

soil were established and corresponding activities are being implemented (see section 2.3.1 and Appendix II).

1.2.3 Species diversity in agro-ecosystems

There is a correlation between species diversity in agricultural lands and the intensity with which the lands are used (Table 5). Alpine pastures, which are not counted as agricultural area in the narrower sense, bear a high species diversity, whereas intensively used arable lands provide habitats for few species only.

BDM Switzerland has recorded a slight increase in mean species richness in Swiss meadows since 2001. First analyses show that this increase is mostly due to the continued spread of common plant species of fertilised meadows. But the natural range of rare and endangered native species (RL) could not yet be stabilised (even if there are local successes of promotion-projects in deficit areas).

Within intensively used agricultural lands, ECAs such as extensively farmed grasslands, wild flower strips or hedges, provide valuable habitats for many species. Two case studies conducted by the Swiss Federal Research Station for Agroecology and Agriculture reveal that species diversity is clearly higher on ECAs than on intensively farmed lands (Figure 4, Table 8) with many specialised species.

ECAs also support the conservation of ecologically valuable habitats located in areas no longer yielding a profit in agricultural production. Direct payments enable farmers to keep on cultivating even low productivity areas in remote mountain locations. This counteracts forest encroachment, a trend which would, for instance, destroy the habitat of light-requiring species. In other regions, ECAs were able to preserve near-natural habitats valuable for species diversity, such as standard fruit tree orchards and litter meadows. Moreover, ECAs, coupled with other measures required for proof of ecological performance, have a favourable effect on aquatic species diversity as well. Since ECAs are not fertilised (or only in small amounts), pollution of ground and surface waters is reduced (BDM indicator E14, see Appendix IV).

The quality of ECAs is assessed using indicators established by the Federal Office for Agriculture (FOAG). The indicators include – depending on the kind of habitat – the surface of the area, selected (umbrella-) species, the total number of species and the presence of microstructures[14]. An assessment of the quality of ECAs revealed that, in the plains, 72 % of extensively farmed grasslands and 89 % of low-intensity farmed grasslands fall short of the

14 OFAG: Qualité biologique, http://www.blw.admin.ch, status June 2009

quality targets. In the mountain areas, however, the quality targets are met for about 80 % of both grassland types. It is estimated that ECAs are still far from exhausting their potential to promote biodiversity. In order to allow threatened species to return and to prevent further species losses, initiated efforts must be continued and complemented by additional measures.

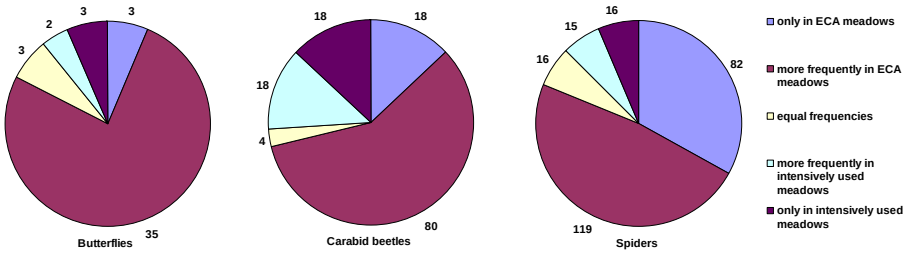

Figure 4: Mean species numbers of butterflies, Carabid beetles and spiders in ECA (ecological compensation areas) meadows and intensively used meadows in three different regions of Switzerland (Source: Swiss Biodiversity Forum, Hotspot 11/2005)

Table 8: Ecological compensation areas [ha] eligible for direct payments, broken down by types (Source: BDM indicator M4, status October 2008).

	1993	**1995**	**1997**	**1999**	**2001**	**2003**	**2005**	**2007**	**2009**
Extensively farmed grasslands	19'319	23'274	37'299	34'148	43'926	48'695	52'219	56'058	60'058
Litter meadows				4'713	4'788	6'828	6'964	7'112	7'363
Hedges, field and bankside groves				2'283	2'274	2'336	2'457	2'538	2'650
Low-intensity farmed grasslands	31'038	32'547	41'486	40'388	38'620	35'263	32'236	29'325	25'860
Extensively farmed grasslands on set-aside arable land	1'104	2'804	6'841	6'642					
Wildflower strips		79	256	746	1'961	2'423	2'321	2'141	1'751
Crop-rotation fallow lands	-	-	-	328	1'281	1'311	893	845	593
Crop margins	-	-	-	59	44	31	51	38	45
Standard fruit trees	0	0	0	0	0	0	0	0	0
Total including standard fruit trees	**51'461**	**58'704**	**85'882**	**89'308**	**92'893**	**96'887**	**97'142**	**98'058**	**98'320**
Total excluding standard fruit trees	**51'461**	**58'704**	**85'882**	**89'308**	**92'893**	**96'887**	**97'142**	**98'058**	**98'320**

1.2.4 Animal and plant genetic resources for food and agriculture

Conserving livestock breeds and crop plant varieties preserves the genetic diversity of the plants and animals we depend on for food production. Since the middle of the 20th century, however, this diversity has decreased significantly because agriculture has focused on the breeding of a few high-yield breeds and varieties [15].

In 1998, FOAG adopted a strategy for the conservation of animal genetic resources[16]. Since then, the Confederation has supported conservation activities for Swiss breeds. Table 6 and Table 7 above provide an overview of livestock breeds, as monitored through BDM (indicator Z1). Further information on the breeds, their characteristics, their conservation status, and conservation activities being implemented are available from the European Farm Animal Biodiversity Information System[17].

In the area of animal genetic resources, the loss of biodiversity in livestock was stopped thanks to the intensive cooperation between farm organizations and the Federal Office for Agriculture, which financially supported many conservation projects.

The first International Technical Conference on Animal Genetic Resources for Food and Agriculture organised by the FAO, with support of the Swiss government, was held in September 2007 in Interlaken, Switzerland. The conference adopted the Global Plan of Action for Animal Genetic Resources, and the Interlaken Declaration, both which will guide future international and national work on this issue.

The challenge for the conservation of plant genetic resources is even higher than for animal genetic resources, as the diversity is much higher. Based on FAO's Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture, FOAG developed a National Plan of Action (NPA-PGRFA , see section 2.3.7), and established the Swiss National Database for the Conservation of Phytogenetic Resources[18]. The inventory of Switzerland's phytogenetic resources yielded 20 195 "accessions", i.e. strains managed in collections for *in-situ* or *ex-situ* conservation (Table 9, Figure 5).

15 Biodiversity Monitoring Switzerland: Actualities, http://www.biodiversitymonitoring.ch, status February 2009.
16 OFAG - Préservation de ressources phytogénétiques et zoogénétiques http://www.blw.admin.ch, status June 2009.
17 EFABIS: European Farm Animal Biodiversity Information System, www.efabis.ch, status March 2010.
18 BDN: Swiss National Database for the Conservation of Phytogenetic Resources, www.bdn.ch, status March 2010.

Table 9: The number of crop plant varieties included in each species' positive list (i.e. deemed worthy of preservation) in the Swiss National Database[19] (Source: BDM indicator Z1, status August 2008).

Year	2008
Potatoes	89
Apples	722
Pears	1507
Vines	129
Rye	13

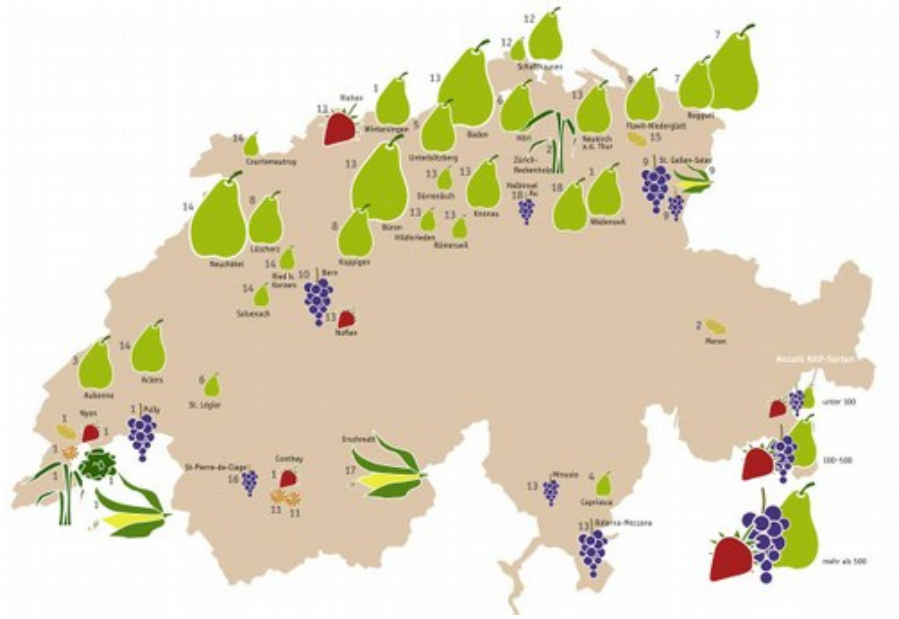

Figure 5: Overview of conservation collections of the NPA-PGRFA (Source: Conservation of plant genetic resources, Swiss National Database, status June 2009).

Many private organisations are involved in the conservation of Switzerland's animal and plant genetic resources, such as Pro Specie Rara[20] and the Swiss Association for the Protection of Fruit Heritage[21]. Activities for the conservation of plant genetic resources are coordinated by the Swiss Commission for the Conservation of Cultivated Plants (see section 2.3.7).

19 BDN: Swiss National Database for the Conservation of Phytogenetic Resources, www.bdn.ch, status March 2010.
20 Pro Specie Rara, animals, plants, www.prospecierara.ch, status March 2010.
21 Fructus: Swiss Association for the Protection of Fruit Heritage, conservation of fruits, www.fructus.ch, status March 2010.

1.2.5 Protected areas in agro-ecosystems

Three categories of protected areas target or include agricultural areas:

1. Dry meadows and pastures: an inventory of dry meadows and pastures was compiled. The inventory entered into force in February 2010 and contributes significantly to improving the conservation of the rich flora and fauna borne by grasslands (see section 1.5).
2. Agricultural areas: these may be parts of protected areas targeting the conservation of the landscape (i.e. biosphere reserves, regional nature parks, nature discovery parks; see Appendix V). These areas may provide an indirect benefit to the conservation of biodiversity by protecting relevant landscape structures and elements.
3. Cultural heritage: the Lavaux vineyard landscape is registered on the UNESCO World Heritage list as a thriving (agri)cultural landscape that demonstrates in a visible way its evolution and development over almost a millennium. However, the protection of the Lavaux vineyard region is predominantly motivated by cultural interest.

Some ECAs are part of the national ecological network (REN, see section 1.1) and therewith support the functioning of protected areas by being part of migratory pathways.

1.2.6 Sustainable use of biodiversity-based products derived from agro-ecosystems

One indicator for assessing the use of sustainably grown products is the consumption of food produced according to standards for organic farming. Organic farming has beneficial effects on biodiversity: it enhances growth of beneficial organisms, and increases soil fauna und thus soil fertility. The consumption of organically grown products, which generally are more expensive than the standard products, is monitored by the MONET indicator system[22]. The indicator measures expenditure on organically produced foodstuff and beverages as a percentage of the total costs for food per household. The indicator shows that the share of organically grown products increased since 2000 (4.4 %) to reach 6.5 % in 2005. The indicator also shows that households with a greater income buy significantly more organically produced products.

The demand for fair trade products has also significantly increased. For instance, 5 % of coffee and 52 % of bananas sold in Switzerland in 2007 were derived from fair trade. However, it should be noted that fair trade products are not necessarily produced in an environmentally sound way.

22 Swiss Statistics: Sustainable Development - MONET, http://www.bfs.admin.ch/bfs/portal/en/index/themen/21/02/ind9.html, status June 2009.

1.2.7 Invasive alien species in agro-ecosystems[23]

Many weeds cause problems in agriculture, but only 20 % of them are neophytes (Arl et al. 1995). In fact, most neophytes are not directly related to agriculture and colonise arable land more or less accidentally. Exceptions include the ragweed (*Ambrosia artemisiifolia*) and the narrow-leaved ragwort (*Senecio inaequidens*), which invade and threaten arable land. *Ambrosia artemisiifolia* affects human health due to its highly allergenic pollen. Therefore, mandatory eradication was included in the Ordinance on Plant Protection. *Senecio inaequidens* is highly toxic for cows and horses and can cause meadows and pastures to become worthless if invaded. Other neophytes, e.g. the velvetleaf (*Abutilon theophrasti*), are noxious but do not seem to threaten biodiversity.

In addition to neophytes, a small number of invasive animals can also cause agricultural problems; for example, the Asian lady beetle (*Harmonia axyridis*). In Switzerland, monitoring of this beetle started in 2005. Scientists of the research institute Agroscope Reckenholz-Tänikon (ART), in cooperation with scientists of CABI Europe-Switzerland, decided to systematically record the lady beetle fauna along the Swiss-German border. The goal of this project, which was funded by FOEN, was to document the arrival of the Asian lady beetle in Switzerland. Additionally, native lady beetles would be closely observed in order to analyse the ecological consequences of the Asian immigrant.

In 2005, the beetle was not yet detected in Switzerland; shortly afterwards it was observed to spread quickly. In certain surveyed areas, the beetle can be found more frequently than the native species. The foreign species is highly competitive and relatively resistant to pesticides. In the coming years it is expected to spread further and considerably increase in numbers. It is no longer possible to stop this development. The consequences for local fauna and agriculture are not foreseeable yet. The Asian lady beetle can, according to experiences in the USA, displace native lady beetle species. It can also become a serious problem for orchardists and winegrowers, as the inedible beetles may spoil the taste of juices and wines when accidentally harvested together with fruits and berries.

1.2.8 Agriculture and climate change

On the one hand, the agricultural sector contributes to climate change with 11 % (expressed in CO_2 equivalents) of the greenhouse gas emissions in Switzerland in 2008 (Figure 6). On the other hand, agricultural production is strongly influenced by the climate and therefore affected by climate change.

23 Kowarik I 2003: Biologische Invasionen: Neophyten und Neozoen in Mitteleuropa. 380 S. Verlag Eugen Ulmer, Stuttgart.

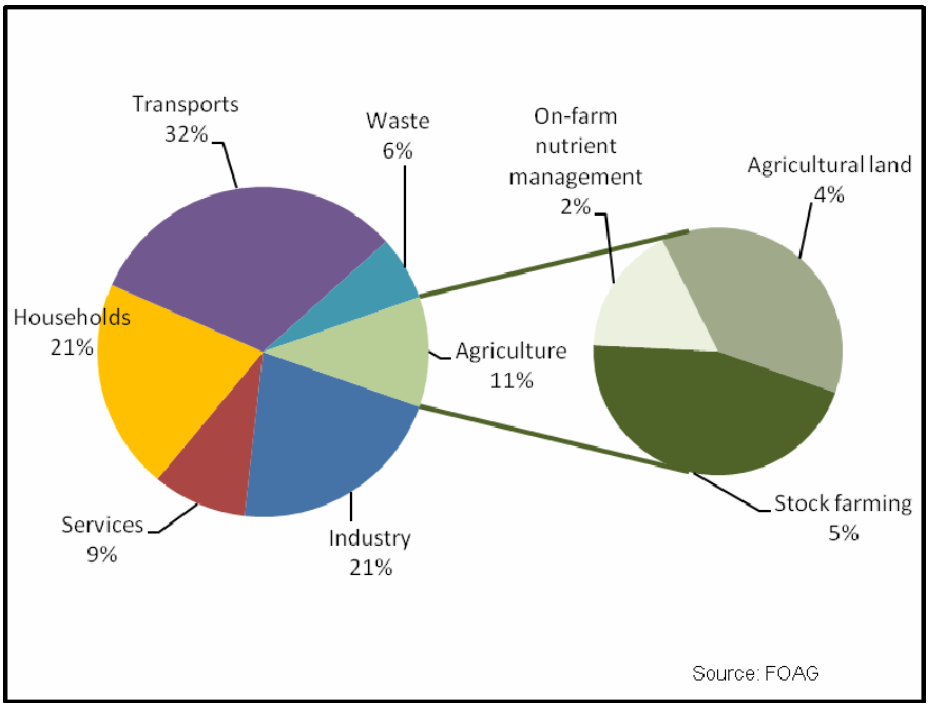

Figure 6: Greenhouse gas emissions in 2008 by various sectors in Switzerland (total 53,22 mio. t carbon dioxide equivalents, Source: FOAG, Agricultural report 2009).

The impact of climate change on Switzerland's agriculture has been investigated by Swiss Advisory Body on Climate Change (OcCC). The study concluded that a moderate warming of less than 2 to 3°C may have an overall positive effect on Swiss agriculture. On one hand, the productivity of meadows and the potential crop yield of many cultivated plants will increase as a result of the longer vegetation period, provided that the supply of water and nutrients is sufficient. Livestock farming will profit from this as well. On the other hand, water supply will decrease in summer, weeds and insect infestation will occur more often, and damage caused by extreme events will increase. Through the appropriate choice of cultivated plants, cultivation methods and management, agriculture will be able to adapt to a moderate rise of 2 to 3°C of the mean temperature by 2050. The increase in heat waves and drought periods is problematic. Furthermore, more frequent precipitation events will aggravate soil erosion. The demand for irrigation will increase in many regions. These risks may be reduced by diversification on farms and higher insurance cover.

If the temperature rises by more than 2 to 3°C by 2050, the disadvantages will outweigh the advantages of warming: during the vegetation period, water scarcity will become more frequent, and faster plant development will result in harvest losses for crop and grain legumes [24].

24 OcCC 2007: Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html, status June 2009).

1.2.9 Agriculture and pollution

Agriculture can lead to large-scale pollution of soils with heavy metals. In 90 % of the Swiss soils the accumulated pollution is considered low, in 9 % it is medium and in almost 1 % it is high.[25] The pollution mainly consists of lead (Pb), copper (Cu) used in pesticides and animal fodder, cadmium (Cd) used in mineral fertilisers and zinc (Zn) utilized in animal fodder.

Some soils of vineyards are heavily polluted due to the use of copper-based plant treatment agents. A couple of studies show the relationship between the inappropriate use of sewage sludge in agriculture and the pollution of soils..[26]

For early detection of pollution and for evaluating the effectiveness of soil protection measures, the Swiss Soil Monitoring Network (NABO) was created. It has been jointly operated by the Federal Office for the Environment and the Federal Office for Agriculture since 1984[27] (see section 2.3.9).

Rough trend predictions about the risk of the pollution burden will be possible within a few years on the basis of agro-environmental indicators (agro-environmental monitoring within a grid of reference farms). These risk-indicators will be completed and validated with representative surveys on the pollution of agricultural soils.

1.2.10 Ecosystem services provided by agro-ecosystems

In 2007, the total production value (products and services) of Swiss agriculture amounted to about CHF 10 913 million, to which agricultural goods contributed CHF 9 982 million. Table 10 lists the annual production for selected products.

25 Desaules, 1998: Prévenir coûte moins cher que guérir. ENVIRONNEMENT 2/98: 4-6. Office fédéral de l'environnement, de la forêt et du paysage (éd.), 3003 Berne.
26 FOEN: NABO Status, http://www.bafu.admin.ch/boden/00972/00976/index.html?lang=en, status June 2009.
27 FOEN: NABO - Soil monitoring network, http://www.bafu.admin.ch/boden/00972/index.html?lang=en, status June 2009.

Table 10: Animal and plant production in Switzerland in 2006 (Source: Federal Statistical Office).

	Production in 10'000 t
Meat	437
Milk	3923
Cereal	1008
Potatoes	392
Sugar beets	1243
Vegetable	289
Fruits	430
Green forage	19362
Silage maize	1343

Honeybees perform an important contribution to the national economy by the pollination of cultural and wild plants as well as the production of honey, pollen and wax. The pollination value of a single bee colony for the harvest of fruits and berries amounts to CHF 1 250 per year. There are about 19 000 beekeepers with 170 000 bee colonies in Switzerland. This means that each beekeeper has an average of ten colonies. The average honey harvest is about 10 kg per colony and amounts to 3 200 t a year (1993–2002). Switzerland has a bee density of 4.5 colonies/km^2.[28,29] The honeybee, however, is threatened. Since the spread of the varroa mite into Switzerland via Germany from Asia, there are no longer any wild bee populations in our climate zones. The threat is constantly increasing as disease and pests spread with the international exchange of goods.

To counteract this development, scientific research on apiculture has been reinforced at all levels, including research on viral and bacterial illnesses transferred by the varroa mite, on methods to combat the mite, and on methods for biological pest control to avoid negative impacts of pesticides on honeybees. Further, the Swiss Bee Research Centre coordinates the international platform “Prevention of honeybee **co**lony **loss**es” or, Coloss[30].

Further ecosystem services, so far not quantified, are: increase of beneficial organisms (insects), erosion prevention through intercropping, leisure and recreational zones, etc.

28 Fluri P, Frick R 2005: Imkerei in der Schweiz - Fakten und Bedeutung. Agrarforschung 12(03). 104–109
29 Agroscope Liebefeld-Posieux Research Station ALP: Beekeeping in Switzerland, http://www.alp.admin.ch/themen/00502/00533/index.html?lang=en, status June 2009
30 Agroscope Liebefeld-Posieux Research Station ALP: Apiculture, http://www.alp.admin.ch/themen/00502/index.html?lang=en, status June 2009.

1.3 Forest Biodiversity

1.3.1 Introduction

Around 1840, the forested area of Switzerland was estimated to be about 0.71 million ha. At that time, entire mountainsides were being clear-felled and there were numerous floods as a consequence. The first Swiss Forest Act of 1876 put a halt to the unchecked deforestation. By 2006, the forested area had increased to about 1.278 million ha (Table 11) – an increase of more than 70 %. It should be kept in mind, however, that "forest" was previously defined differently from the way it is today. However, even taking these differences into account, the forest area has grown by about 45% since the late 19th century. This shows that Swiss forestry policy has been a great success. And the forests continue to expand. The Swiss National Forest Inventory shows that between 1985 and 2006 forested area increased by 5%.

The basis for the future orientation of the Swiss Confederation's forest policy is the Swiss National Forest Programme (Swiss NFP for 2004–2015)[31].

1.3.2 Characteristics of the Swiss forest area

Today, almost one-third of the country's area is covered by forests. However, there are large regional differences. Whilst only about 24 % of the Central Plateau is forest covered, forests cover more than 40 % of the land on the southern side of the Alps and on the Jura. If areas on which trees cannot grow at all, e.g. on water or above the timber line, are excluded, then the proportion of area covered by forest is even higher: 41 % for the whole of Switzerland, rising to 76 % for the southern side of the Alps[32]. About 2.7 % (33 400 ha)[33] of Switzerland's forest area is inaccessible and has therefore been minimally influenced by human management. About 100 ha are considered as virgin forests.

31 FOEN 2004: Swiss National Forest Programme (Swiss NFP), Environmental documentation No. 363,Swiss Agency for the Environment, Forests and Landscape, Berne. 117 pp. (download: pdf, 982 kB, http://www.bafu.admin.ch/wald/01152/01154/01158/index.html?lang=en, status June 2009).

32 FOEN, WSL (Eds.) 2005: Forest Report 2005 – Facts and Figures about the Condition of Swiss Forests. Berne, Swiss Federal Agency for the Environment, Forest and Landscape; Birmensdorf, Swiss Federal Research Institute WSL. 152 p. (download: pdf, 17 MB, http://www.bafu.admin.ch/publikationen/publikation/00767/index.html?lang=en, status June 2009).

33 FOEN: Biological diversity - Forest types and primeval forests, http://www.bafu.admin.ch, status June 2009.

Table 11: Forest area in 1 000 ha in the Swiss regions between 1983/1985 and 2004/2006 (Source: Swiss National Forest Inventory 3).

Inventory	Jura 1 000 ha	Central Plateau 1 000 ha	Pre-Alps 1 000 ha	Alps 1 000 ha	Southern Alps 1 000 ha	Switzer-land 1 000 ha
NFI1 (1983/85)	197.9	227.7	216.3	378.9	161.7	1182.6
NFI2 (1993/95)	201.2	231.2	222.2	401.3	167.6	1223.5
NFI3 (2004/06)	202.3	231.3	227.9	434.6	182.6	1278.6

1.3.3 Habitats in forests

About 34 basic forest habitat types can be distinguished in Switzerland. The potential natural distribution of the main forest communities in Switzerland (*Fagenion*, *Abieti-Fagenion*, other deciduous forests, *Abieti-Piceetum*, *Vaccinio-Piceenion, Rhododendro-Vaccinienion* and *Pinetea*) is shown in Figure 7.

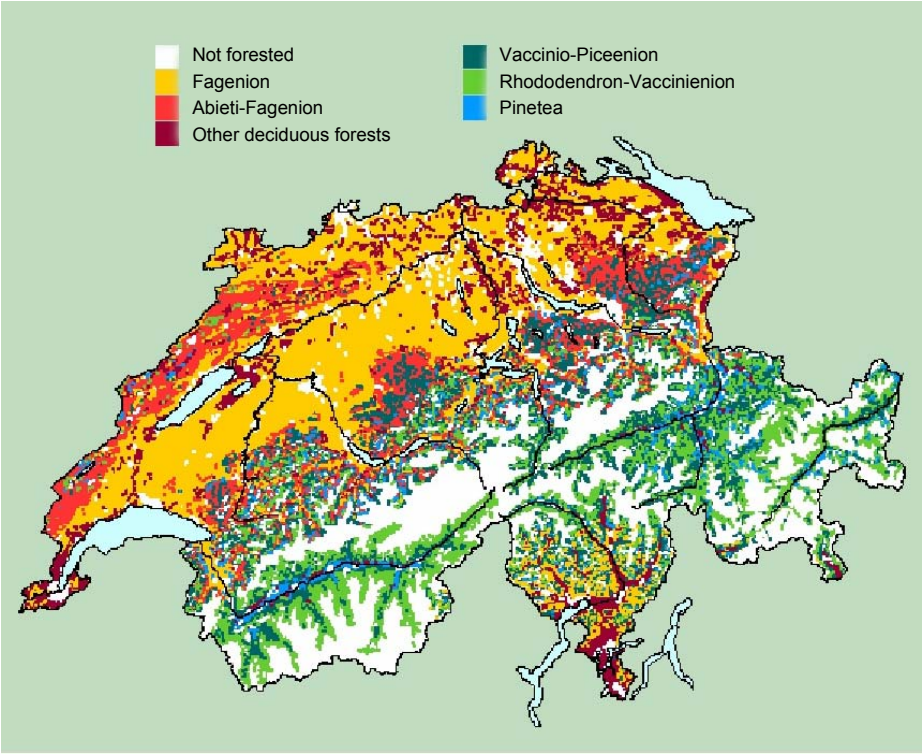

Figure 7: Potential natural forest communities in Switzerland (Source: Swiss National Forest Inventory 1993–1995).

Old and dead trees (deadwood) are typical for natural forest, in which the average volume of deadwood amounts to 50 - 400 m^3/ha. In Swiss forests,

the average volume amounts to 21.5 m^3/ha (counting stems over 12 cm in diameter of lying (10.7 m^3/ha) and standing (10.8 m^3/ha) deadwood). However, the distribution is not uniform, deadwood occurs mainly in steep and remote areas, whereas in intensively managed forests little deadwood can be found.

1.3.4 Protected forest areas

There are two main categories of protected forest areas in Switzerland: natural reserves and special forest reserves. Promotion of biodiversity takes precedence over commercial use in both of the categories. Natural forest reserves are left undisturbed, while in the special forest reserves interventions are made to create or improve habitats for selected plants and animals. The two kinds of reserves are sometimes combined in complex reserves where the natural forest reserve forms the core and the special forest reserve the surrounding environment.

About 400 km^2 of forest areas are declared as protected forest areas, which corresponds to 3.2 % of Switzerland's forested area (including the Swiss National Park and its forest area of 4 768 ha). This is much lower than the stated goal of forest policy, which aims to have established reserves in 10% of the forested area by 2030[34]. The reserves are mostly fragmented in small patches of less than 20 ha. In addition to the protected areas, on 18 % of Swiss forest area, no harvesting operations or human interference took place in the last 50 years, which adds to the undisturbed natural forest area.

1.3.5 Species diversity in forests

About half of the approximately 40 000 animal, fungi and plant species recorded in Switzerland dwell in forests. Figure 8 gives an overview of the number of species living in Swiss forests by species group.

In their natural state, over 70 % of Swiss forests would be dominated by only one tree species: this species would be either beech (*Fagus silvatica*) or spruce (*Picea abies*) (Figure 7). All other 53 tree species (thereof 11 conifer species) are less common or even rare.

Of the mammal species native to Switzerland, 44 dwell in forests. Regarding breeding birds, forests are the most species-rich habitats. There are 195 breeding bird species recorded in Switzerland, with 58 species relying on forest habitats for their survival; 7 species are classified as endangered.

34 FOEN 2004: Swiss National Forest Programme (Swiss NFP), Environmental documentation No. 363,Swiss Agency for the Environment, Forests and Landscape, Berne. 117 pp. (download: pdf, 982 kB, http://www.bafu.admin.ch/wald/01152/01154/01158/index.html?lang=en, status June 2009).

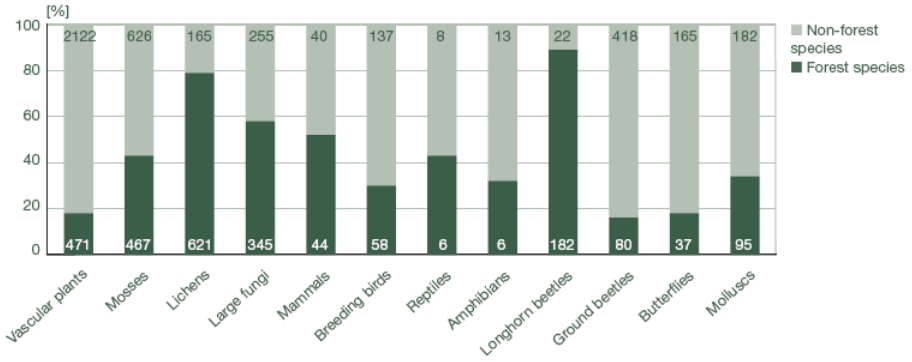

Figure 8: Number and proportion of species in each organism group in Switzerland that live and depend wholly or partially on the forest (Source: FOEN & WSL, Forest Report 2005).

Based on 10 m^2 samples, Switzerland's forests harbour, on average, 20 - 22 vascular plant species, 14 - 16 bryophyte species and 8 - 10 molluscs. The average plant and moss diversity is highest in the subalpine zone. Altogether, about 1 300 plant species are recorded for Swiss forests, out of which 8 % are considered endangered according to the Red List. On the Central Plateau this ratio is considerably higher (40 %). The amount of forest area dominated by alien species was 0.2 % and 0.6 % in the years 1993 and 1995, respectively (BDM indicator Z9).

Approximately a fifth of the plants and animals found in the forest, that is to say over 6 000 species, are dependant on deadwood as a place to live and as a source of food (these species are called xylobionts). Amongst these are 1 200 kinds of beetles and 2 500 kinds of large and other fungi[35]. A lack of old and deadwood therefore threatens biological diversity and influences the regulatory mechanisms in the forest ecological system (BDM indicator E10).

1.3.6 Genetic diversity of forest species

The genetic material of trees ensures the long-term survival of the tree species. Maintaining and promoting genetic diversity is thus one of the main challenges of forest policy (Table 12). In Switzerland, it is a matter of principle to interfere as little as possible with the propagation of trees. For this reason, fewer trees are being planted than previously. Trees regenerate naturally on 80 % of the forested area. Where planting is necessary, for example to change artificial conifer forests into natural broadleaved forests, foresters use seedlings of Swiss origin appropriate for the site.

In the 1990s, the Swiss government recorded the seed stands in a national seed-stand register (NKS). This database provides information about the

35 FOEN: Biological diversity - Old wood and dead wood, http://www.bafu.admin.ch, status June 2009.

characteristics of the stands and their locations, and helps foresters find ecologically suitable seed material for planting.

Furthermore, forests of special genetic interest have been designated. They are intended to protect local tree populations with special genetic characteristics. They are managed in a way that ensures the maintenance of selected species and their genetic material. To date, the federal government has designated five areas as special genetic interest forests for the tree species sessile oak (*Quercus petraea*), silver fir (*Abies alba*) and Norway spruce (*Picea abies*)[36].

Table 12: Genetic resources in Swiss forests (Source: FOEN & WSL, Forest Report 2005).

Category	*No. of objects*	*Total area*	*No. of species*
Forests of special genetic interest (SGI forests, Gene reserves)	5	1157 ha	3
Selected seed stands	366	2507 ha	33
Guaranteed source seed stands	1264	873 ha	30
Seed plantations	18	-	9

1.3.7 Sustainable use of forest products and services

In Switzerland, about 5 million m^3 of timber is harvested every year. This is 70% of the growth of useable wood in Swiss forests. In one year, about 6.5 million m^3 of timber is used in Switzerland (Table 13)[37]. Exports of timber amount to 222, 000 m^3 and imports to 416 000 m^3. After the imports of tropical round timber declined between the 1990s and 2002, they increased again and amount to 1 % (2 512 t) of the total round timber imports in 2006. Of the trimmed timber imports, tropical timber has a share of about 5 % (13 861 t) and is also increasing again.[38]

To promote biodiversity, Switzerland is at the present time establishing basic requirements for “close to nature forest management” in a project directed by FOEN and involving all interested parties.

36 FOEN, WSL (Eds.) 2005: Forest Report 2005 – Facts and Figures about the Condition of Swiss Forests. Berne, Swiss Federal Agency for the Environment, Forests and Landscape; Birmensdorf, Swiss Federal Research Institute WSL. 152 p. (download: pdf, 17 MB, http://www.bafu.admin.ch/publikationen/publikation/00767/index.html?lang=en, status June 2009).

37 FOEN: Production et utilisation du bois http://www.bafu.admin.ch, Status June 2009.

38 BAFU (Hrsg.) 2008: Jahrbuch Wald und Holz 2007. Umwelt-Wissen Nr. 0807. Bundesamt für Umwelt, Bern. 175 S. (download: pdf, 4 MB, http://www.bafu.admin.ch/publikationen/publikation/00087/index.html?lang=fr, languages: fr, de).

Table 13: Percentage of wood used for different end products (Source: FOEN 2008).

% of used wood	End products
37 %	Energy production
24 %	Construction
22 %	Paper and cardboard
Rest	Furniture, packaging and other wood products

Forest management close to nature is a form of management which puts to the best possible use of natural processes in a forest. The growth and development of the forest is controlled only as much as is absolutely necessary in order to reach conformity with the form of use required. Forests managed with silviculture close to nature mainly consist of tree species native to the locality. Forests close to nature differ from primeval and natural forests in the quantitative distribution of tree species (economically important species such as spruce might be over-represented), in the age structure (young trees and very old trees might be under-represented) and in the lack of sufficient deadwood.

In 1997, the Forest Stewardship Council (FSC) standard was introduced and by 2007 almost 650 000 ha of forests had been certified, representing 60 % of Swiss forests. At present, more than 350 enterprises in Switzerland offer FSC-certified products. Further areas are certified according to standards set by the Programme for the Endorsement of Forest Certification Schemes (PEFC). Many enterprises have both FSC and PEFC certificates.

Swiss forests are not only used for timber production but play an important role as protective areas in mountainous regions (see ecosystem services), and are also important for leisure and recreation. Everyone has the right to enter forests and pastures, and to pick berries and mushrooms in volumes customary for the location. This right applies to both private and publicly-owned forests.

1.3.8 Pressures on forest habitats

Forest biodiversity is not only threatened by over-exploitation but may also be affected by under-exploitation. In Switzerland, for instance, the stock of wood increased by 13 % between 1983/1985 and 1993/1995, and by 3 % between 1993/1995 and 2004/2006 due to lack of exploitation and the increase of forest area. This corresponds to an increase in wood stock of 359 m^3/ha. As a result, many forests have become denser and darker. An analysis by BDM Switzerland confirms the assumption that these forests are less diverse than more intensively managed forests. Therefore, forest exploitation adapted to the local conditions can be important for the conservation of biodiversity.

Areas of forest wilderness are rare (Table 14). In summertime, more than 90 % of the Swiss population regularly hike in the forests, and on fine days during spring or autumn visitor numbers can be up to 240 000 visitors a day [39].

Table 14: Percentage of the forest area (excluding shrub forests) in the Swiss regions at a certain distance to the next road accessible to cars (1993/95) (Source: 2nd National Forest Inventory 1993–1995).

horizontal distance in m	Jura	Central Plateau	Prealps	Alps	Southern Alps	Switzerland
	%					
up to 100	58.2	72.7	30.2	20.7	14.4	38.6
101 - 500	39.39	25.7	53.5	46	34.3	40.9
501 - 1000	1.7	1.5	12.8	22.0	20.1	12.4
over 1000	0.1	0.1	3.5	11.3	31.2	8.1

1.3.9 Invasive alien species in forests

Alien species are also part of Switzerland's forest ecosystem. Some species are used for forestry (e.g. Douglas fir, *Pseudotsuga menziesii*), while others can displace native species or cause damage to forestry (such as O*phiostoma novo-ulmi, a* pathogen fungi from Central Asia that causes elm disease)[40].

The threat posed by exotic species for Swiss forests is, however, small as only 0.6 % of trees are exotic and in just 0.4 % of the Swiss forest area do exotic species make up more than 50 % of the growing stock. Exotic species are said to be dominant if they form 50 % or more of the stock. Between 1985 and 1995 the proportion of exotic species in Switzerland's tree stands increased by 0.1 %.

Non-native plants still pose a certain risk. Those species that can spread without human assistance and can out-compete native plants in their habitats are especially dangerous (invasive species). Black Locust (*Robinia pseudo-acacia*), for example, which originated in North America, prefers poor soil and displaces native pioneer plants that also specialise in nutrient-poor habitats. Black Locust is therefore on the Black List, which includes those plant species to be controlled (see section 2.3.4). On the other hand, Black Locust can be legally planted as forest tree in Switzerland subject to approval by the cantonal forest service for a specific site, often for soil erosion purposes.

Some general facts about alien species include:

- Forests close to settlements show more alien plant species than those in more remote woods (due to illegally dumped garden waste, natural distribution vectors, planting);
- Invasive neophytes (e.g. *Robinia pseudoacacia*) can induce the growth of forest on open areas such as on species-rich dry areas;

39 FOEN: Sports et forêts, http://www.bafu.admin.ch, status June 2009.
40 Heiniger, U 2003: Das Risiko eingeschleppter Krankheiten für die Waldbäume. Schweiz. Z. Forstwes. 154,10: 410–414.

- "Plant lovers", beekeepers and hunters may intentionally introduce plants for the purposes of game browsing or covering, or fodder plants for bees[41].

Presently, the impact of invasive plant species occurring in Swiss forests is locally limited. For instance, only the forests in Canton Ticino (southern Switzerland) are affected by laurel cherry (*Prunus laurocerasus*) or the Chusan palm (*Trachycarpus fortunei*). Another invasive species, the Kutzu (*Pueraria lobata*) is an increasing threat to the forest in the South of Switzerland, covering trees totally. Their spread is influenced by proximity to settlements and rivers, high temperatures and sparse or disturbed forests. The prevalence of invasive alien plant species in forests is expected to increase due to global warming and the associated predicted increase in disturbances by storms and fires, and also due to other factors such as the use of foreign ornamental plants in gardening, the further expansion of settlement areas and the spontaneous spreading of already released species.

1.3.10 Forests and climate change

Impacts of climate change can already be recognised today in their early stages; the extension of the vegetation period by 5-6 days, for example, is one observed impact. In the future, extreme events (heat, drought, fire, heavy precipitation, storms) may become more frequent or pronounced, and these can have massive effects locally and can abruptly change ecosystem integrity. Up to now, temporary loss of living space security occurred due to extreme weather events that led to, for example, landslides. Dry conditions, in combination with high summer temperatures and intensified insect infestation, led to the extensive dying of trees. This was observed, for example, in the bark beetle epidemic after the storm Lothar, and in the pine forests in Canton Valais in the dry summer of 2003.

Due to climate change, the productivity of Swiss forests is expected to change considerably. At higher elevations, it is possible that productivity will rise as a result of warming; at lower elevations, productivity will decline as a result of summer drought and higher temperatures. In those years with sufficient humidity, warming may possibly prolong the growth period.

The fact that the dominant tree species will move upwards to higher elevations due to general warming is undisputed and can be verified for the late and post-glacial development. The small number of observed species shifts in the range of the timber line point to the fact that such reactions take place particularly slowly at high elevations. Also, at lower elevations, the

41 Kowarik I 2003: Biologische Invasionen: Neophyten und Neozoen in Mitteleuropa. 380 S. Verlag Eugen Ulmer, Stuttgart.

biocenosis will change as, for example, heat-loving neophytes will spread more into the forests[42].

Impacts of climate change on forest ecosystems might occur at a rate rendering natural adaptation through genetic processes or species migration difficult. Switzerland has therefore launched an intensive research programme to explore how forestry can contribute to climate change adaptation and to provide practitioners with guidance on how to maintain ecosystem services provided by forest.

1.3.11 Threats to forest biodiversity from pollution

To monitor the health of Swiss forests, the Sanasilva Inventory has been carried out since 1985. Its aim is to monitor the health of Swiss forests using crown and tree parameters as indicators of forest condition.[43] Crown transparency is a good indicator for the stress a tree is subject to, but general statements about the health status of a forest are not possible based on this indicator alone. Up to 1996, the proportion of trees with more than 25 % transparency increased continuously, after that no further trend could be observed.[44]

In the past 50 years, forests have grown much faster than before as a result of increased atmospheric nitrogen inputs and favourable climate conditions. Today, 90 % of Swiss forests are over-supplied with nitrogen, which, apart from enhanced tree growth (which results in denser stands and thus loss of habitat for species in need of light), leads to a decrease in base saturation in the soil, soil acidification, and contamination of the leakage water that feeds the groundwater.[45]

In the year 2000, atmospheric deposition of nitrogen throughout Switzerland amounted to a total of 75 000 tonnes. In comparison to adjacent open country, the deposits in the forest were generally higher because trees filter the pollutants out of the air. Some 34 % of Swiss forests were exposed to excessive deposition from air pollution with acidifying effects. Compared to the end of the 1980s when this figure exceeded 60 %, the situation has improved in recent years. However, more than 90 % of Switzerland's forest area is getting too much nitrogen (Figure 9). Researchers are also worried about the high concentrations of ozone close to the ground because ozone affects plant cells.

42 OcCC 2007: Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html)
43 Swiss Federal Institute for Forest, Snow and Landscape Research: Forest health inventory, www.wsl.ch, status June 2009.
44 Swiss Federal Institute for Forest, Snow and Landscape Research: Aktuelle Sanasilva Inventur http://www.wsl.ch/forschung/forschungsunits/wald/sanasilva/aktuelle_inventur_DE, status June 2009.
45 OcCC 2007: Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html)

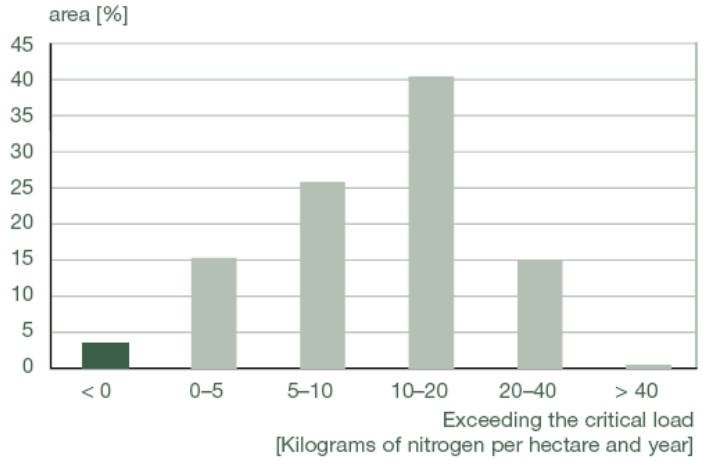

Figure 9: Frequency distribution of nitrogen in Swiss forest areas. Areas where nitrogen depositions exceed the critical loads are shown in light grey (Source: SAEFL, WSL 2005[46])

1.3.12 Ecosystem services provided by forests

In addition to protection against natural hazards, forests fulfil important functions, such as air and water purification, carbon and water storage, nutrient recycling, as well as providing leisure and recreational areas. They provide economically relevant products like wood for construction or energy, as well as recreation possibilities. Furthermore, forests have a particularly high carbon sink potential due to the large biomass stock of trees[47].

Drinking water from forests is of excellent quality and contains far fewer pollutants than water from areas used for agriculture. One reason is that forests receive lower depositions, but also the forest soil, unlike agricultural land, is seldom compacted through human activities. Compressed ground does not allow water to seep through easily and is less effective as a filter. Water from forests is not only of good quality but also occurs in large quantities since the forest floor can store up to two million litres of water per hectare. In Switzerland, we benefit from the advantages forests offer as natural suppliers of water: 46 % of Swiss groundwater zones are in forests.

Another important function of the forest is the protection of infrastructure against natural hazards such as avalanches, rockfalls, landslides and debris flow. About 40 % of Swiss forest area provides this service[48]. Tending protective forest is often labour-intensive and therefore costly, but it is still much more cost-effective than technical constructions such as avalanche barriers. Protecting the public is clearly of national importance. This is why the

46 SAEFL, WSL (Eds.) 2005: Forest Report 2005 – Facts and Figures about the Condition of Swiss Forests. Berne, Swiss Federal Agency for the Environment, Forest and Landscape; Birmensdorf, Swiss Federal Research Institute WSL. 152 p.
47 OcCC 2007: Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html).
48 Swiss Federal Institute for Forest, Snow and Landscape Research: Swiss National Forest Inventory 2004–2007,www.lfi.ch, status June 2009.

Swiss government has developed the strategy “Sustainability in Protection Forests” (SIPF), where experts assess the current state of protective forests and develop measures to maintain and increase their protective effectiveness in the long term. This work has top priority and is listed in the Swiss National Forest Programme as one of the five main priorities for Swiss forest policy[49].

Furthermore, the forest provides game, mushrooms and berries. Even though these forest products are marginal for Switzerland’s economy, they may be of local importance. For instance, the value of mushrooms collected in Switzerland’s forests is estimated to be CHF 8 million[50].

49 SAEFL 2004: Swiss National Forest Programme (Swiss NFP), Environmental documentation No. 363, Swiss Agency for the Environment, Forests and Landscape, Berne. 117 pp.
50 Ayer F 2004: Champignons comestibles: produits forestiers non ligneux recherchés. Hotspot 10, p. 10.

1.4 Inland Waters Biodiversity

With abundant freshwater resources, Switzerland can be considered part of the water reservoir of Europe. Although the country accounts for barely 0.4 % of the total area of the continent, some 262 billion m^3 of water lies within its borders – 6 % of Europe's total freshwater reserves.

1.4.1 Characteristics of Switzerland's watercourses

Switzerland's 65 000 km of watercourses consist predominantly of small rivers with a width of less than 5 m (96 % of all watercourses)[51]. The lakes cover a total area of 1 422 km^2, ten are larger than 10 km^2 [52]. Since the last minor ice age, which ended around 1850, the area covered by glaciers has been shrinking. In 1999, around 1 063 km^2 remained[53].

Further habitats relying on water include alluvial zones, bogs and fenlands. Many of these habitats were lost during the last centuries due to land-use changes.

1.4.2 Inland water habitats

Switzerland has many lakes, rivers and glaciers. However, inland water ecosystems are under threat due to, among other factors, river control, dams and hydropower plants, water pollution, nutrient depositions, invasive alien species and land-use changes resulting from agriculture, forestry and tourism.

Inland water habitats play an important role in the conservation of Switzerland's biodiversity. Raised bogs, for instance, bear only a few species but these are highly adapted to the nutrient-poor environment. Alluvial zones host probably more than 1 200 species. Within the densely populated Central Plateau, streamside vegetation provides vital pathways for species migration.

The importance of inland water habitats for biodiversity is reflected in the fact that most of the inventories on biotopes of national importance (see next section) target inland water habitats, as do many protected areas at the cantonal and municipal level.

1.4.3 Inland water protected areas

Alluvial zones: In 1992, the Federal Council developed the inventory of alluvial zones of national importance. Today the inventory contains 283 sites with a covering an area of 226 km² in total. The alluvial zones occur in the lowlands as well as in the Alps; their areas are between 2.1 and 439.5 ha and they

51 BAFU: Ökomorphologischer Zustand der Schweizer Fliessgewässer: Zwischenauswertung aufgrund der Erhebungen aus 18 Kantonen.
52 Swiss Statistics: Switzerland at a glance, http://www.bfs.admin.ch, status June 2009
53 Farinotti D, Huss M, Bauder A, Funk M & Truffer M.: A method to estimate ice volume and ice thickness distribution of alpine glaciers. Journal of Glaciology (2009), 55, 422–430.

appear as flood plains, alluvial zones at lakesides, deltas, glacier forelands or Alpine alluvial plains.[54]

Mires: The federal inventory of raised bogs and transitional mires of national importance includes 545 sites with a total area of 1 524 ha; the federal inventory of fenlands includes 19 218 ha (1 170 sites) and the inventory of mire landscapes of particular beauty and national importance comprises 89 mire landscapes.[55]

Amphibian spawning areas: The federal inventory of amphibian spawning areas of national importance includes 828 sites with areas ranging from 12 m^2 to 1 km^2. These areas are especially important for rare and threatened species; for example, 69 % of the populations of the Smooth Newt (*Triturus vulgaris*) occur in the protected areas.

Reserves for waterbirds and migrants: To date, 10 reserves for waterbirds and migrants of international importance and 26 reserves of national importance have been designated[56]. Further protected areas have been established by the cantons. An estimated 400 000–500 000 waterbirds winter on Swiss waters (more than twice the number of 1967). About 30–40 % stay in reserves of international and national importance. An additional 10–20% are found in reserves established by the cantons. When focusing on migratory birds wintering in Switzerland, it is estimated that up to 80 % stay in protected areas. The Ordinance on Waterbirds and Migratory Birds of International and National Importance is currently being revised.[57]

Watercourse sections of national importance: For graylings (*Thymallus thymallus*), the common nase (*Chondrostoma nasus*) and crayfish species (*Astacus astacus*, *Austropotamobius pallipes*, *Austropotamobius torrentium*), watercourses with populations of national importance have been designated.[58]

1.4.4 Species diversity in inland water ecosystems

Many species are bound to inland water ecosystems (Figure 10). In alluvial zones where terrestrial and aquatic ecosystems meet, the reported species diversity is particularly high. For instance, in alluvial zones of national importance, i.e. 0.26 % of the national territory, over 1 200 of the total 3 000 plant species occurring in Switzerland and 80 % of the animal species have been reported[59], with 300 of the latter living exclusively or predominantly in alluvial habitats (Table 15).

54 FOEN: Habitats, www.bafu.admin.ch, status June 2009
55 FOEN: Habitats, www.bafu.admin.ch, status June 2009
56 FOEN: Game and Hunting, www.bafu.admin.ch, status June 2009
57 FOEN: Game and Hunting, www.bafu.admin.ch, status June 2009
58 FOEN: Fisheries, www.bafu.admin.ch, status June 2009
59 FOEN: Landscape, www.bafu.admin.ch, status June 2009

Table 15: Animal species that live exclusively or predominantly in alluvial habitats (characteristic species status K+ and K2) (Source: Auen-Fauna-Datenbank 2008).

Animal groups[60]	Number of species living exclusively or predominantly in alluvial zones	% of species of the animal group in Switzerland
Reptilia (Reptiles)	3	20
Lepidoptera (Butterflies)	6	2.94
Amphibia (Amphibians)	7	29.17
Mammalia (Mammals)	7	8.43
Odonata (Dragonflies)	10	12.2
Mollusca (Molluscs)	12	5.69
Saltatoria (Grasshoppers)	12	10.26
Apoidea (Wild bees)	24	4.1
Aves (Birds)	33	8.44
Heteroptera (True bugs)	47	6.27
Carabidae (Carabid beetles)	139	26.58

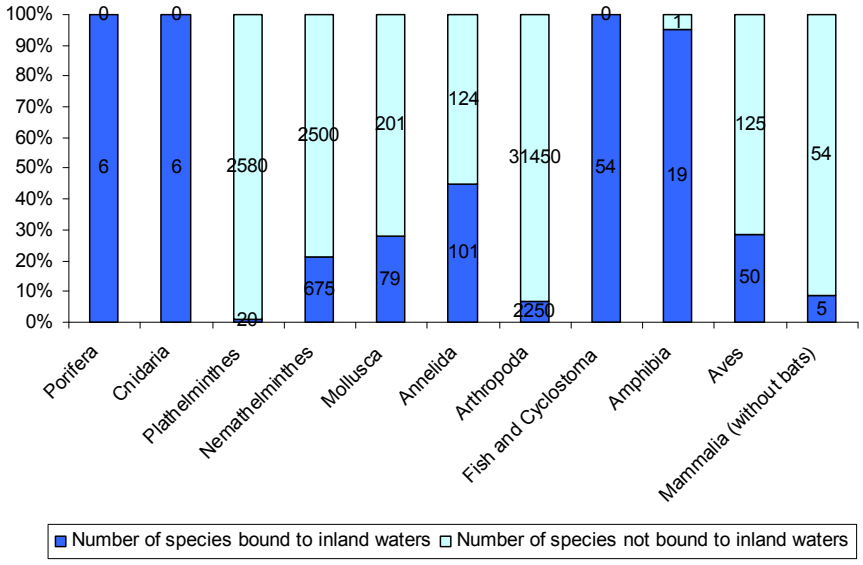

Figure 10: Number of species occurring in Switzerland that are bound to inland waters (Source: Swiss Biodiversity Forum, Hotspot 6/2002)[61].

1.4.5 Genetic diversity of fish species

Studies concerning population genetics of several inland water fish species have been conducted. In succession management, principals were elaborated

60 Agroscope Reckenholz-Tänikon Research Station ART: Anteil Arten, die in der Schweiz vorwiegend oder ausschliesslich in Auenbiotopen vorkommen, pro Tiergruppe, www.services.art.admin.ch, status June 2009

61 Hotspot 6/2002. Bulletin d'information du Forum Biodiversité Suisse. http://www.biodiversity.ch/f/publications/hotspot/

for the sustainable use of fish populations in Swiss lakes and rivers. The studies were particularly focused on salmonids, for which separate management of the main catchment areas is mandatory by federal legislation. Despite intensive fish stocking programmes, genetic data still prove the existence of indigenous biogeographic populations, which possess genetic peculiarities.[62]

1.4.6 Sustainable use of biodiversity-based products from inland waters

Watercourses fulfil many different functions: they shape landscapes, and transport water and sediment. They serve as life-giving arteries in our landscapes and help to maintain the natural balance of our ecosystems. They replenish groundwater resources. First and foremost, however, they are living, dynamic entities, which carve out their own path, sometimes overflowing their banks in the process. But they have often been harnessed by humans.[63]

As a result of human interventions, watercourses may no longer be able to fulfil their various functions:

- Confined channels and reinforced banks can increase the risk of flooding;
- Over-intensive industrial or agricultural land use too close to the water can adversely affect water quality.

Integrated water resources management seeks to reconcile the diverse requirements and to promote sustainable development in Switzerland.[64]

1.4.7 Pressure on inland water ecosystems

It is estimated that 35 000 km (or 54 %) of Switzerland's watercourses are in an eco-morphologically natural or near-natural state (Figure 11). A total of 14 000 km of watercourses are classified as insufficient with, among other adverse factors, 101 000 artificial barriers higher than 50 cm strongly affecting the rivers' ecological functions. The proportion of rivers with insufficient eco-morphological status varies among regions, significantly depending on the degree of urbanisation and the percentage of land under agricultural use. A total of 36 % of watercourses in the Jura are considered in an insufficient state, the proportion reaches 38 % on the Central Plateau and only 15 % in the alpine region. The highest percentage of watercourses in a bad or insufficient state (46 %) is found in the densely populated alpine valleys below 600 m asl.. In order to remediate affected rivers, revitalisation projects are being implemented throughout the country.

62 Largiadèr C, Hefti C 2002: Principes génétiques de conservation et de gestion piscicoles, informations concernant la pêche no 73,FOEN, Berne.
63 FOEN 2003: Guiding principles for Swiss watercources. Promoting sustainable watercourse management. 12 pp.
64 FOEN/FOWG (Ed.), 2003: Guiding Principles for Swiss watercourses. Promoting sustainable watercourse management. Bern, 12 pp.

Further, two-thirds of Switzerland's lowland alluvial zones of national importance (see section 1.4.3) are no longer characterised by natural dynamics. Flooding is prevented by dams or modified discharge regimes for purposes of power production or flood protection. Barriers impede biological exchanges along rivers and streams and between watercourses, banks and surrounding areas. Eutrophication of habitats (due to excessive nutrient inputs) has also contributed to the loss of diversity in alluvial vegetation. Local activities such as landfills, earthworks, drainage, gravel extraction, etc. are also factors contributing to the degradation of alluvial habitats[65].

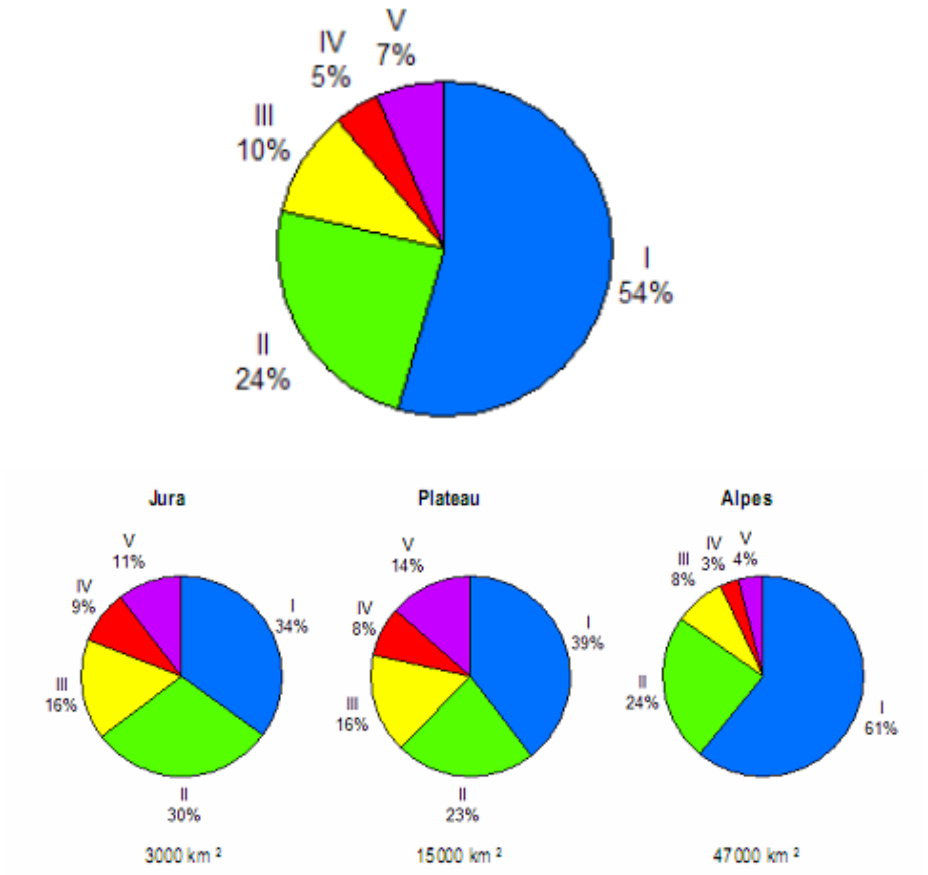

Figure 11: Eco-morphological status of Swiss rivers and their distribution among regions (extrapolated to the river network at a scale of 1:25 000).
Categories: I natural/near-natural; II slightly modified; III heavily modified; IV non-natural/artificial; V culverts. [66]

65 FOEN (2005): Alluvial zones in Switzerland, leaflet (download: pdf, 463 kB, http://www.bafu.admin.ch/publikationen/publikation/00888/index.html?lang=en, languages: en, fr, de,it).

66 Zeh Weissmann Heiko, Könitzer Christoph, Bertiller Anita 2009: Ecomorphologie des cours d'eau suisses. Etat du lit, des berges et des rives. Résultats des relevés écomorphologiques (avril 2009). Etat de l'environnement no 0926. Office fédéral de l'environnement, Berne. 100 p. (download: pdf, 10536 kB, languages: fr, de http://www.bafu.admin.ch/publikationen/publikation/01075/index.html?lang=fr&download=NHzLpZig7t,lnp6I0NTU042l2Z6ln1ae2IZn4Z2qZpnO2Yuq2Z6gpJCGdoJ3gmym162dpYbUzd,Gpd6emK2Oz9aGodetmqaN19XI2IdvoaCVZ,s-.pdf)

The effectiveness of Swiss mire protection has been monitored[67], and the final report concludes that the areas of raised bog and fen of national importance have approximately been maintained. However, the quality of the mires has clearly declined. Many types of mire have become drier, poorer in peat and richer in nutrients, and there is an increased amount of woody plant growth. Regeneration measures have been successful, but they were too infrequent and at too small a scale to compensate for the qualitative losses. There are considerable deficiencies in the implementation and execution of buffer zones. In mire landscapes, buildings, roads and paths continue to be constructed, which are inconsistent with the objectives of protection.

1.4.8 Invasive alien species in inland water ecosystems

Inland waters and habitats influenced by water (alluvial zones, fens and mires) have an average proportion of alien species, but those species occur in much higher densities than observed in other ecosystems, thus severely threatening the native flora and fauna.

The Rhine River is especially affected by alien species. They (mainly crustaceans and molluscs) dominate the Rhine in terms of total abundance and account for 80 % of the total biomass (Figure 12).[68] [69]

Since 1990, the International Commission for the Protection of the Rhine (ICPR) has been coordinating biological surveys on the river, from Lake Constance to the North Sea. In this context, FOEN and the Baden-Württemberg State Agency for the Environment, Surveys, and Nature Conservation (LUBW) commissioned, for the fourth time since 1990, surveys of the zoobenthos of the Rhine in Switzerland in the autumn of 2006 and spring of 2007. The surveys were conducted, as previously, along nine representative profiles.

The results of the studies on the Rhine in 2006/2007 confirm past prognoses about the effects of alien species on the benthos-fauna of the High Rhine. The following developments can be noted:

- Since approximately 1995, nine different hololimnic alien animal species have been introduced to the High Rhine. Six of them show tendencies to mass reproduction and invasive land-use behaviour; the other three remain inconspicuous. Just one of the introduced species

67 Klaus G. (Red.) 2007: Zustand und Entwicklung der Moore in der Schweiz. Ergebnisse der Erfolgskontrolle Moorschutz. Umwelt-Zustand Nr. 0730. Bundesamt für Umwelt, Bern. 97 S.

68 Wittenberg, R. (ed.) 2005: An inventory of alien species and their threat to biodiversity and economy in Switzerland. CABI Bioscience Switzerland Centre report to the Swiss Agency for Environment, Forests and Landscape. The environment in practice no. 0629. Federal Office for the Environment, Berne. 155 pp. (download: pdf, 2.2 MB, http://www.bafu.admin.ch/publikationen/publikation/00028/index.html?lang=en).

69 Haas G, Brunke M and Streit B (2002) Fast turnover in dominance of exotic species in the Rhine river determines biodiversity and ecosystem function: an affair between amphipods and mussels. In: Leppäkoski E, Gollasch S and Olenin S (eds) Invasive aquatic species of Europe: distribution, impacts, and management, Dordrecht, pp 426-432

(*Dikerogammarus haemobaphes*) has disappeared again from the High Rhine;

- In their areas of expansion, invasive animal species show high population densities. This suggests that the process of colonisation – originating from an introduced initial population – happens downstream;
- The food available in the High Rhine does not appear to limit population explosions of invasive alien animals. The only limitations they encounter are in relation to habitat availability, and environmental factors that have selective effects (temperature, current and substrate);
- Invasive animal species seem to be suppressing native species in the lowest part of the High Rhine. *Dikerogammarus villosus* and *Echinogammarus ischnus* are known to be acting as predators and in doing so directly influencing other macro-invertebrates;
- In the near-natural sections of the High Rhine, no introduction of non-native species has yet occurred or, if species have been introduced, they could not naturalise so far as to show any distinctive impact on the biocenosis of the benthos;
- A predominant part of the alien animal species relevant to the biocenosis originates from the Ponto-Caspian area. Further invasive species, which were already detected in the Upper Rhine, are expected to emigrate especially from that area to the High Rhine. Further species of *Gammaridea* as well as the recently introduced mussel *Dreissena bugensis* are expected to have particularly drastic impacts.[70]

In ponds, lakes and slow-flowing rivers, three North American crustacean species (*Pacifastacus leniusculus*, *Orconectes limosus* and *Procambarus clarkii*) pose a threat to the local crayfish fauna. The American varieties are not susceptible to the crayfish plague, but they are vectors of the disease, carrying it into European crayfish (*Astacus astacus*) populations. The severity of the disease in these populations raises grave concerns about the survival of the native crayfish species.

Regarding fish fauna in Switzerland, 15 species are considered alien in origin. In some cases, natural breeding has not yet been reported in Switzerland and populations are based on frequent releases.[71]

70 Mürle U., Ortlepp J., Rey P. 2008: Koordinierte biologische Untersuchungen im Hochrhein 2006/2007. Makroinvertebraten. Umwelt-Wissen Nr. 0822. Bundesamt für Umwelt, Bern. 104 S. (download: pdf, 8.4 MB, http://www.bafu.admin.ch/publikationen/publikation/01007/index.html?lang=de, language: de)

71 Wittenberg, R. (ed.) 2005: An inventory of alien species and their threat to biodiversity and economy in Switzerland. CABI Bioscience Switzerland Centre report to the Swiss Agency for Environment, Forests and Landscape. The environment in practice no. 0629. Federal Office for the Environment, Berne. 155 pp. (download: pdf, 2.2 MB) http://www.bafu.admin.ch/publikationen/publikation/00028/index.html?lang=en).

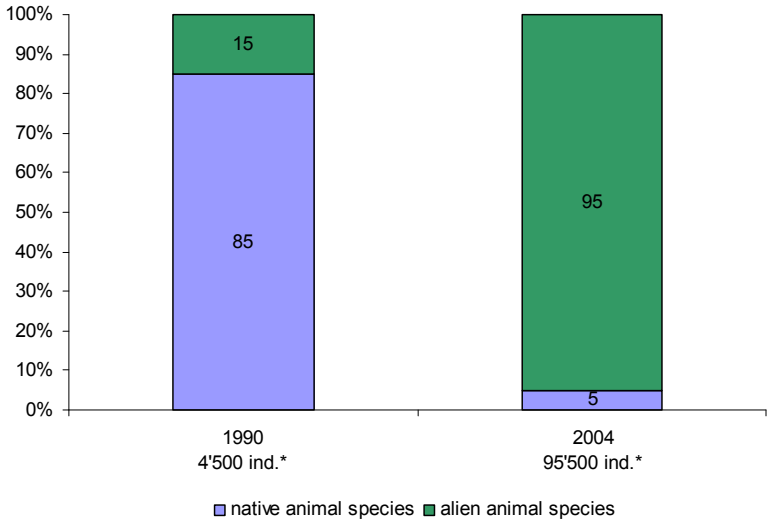

Figure 12: Spread of alien animal species in the Rhine. *Maximum number of individuals on a sampling site (individuals per square meter) (Source: FOEN 2008).

1.4.9 Inland water ecosystems and climate change[72]

As a result of climate change, the water supply in summer and autumn is expected to decrease. In particular, during the more frequent heat waves of summer even medium and larger midland rivers may have water levels as low as those experienced in winter. Accordingly, groundwater levels in valley gravels will decline more strongly in late summer and autumn. At the same time, the agricultural demand for irrigation water will increase. As a result, competition will rise between the water demand of river ecosystems and that of different users and regions, in particular regarding the use of groundwater, and water from small and medium rivers. Except for in the southern part of Switzerland, a decrease in the number of species, particularly in fens, is expected. This development will become even stronger if precipitation decreases and these habitats shrink due to water shortage. In this respect, the upland mires in Switzerland are especially vulnerable: increased temperatures and longer dry periods endanger the moss cover and enable species uncommon in upland moors to invade these habitats.

In lakes, the warming is stronger in the well-mixed surface layer than in the deep water. As a result, the stability of density layering increases and the period of stable layering in summer lasts longer. In the lake of Zurich, a mean warming of 0.24°C per decade in the surface layer and 0.13°C per decade in the deep water has been observed. Stable layering lasts about two to three

[72] OcCC 2007: Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html)

weeks longer. In the lakes of the Central Plateau, which have no regular ice cover, the frequency of mixing events in winter has tended to decrease. As a result of this, less oxygen reaches the deep water. This does not apply for lakes at higher elevations that are regularly covered with ice; there, the mixing takes place earlier in spring and later in autumn. In mountain lakes, the decrease in the annual ice cover will lead to an increase in biological production and an increased oxygen demand.

The increase in thermal stability and the change in circulation conditions have resulted in temporal shifts in the food chain. In spring, the feeding pressure of zooplankton ends the algal bloom. What follows is the “clear-water” phase. Since the growth and feeding rates of zooplankton are higher in warmer than in cooler water temperatures, the clear-water phase occurs earlier after warm winters. The clear-water phase has been observed to occur about two weeks earlier than it did 20 years ago.

As a result of this 0.4–1.6°C warming in Swiss streams in the past 25 years, trout habitat has shifted upwards by 100–200 m. Estimates have shown that with a warming of 2°C by 2050, the habitats of cold-water fish species in Switzerland will shrink. However, both cold-water and warm-water fish will profit from warmer winter temperatures; growth phases will last longer and the fish will grow more quickly.

As a result, bodies of water will become more suitable for carp (*Cyprinidae*) and exotic fish species. Additionally, illnesses like the parasite infection Proliferative Kidney Disease will spread with warmer water temperatures[73].

Climate protection efforts are leading to an increased demand for hydropower. In this respect, there is a conflict between climate protection and biodiversity conservation in inland waters.

1.4.10 Threats to inland water ecosystems from pollution

Inputs of pollutants and nutrients into lakes have declined considerably with the expansion of wastewater treatment facilities and the use of new treatment processes. Phosphorus concentrations have declined markedly since the mid-1970s. However, phosphorus levels remain excessive in certain lakes exposed to inputs from intensive cattle farming or extensive cropping, and substances such as pesticides and pharmaceutical residues (micropollutants) are having an increasing impact on bodies of water.

Some of these organic trace elements can have adverse effects on aquatic ecosystems even at very low concentrations. One example is endocrine

73 OcCC 2007: Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html)

disruptors, hormonally active substances that are currently being investigated within the context of National Research Programme (NFP) 50.

Nitrates, mainly deriving from agricultural sources, are detected especially in groundwater. By this route, however, they also enter rivers and streams. Problems of eutrophication in the 1980s prompted the development of a nitrate reduction strategy. In contrast to the phosphorus reduction efforts, however, the defined targets were not reached.

Heavy metals accumulating in the sediments and suspended solids of watercourses may have adverse impacts on aquatic organisms. Concentrations of heavy metals were investigated in a sediment contamination study over the period 1999/2000 in the Rhine, Thur, Aare, Reuss, Limmat, Birs, Rhône, Ticino and Inn rivers. Concentrations were found to have decreased substantially since 1986/1990.

1.4.11 Ecosystem services provided by inland waters

Switzerland's inland water ecosystems provide many services, for instance:

- Glaciers, surface water and groundwater store and provide water for drinking and irrigation;
- Surface waters allow a catch of 1 600 tonnes of fish a year (2007);
- Alluvial zones retain water and weaken flood events;
- Waterside areas and bodies of water offer opportunities for recreational activities;
- Hydropower covers about 56 % of Switzerland's electricity demand.

1.5 Dry and Subhumid Lands Biodiversity

Even though Switzerland is situated outside the delineated areas of the global drylands, patches of dry and subhumid meadows and pastures exist all over the country (Figure 13). These meadows and pastures are species-rich habitats developed from extensive agricultural use. Without human activity they would be rapidly overgrown with bushes and trees. The characteristics of these habitats vary, depending on the location and the cultural history of the site. Dry meadows and pastures are the only vegetation types in Switzerland that fall under the Convention on Biological Diversity for dry and subhumid lands.

1.5.1 Dryland habitats

The mapping of dry grassland sites for the federal inventory of dry meadows and pastures of national importance includes sites up to the timber line, with the exception of mown areas. Furthermore, the vegetation must cover at least 25 % of an area. Thus rocky areas and rocky debris are clearly excluded. Above the lower limit of the summer pastures, fallow lands are not included either.

The most common vegetation is the blue moorgrass slope (18 %) followed by nutrient-rich semi-dry grassland (17 %) and true semi-dry grassland (12 %). Most of the remaining dry grassland is situated on slopes between 1 250 and 2 000 m asl.[74].

The characteristics of the vegetation of dry meadows and pastures vary strongly due to natural as well as cultural and historical circumstances.

1.5.2 Drylands protected areas

The species-rich dry meadows and pastures are endangered. It is estimated that since 1945 dry meadows has declined by 90 %. To counteract the loss of dry meadows and pastures FOEN has developed the inventory of dry meadows and pastures of national importance (Figure 13) in compliance with Article 18a para.1 of the Federal Act on the Protection of Nature and Landscape.

The Ordinance on the Protection of Dry Meadows and Pastures of National Importance has been enacted in February 2010.

Dry meadow conservation is implemented in co-ordination with agriculture and forestry policy. It is based on the principles of sustainability and promoting a strategy of incentives, so that conservation and promotion of dry meadow areas is economically advantageous for farmers. This means that our dry

74 FOEN: Prairies et pâturages secs (PPS), Projet PPS, www.environment-switzerland.ch (languages: fr, de, it), status July 2009).

meadow conservation policies will contribute to the structural improvement of economically marginal areas in the mountains. By means of financial contributions, economical value is added to these economically marginal but biologically rich grasslands, with the aim to stop the retreat of agriculture in these mountain areas.

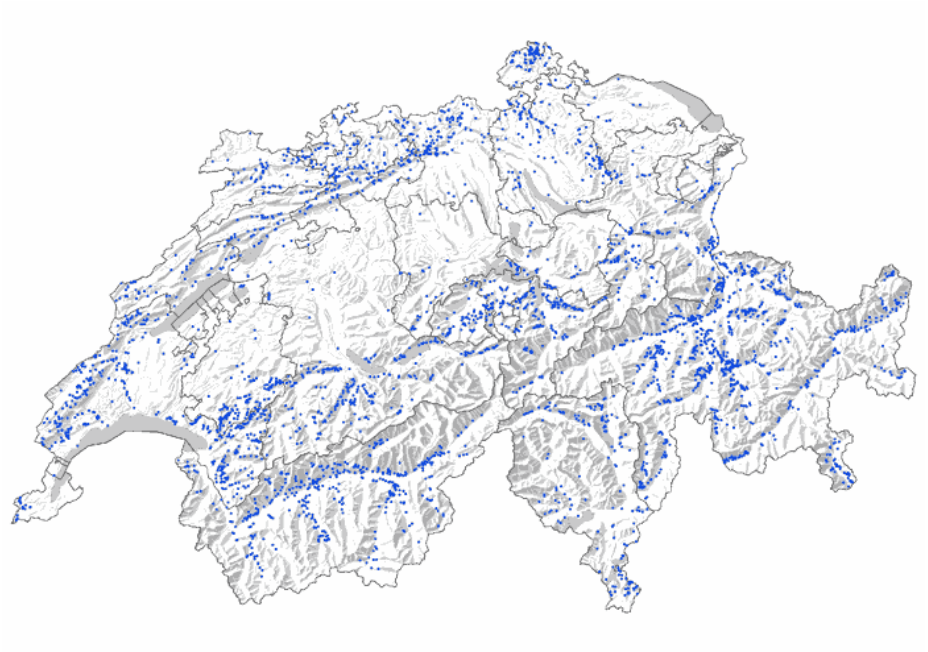

Figure 13: Dry meadows and pastures of national importance in Switzerland (Source: FOEN 2008).

The highest shortfall in terms of biodiversity is in the Central Plateau. Further loss through intensification of the remaining grassland areas must be stopped. Mandatory regulations are available to achieve this. Alternatively, financial incentives can motivate the regeneration of formerly valuable dry grassland areas.

The central instrument of the implementation of measures to conserve grasslands will be contracts between farmers and competent cantonal authorities (possibly represented by conservation bodies). These contracts contain agreements on land management, conservation, maintenance measures and the financial compensation for all efforts. With the contract model, “bio-diversity as a product”, biodiversity has a value that is demanded and compensated by the public. This model prioritises an approach that has been applied in many cantons with great success. Furthermore, management contracts can easily be combined with other instruments of agricultural policy and are well-accepted by farmers.

In addition to classical object conservation, a further implementation tool is offered to the cantons: priority zones. The cantons will be enabled to conserve the dry grassland objects in combination with their surrounding biotopes, in order to enhance the flexibility of implementation. In doing so, the common

principle of “undiminished conservation” of the single object is of secondary importance to the overall biotope combination. Thus, interplant and regionally adapted solutions that are holistic in their approach are possible for optimally achieving the conservation targets.

Regional concepts are the basis for priority zones whose implementation is ruled by a service agreement. Furthermore, there is a connection between these priority zones and the agricultural legislation: regional networking projects according to the federal ordinance relating to ecological quality. Valuable synergies can be created between these two instruments by co-ordinating the targets, especially the definition of target species.

1.5.3 Species diversity in drylands

With up to 100 plant species per 100 m^2, dry meadows and pastures are amongst the most species-rich plant communities of Switzerland.[75] They harbour almost two-thirds of the entire Swiss flora as well as rare and endangered plant species. Of the total of 3 100 vascular plant species that are found in Switzerland, over 400 (13 %) occur predominantly in this habitat. On average, 37 % of these plant species are endangered or critically endangered. The rate is highest for the Swiss Central Plateau (70 %), the Northern Alps and the Jura (50 % each). An additional 13% of vascular plant species occurring predominantly in this habitat are near threatened.

While compiling the Red List of threatened species in Switzerland about 150 terricolous (ground-dwelling) and about 350 epiphytic and epilithic (stone-dwelling) lichens as well as about 400 species of fungi were found in dry habitats. Amongst them were three lichens and two fungi that are protected in Switzerland. In total, 143 macrofungi and 295 ground-dwelling lichens occurring in dry meadows and pastures are registered in the corresponding Red List.

According to data on animal groups (birds, reptiles, molluscs, ground beetles, wild bees, *Heteroptera*, grasshoppers, butterflies and skippers), about 17% of the species occurring in Switzerland depend exclusively or predominantly on dry meadows and pastures (species indicator status 1 and 2). This is especially pronounced for butterflies and skippers (40 % of the species) as well as for grasshoppers (30 % of the species). As much as 40 % of the animal species recorded in Switzerland depend on dry meadows and pastures if those species occurring typically but not predominantly in dry meadows and pastures are also considered (Table 16). Finally, it is estimated that the insect diversity in dry meadows and pastures might be up to 1 000 species or even higher.

75 Eggenberg S., Dalang, T., Dipner M., Maier, C., 2001: Cartography and Evaluation of Dry Grassland Sites of National Importance: Technical Report, Environmental Series No. 325, published by the Federal Office for the Environment (FOEN), Berne. 252 pp.

Table 16: Habitat specificity and species diversity of dry grassland sites (DGS) (Source: Eggenberg et al. 2001)[76].

species indicator status*	1	2	3	4	5	6	Total	1+2	1+2+3
Aves (birds)	0	7	23	58	103	0	191	7	30
Reptilia(reptiles)	0	1	6	5	3	0	15	1	7
Mollusca (molluscs)	9	21	8	21	162	26	247	30	38
Carabidae (ground beetles)	15	58	78	87	237	36	511	73	151
Apoidea (wild bees)	7	86	242	79	56	110	580	93	335
Heteroptera (bugs)	0	100	114	127	281	0	622	100	214
Saltatoria (grasshoppers)	8	24	31	22	23	4	112	32	63
Rhopalocera (butterflies Hesperidae (skippers)	32	47	67	39	13	5	203	79	146
Total	71	344	569	438	878	181	2481	415	984

*Indicator status: 1 exclusively in DGS, 2 predominantly in DGS, 3 typically, but not predominantly in DGS, 4 occasionally in DGS, 5 not in DGS, 6 uncertain.

Data from BDM Switzerland show that landscapes with dry meadows and pastures harbour on average more species than normal landscapes, particularly vascular plants and butterflies. This feature is particularly distinct for the Southern Alps.

The analysis of the data shows that about 18 % more species (of butterflies, vascular plants and breeding birds combined) live in areas with dry meadows or pastures than without (Figure 14). However, for breeding birds alone this difference is not significant [77].

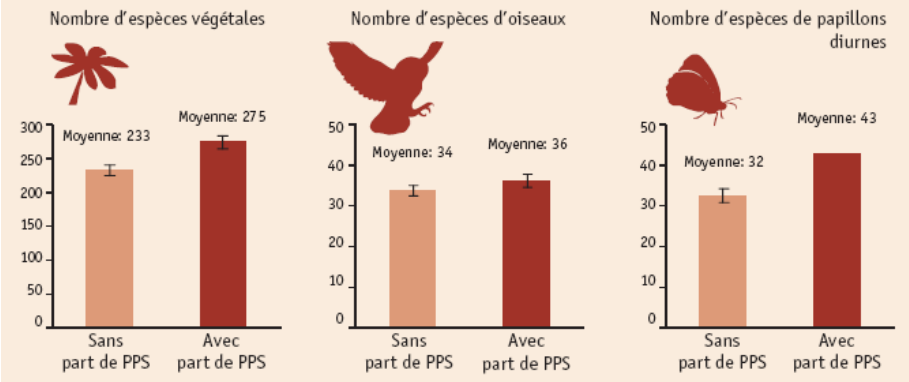

Figure 14: Mean species numbers in landscapes (1 km^2) with and without dry meadows and pastures (Source: Urs Draeger, (2008), Monitoring de la biodiversité en Suisse (MBD): Les PPS sont essentielles à la diversité des espèces. Hotspot 18/2008, pp. 20-21)[78].

76 Eggenberg, S., Dalang, T., Dipner M., Maier, C., 2001: Cartography and Evaluation of Dry Grassland Sites of National Importance: Technical Report, Environmental Series No. 325, published by the Federal Office for the Environment (FOEN), Berne. 252 pp.
77 Hotspot 18/2008. Bulletin d'information du Forum Biodiversité Suisse. http://www.biodiversity.ch/f/publications/hotspot/
78 Hotspot 18/2008. Bulletin d'information du Forum Biodiversité Suisse. http://www.biodiversity.ch/f/publications/hotspot/

1.5.4 Sustainable use of biodiversity-based products

The sites evaluated in the project “Dry Meadows in Switzerland” are used as meadows or mown pastures (24 %), pastures (62 %) or not used (fallow land: 14 %). Furthermore, traditional and probably sustainable types of use as wild hay meadows, slopes, wood pastures or rocky steppe vegetation are distinguished.

1.5.5 Pressure on habitats

The inventory of dry meadow and pasture sites in Switzerland reveals a rapid decline of these habitats. The main pressures include the intensification of land use, especially from agriculture, natural reforestation, and constructions, since dry grassland sites are attractive for housing due to their sunny exposure and because the abandoned farmland is available for purchase.

1.5.6 Invasive alien species in dry and subhumid lands

Generally, invasive alien species (IAS) are of minor importance to dry meadows and pastures. However, the abandonment of agricultural management can favour the spread of invasive species. The Black Locust (*Robinia pseudoacacia*), for instance, was observed to invade abandoned grasslands and, due to their ability to convert nitrogen compounds, rapidly altered soil conditions, and thus supported natural reforestation.

Neophytes can cause problems when restoring dry grassland ecosystems, e.g. along railway tracks. Such sites are particularly affected by *Solidago canadensis* or *Buddleja davidii*, resulting in significantly higher maintenance costs.

1.5.7 Dryland ecosystems and climate change

Since species react differently to climate change and the cultivation of land, ecosystems will have to adapt to changed environmental conditions (e.g. earlier hay harvest, irrigation of permanent grassland, adjustment of livestock, and increased significance of high altitude areas for summer pasture). Consequently, the species composition of dry meadows and pastures will change in the long term.

Based on today’s knowledge, strong effects of climate change are to be expected at locations where the upper timber line has been kept artificially low by mountain pastures, the forest may advance again very quickly in the case of a reduction in pasture use and, simultaneously, rising temperatures[79].

79 OcCC 2007: Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html)

1.6 Mountain Biodiversity

With summits above 4 000 meters and an area of 250 000 km², the Alps are the most important mountain chain in central Europe. About 66 % or 27 179 km^2 of Switzerland's territory is mountain regions, with a quarter of Switzerland's population living in this area. Therefore, the conservation and sustainable use of mountain ecosystems is not specifically regulated, but fully integrated in the national and cantonal acts, rules and policies for the protection of nature and climate.

1.6.1 Mountain ecosystems and habitats

The Alps are not only known for their fascinating landscape, they also constitute a hotspot for biodiversity in Europe. Several hundred plant species exist only in alpine regions. By creating cultural landscapes, man has deeply changed the natural landscapes and habitats of Switzerland's mountain ranges. This has significantly enhanced the diversity of the landscape and the biosphere, but, in recent decades, this diversity has increasingly come under pressure[80].

Some mountain habitats of national importance, such as dry meadows, mires and alluvial zones, are discussed in the previous sections.

1.6.2 Protected areas in mountain regions

Many protected areas are located in mountainous regions, e.g. the Swiss National Park (17 033 km^2 between 1 400–3 174 m asl) as well as three UNESCO natural world heritage sites (Schweizer Alpen Jungfrau-Aletsch, Monte San Giorgio and Tectonic Arena Sardona). Further, 15 out of 31 Important Bird Areas (IBAs) are located in mountainous regions, and most of the dry meadows and pastures of national importance (cf. drylands biodiversity) are found at altitudes between 1 250 and 2 000 m asl. Also, 42 % of the sites listed in the inventory of alluvial zones of national importance (cf. inland waters biodiversity) are alpine alluvial zones, i.e. glacier forelands and alpine alluvial plains at altitudes above 1 750 m asl. Further mountainous areas are protected by virtue of the inventory of mires of national importance or are designated as federal game reserves.

1.6.3 Species diversity in mountain ecosystems

Scientists at the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) have modelled Switzerland's species diversity based on data

80 Stöcklin J. et al 2007: Utilisation du sol et diversité biologique dans les Alpes. Synthèse thêmatique de l'orientation prioritaire II, Programme national de recherche NFP48 "Paysage et habitats de l'espace alpin" du Fonds national Suisse de la recherche scientifique. Edition vdf, Zürich

from BDM Switzerland (Table 17). The models used account for some 80 variables including climatic and geographical factors, as well as data connected to land cover and land use. The combination of these variables resulted in predictions of 70 % to 80 % of the species diversity actually found in BDM sampling areas[81].

Only few habitats offering ideal conditions to butterflies, birds and vascular plants alike are found in Switzerland. Representing true diversity hotspots for the three species groups, such sites are mainly found on south-facing slopes of alpine valleys, above all in the canton Valais (Figure 15).

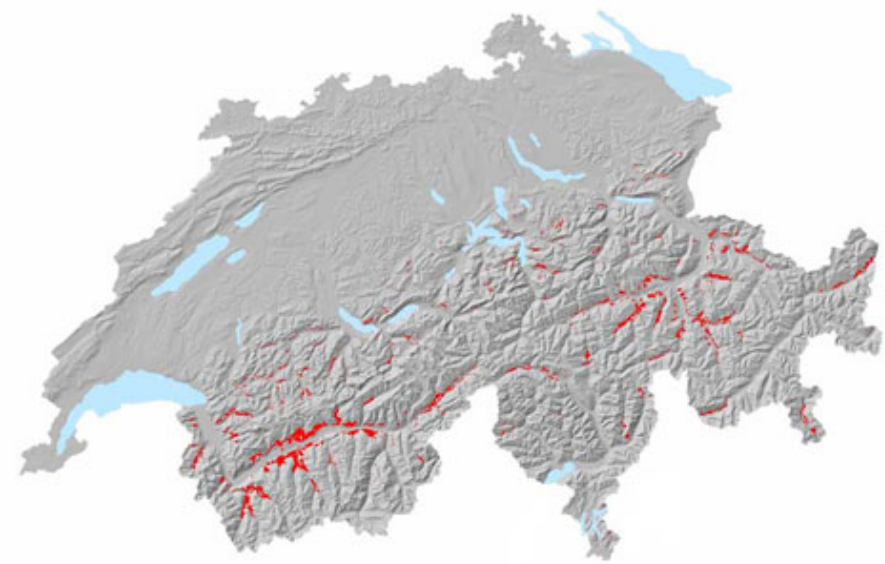

Figure 15: Modelled diversity hotspots for butterflies, birds and vascular plants (Source: Biodiversity Monitoring Switzerland 2006).

A mountainous area especially well studied for its species diversity is the Swiss National Park. Within the park, 30 mammal species, 100 bird species – of which 60 breed in the Park – 2 reptile species and 2 amphibian species, as well as about 5 000 invertebrates, are reported. A rich variety of alpine plants is also observed, with more than 650 different species of vascular plants.[82]

81 Biodiversity Monitoring Switzerland: Artenvielfalt auf einen Blick, http://www.biodiversitymonitoring.ch, status June 2009.
82 Swiss National Park, www.nationalpark.ch, status June 2009.

Table 17: Mean species numbers in Swiss mountainous regions (1 km^2) (Source: Biodiversity Monitoring Switzerland, indicator Z7).

	Mean species numbers		
	Vascular Plants	Breeding Birds	Butterflies
Jura	265 ± 9	40 ± 2	29 ± 2
Northern Alps	263 ± 13	32 ± 2	38 ± 3
Central Alps	205 ± 18	22 ± 3	39 ± 4
Southern Alps	226 ± 19	24 ± 2	40 ± 4
High altitudes*	132 ± 15	9 ± 2	22 ± 3

* Sampling sites with 90 % of their surface area above 1 400 m.

1.6.4 Genetic diversity in mountain ecosystems

The breeding of domestic animals and the cultivation of crop plants, as well as various uses of forests and grasslands, have influenced the genetic diversity of the alpine region. Centuries of breeding and the seclusion of many valleys resulted in a particularly large number of domestic animal landraces and crop varieties (see section 1.2.4).

In the Swiss Alps, studies on the genetic diversity of several wild species of animals and plants have been conducted, for instance:

The genetic diversity of 11 daphnia populations in mountain lakes at varying elevations, and the factors that influence their diversity were examined. The results presented a very heterogeneous genetic composition [83].

The remnant adder (*Vipera berus*) exhibits a considerable genetic differentiation among populations, even if these are not geographically isolated. Moreover, the genetic diversity within populations in the Jura mountains and in the less disturbed Swiss Alps is significantly lower than in French populations, possibly due to post-glacial recolonisation processes[84].

1.6.5 Sustainable use of mountain biodiversity

Sustainable development in mountain regions has a long tradition in Switzerland, nevertheless it remains a challenge. Indeed, to find a balance between the many and often conflicting interests of tourism, transit traffic, industry and agriculture constitutes a central task of policymaking. This balance can only be achieved by solidarity among the entire population, including economic centres in the lowlands.

In concrete terms, sustainable management of mountain resources means enabling mountain populations to earn a livelihood, providing protection

83 EAWAG News, No. 56: Genetic Diversity of Daphnia in Alpine Lakes, www.eawag.ch, status June 2009.

84 Ursenbacher S, Monney J-C & Fumagalli L 2009: Limited genetic diversity and high differentiation among the remnant adder (*Vipera berus*) populations in the Swiss and French Jura Mountains. Conservation Genetics 10/2, 303–315 pp.

against natural hazards, enhancing conservation of natural resources, safeguarding social and cultural traditions, and supporting development that takes account of the special features of mountain regions and ensures that the interests of both mountain and lowland populations are equal parts of a fundamental social contract.

For the last six decades, Switzerland has followed a policy designed to avoid widespread depopulation of its mountain areas that would have led to severe ecological problems. First, farmers and forestry operations in the mountains had access to subsidies and sectoral infrastructure programmes, which provided compensation for the disadvantages faced when competing with lowland farmers. Second, a Federal Act on Aid for Investment in Mountain Areas (IHG) was adopted in 1974 to provide loans for small investment projects in mountain communities. To gain access to the IHG, the politically independent mountain communities must organise themselves into development regions and reach consensus on their development priorities.

1.6.6 Pressures on mountain ecosystems

Mountain regions are extreme habitats, with highly fragile ecosystems. As such, they register environmental degradation earlier and more clearly than less sensitive systems.

Since centuries, humans have been increasingly affecting mountain ecosystems. The major factors include mechanisation and intensification of agriculture as well as the clearing of the landscape and the uncontrolled spread of settlements. Landscape elements like single trees, hedges and orchards have been systematically removed. Important habitats for animals and plants have disappeared.

In the grasslands, two opposite developments took place: On the one hand, areas that easily lent themselves to agricultural use were cultivated ever more intensively, thus leading to a loss of species diversity at both the level of the individual land holding and at the landscape level. On the other hand, steep and poorly accessible areas were increasingly dismissed and left to natural reforestation.

The appearance of mountain forests and their function of providing protection and habitats have deeply changed, too. For decades, the number of new trees has outstripped the number of felled trees; as a result, the stock of wood has grown and the forest has become dense. While typical types of forest benefit from such reduced wood use, species that like light and warmth become ever rarer.

An indirect threat for biodiversity of mountain ecosystems is global climate change and nitrogen input from the atmosphere (see section 1.6.9). With a temperature rise of several degrees by the middle of this century, the vegetation of the Alps will probably change significantly (see section 1.6.8).

The Global Mountain Biodiversity Assessment (GMBA) is an international network of researchers actively exploring and explaining the great biological richness of the mountains of the world. GMBA seeks to provide input to policy makers and stakeholders for the conservation and sustainable use of biodiversity in mountain regions.[85]

1.6.7 Invasive alien species in mountain ecosystems

In mountainous ecosystems, invasive organisms gain less ground due to the following effects:

- Many invasive species originating from areas with warm climates cannot survive the cooler and more humid climates at higher elevations;
- The effectiveness of their spread by anthropogenic mechanisms is less efficient at higher elevations. Nevertheless, a few organisms are still able to shift along roadsides;
- A few species' altitude boundaries are tied to permanent human settlements because they grow only on sites strongly influenced by human activity.

It is therefore not surprising, that there have not been any problematic invasions above the timber line in central Europe. However, in areas with milder climates, like the insubric area along the southern border of the Alps, a multitude of neophytes is spreading[86]. In the Mountain Invasion Research Network (MIREN)[87], an international group of researchers is using a new and promising research approach to use altitudinal gradients in mountains for understanding plant invasion processes along environmental gradients.

1.6.8 Mountain ecosystems and climate change

Changes in precipitation patterns and rising temperatures result in the shrinking of glaciers and snow-covered areas, which reduces the water holding capacity of mountain ranges. In the Swiss Alps, nine systematically measured glaciers lost on average 17.2 m of the thickness of their ice between 1967 and 2004. The modified water household can affect ecosystems in lower ranges as well as in downstream lowlands and lead to more extreme events that endanger infrastructures and human lives.

Global warming has serious impacts on mountain ecosystems as it causes the retreat and sometimes the disappearance of the alpine life zone. At the beginning of the 20th century, the flora on 37 mountain summits in Switzerland at altitudes between 2 800 and 3 400 m was recorded. The inventories were repeated at the end of the century. The results show a strong increase in the

85 Global Mountain Biodiversity Assessment (GMBA), http://gmba.unibas.ch/, status March 2010.
86 Kowarik I 2003: Biologische Invasionen: Neophyten und Neozoen in Mitteleuropa. 380 S. Verlag Eugen Ulmer, Stuttgart.
87 MIREN: Mountain Invasion Research Network, www.miren.ethz.ch, status March 2010.

number of plant species[88,89]. On average, the number of species was about 62 % higher, but on some summits (Piz Murtèr, Beaufort) the plant diversity tripled[90].

BDM Switzerland can demonstrate particularly striking climate-related changes in the Alps: today subalpine and alpine plant species grow at an altitude 13 m higher than in 2001, on average[91].

Species that are endemic in these areas or species that are bound to cold living conditions may be displaced upwards, can become "trapped" on the summits and will disappear as their habitat is reduced. Especially species with low mobility will face the risk of extinction. At first, species adapted to the cold, such as the mountain hare (*Lepus timidus*) or the rock ptarmigan (*Lagopus muta*), will find more living space in the alpine and nival zones due to the extension of the vegetation cover, but will vanish at lower altitudes. Rock dwelling organisms with southern origins will extend their living range upwards; this will be seen for species such as the ibex (*Capra ibex*) or the wallcreeper (*Tichodroma muraria*); while it can already be seen for the rock partridge (*Alectoris graeca*)[92].

1.6.9 Threats to mountain ecosystems from pollution

High precipitation rates make mountain ranges the primary depository for medium- and long-range air pollutants. In many cases pollutants accumulate in the snow cover or the soils of mountain areas, which can have long-term effects on ecosystems and especially on species that are susceptible to toxins.

In 2000, as a repeat of studies carried out in 1990 and 1995, the Swiss contribution to the European project "Monitoring of atmospheric heavy metal deposition in Europe using bryophytes", involved determining the concentrations of 15 elements (Al, As, Bi, Cd, Co, Cr, Cu, Fe, Hg, Mo, Ni, Pb, Sb, V and Zn) in mosses (*Hypnum cupressiforme* or *Pleurozium schreberi*), which were collected at 142 sites at various distances from the sources of emission. The values found for these elements in Switzerland were rather low and there was little difference between the regions of the Jura, the Central Plateau and the Northern Alps, whereas the Central Alps mostly showed even lower values. However, the values for southern Switzerland were remarkably

88 Walther G-R, Beißner, S, Burga C.A 2005: Trends in upward shift of alpine plants. Journal of Vegetation Science 16:541–548.
89 Vittoz P, Jutzeler S, Guisan A 2006: Flore alpine et réchauffement climatique: observation de trois sommets valaisans à travers le 20ème siècle. Bulletin de la Murithienne, 123/2005, 49–59.
90 Hotspot 16/20077. Swiss Biodiversity Forum. http://www.biodiversity.ch/e/publications/hotspot/
91 Biodiversity Monitoring Switzerland (BDM) Coordination Office 2009: The state of biodiversity in Switzerland. Overview of the findings of Biodiversity Monitoring Switzerland (BDM) as of May 2009. Abridged version. State of the environment no. 0911. Federal Office for the Environment, Berne. 28 pp.
92 OcCC 2007: Climate Change and Switzerland 2050 - Expected Impacts on Environment, Society and Economy (download: pdf, 9.5 MB, http://www.proclim.ch/products/ch2050/CH2050-report.html)

different: in all three measurement periods, the median values were highest in the Southern Alps, sometimes with values as high as those found in highly industrial areas in Eastern Europe and the Ruhr basin. There were clear decreases throughout the decade for Cd, Hg, Pb and (to a lesser extent) Zn, for which measures to reduce emissions have been taken in Switzerland. In 1995, significantly lower values were observed for As, Co, Cr, Mo, Ni and V than in 1990. However, these values remained fairly constant from 1995 to 2000. Levels of Cu and Fe remained stable throughout the decade[93].

Concerning air pollution the National Air Pollution Monitoring Network (NABEL) and cantonal and urban monitoring networks provide information on current concentrations of the principal pollutants (see section 2.3.9).

Atmospheric input of nitrogen compounds may have an impact on both terrestrial and aquatic ecosystems in the alpine area. High nitrogen loads can lead to changes in the composition of ground vegetation and therefore endanger rare plants. The Western European Alps are affected by high nitrogen deposition of about 15 kg N $ha^{-1}y^{-1}$[94].

1.6.10 Ecosystem services in mountain areas

Ecosystem services provided by mountain ecosystems include the preservation of the fertility of soils, the purification of water and air, and protection from avalanches, rockfalls and erosion[95].

Due to the prevailing west winds and the proximity of Switzerland to the Atlantic, the Mediterranean and the North Sea, much humid air is transported to the Alps. The rain fronts are retained for days at this weather barrier and yield an above-average amount of precipitation of 1 457 $lm^{-2}y^{-1}$. The precipitation during the winter season is stored as snow and ice, and runs off in spring and summer. This seasonal discharge is responsible for the function of the Alps as a water tower for Europe as most water flows down when the precipitation is lowest in the neighbouring countries.

Mountainous landscapes are of high value for the tourism industry. For more than a century the Alps have been, and still are, one of the main tourist attractions of Switzerland.

93 Thöni L, Seitler E 2004: Deposition von Luftschadstoffen in der Schweiz – Moosanalysen 1990/1995/2000. Bundesamt für Umwelt. Bern, 142 pp. (download: pdf, 2.7 MB, http://www.bafu.admin.ch/publikationen/publikation/00276/index.html?lang=de, language: de).

94 Arisci S. et al. 2005: Nitrogen deposition on the Western Alps: long-term trends and present status in relation to critical loads. Proceedings of the 7th International Conference on Acid Rain 12.-17. June 2005 in Prague. Czech Hydrometeorological Institute, Prague, p. 637.

95 Stöcklin J. et al 2007: Utilisation du sol et diversité biologique dans les Alpes. Synthèse thêmatique de l'orientation prioritaire II, Programme national de recherche NFP48 “Paysage et habitats de l'espace alpin” du Fonds national Suisse de la recherche scientifique. Edition vdf, Zürich.

2 NATIONAL BIODIVERSITY STRATEGIES AND ACTION PLANS

Switzerland developed the Swiss Landscape Concept (1997) in view of fulfilling Switzerland's international obligations under the United Nations Convention on Biological Diversity. Further instruments and tools were put in place in order to address and implement the provisions of the Convention, including a comprehensive legal framework, cross-sectoral and sectoral strategic and programmatic baselines, the Biodiversity Monitoring Programme as well as a new instrument for financial equalisation and division of tasks between the Confederation and the cantons.

Despite the remarkable array of existing national strategies, programmes and action plans, the loss of biodiversity could not yet be halted (BDM 2009). In September 2008, the Federal Parliament, therefore, mandated the Swiss Federal Office for the Environment to elaborate a new and overarching National Biodiversity Strategy. The biodiversity strategy shall set direction for biodiversity conservation over the next decades. By means of the biodiversity strategy the resilience of ecosystems shall be strengthened, the provision of ecosystem services secured, and the mainstreaming of biodiversity into all relevant sectors fostered.

This section introduces the existing national implementation framework and lists the national strategic and programmatic baselines. Since the vast majority of activities are planned and implemented by the cantons and municipalities, the information provided aims at giving an overview at the national level and is not representative for action at the cantonal and/or municipal level.

2.1 The Implementation of the CBD: The General Framework

2.1.1 Principles of federalism in the implementation of legislation

In Switzerland, there are activities promoting the conservation of biological and landscape diversity at all levels of the federal state:

- The **Confederation** sets the framework of principles by means of federal acts and ordinances, e.g. on the protection of biotopes of national importance, and supports the cantons financially in implementing the legal provisions;
- The **cantons** (federal states) organise the implementation of conservation and enact legislation applicable to their territory;
- The **municipalities** implement cantonal provisions on the ground, for example by promulgating regulations on conservation or by creating nature reserves.

Illustration of the federalist principle in distributing the responsibilities for nature conservation

1. The **Confederation** draws up an inventory which identifies fens of national importance. It supports the cantons financially in carrying out this conservation. In this way it respects the legislative provisions adopted by the population concerning the conservation of biotopes.

2. The **cantons** put the conservation of fens of national importance into practice, and take account of them when making plans for land use. They draw up plans for their conservation and maintenance. The cantons are responsible for conserving fens of regional and local importance.

3. The **municipalities** and private persons implement the actual conservation of the fens. The proprietors of fens commit themselves by private legal contracts to manage the fens in accordance with the established objectives of conservation. In exchange, they receive subsidies from the Confederation and the cantons.

2.1.2 Principles of action by Switzerland to manage biological and landscape diversity

The Federal Council clearly underlined the importance of commitments made at the Rio Summit in its North-South Guidelines of 1994: “The consumption and overexploitation of natural resources by industrialised countries bears a large part of the responsibility for damage to the environment. This cannot provide a model for developing countries. For this reason Switzerland must also make a contribution to sustainable development at home”.

Three guiding principles

Three guiding principles underlie the actions taken by Switzerland to manage biological and landscape diversity:

- **Preservation**. This implies the conservation and maintenance of rare habitats of great value, including traditional and cultural landscapes. A functional ecological network is essential to maintain biological and landscape diversity.
- **Enhancement**. This principle is especially important on the Swiss Central Plateau and in built-up areas where landscapes have been exploited intensively, have lost their variety, and have become impoverished from a biological point of view. Regions which are ecologically poor must be restored, using existing components of the landscape and nature.
- **Sustainable use**. The ability of biological diversity resources to regenerate must be maintained and encouraged, conserving the normal function of ecosystems and adapting the way they are used to specific local conditions. This principle particularly applies to water resources, forestry and agriculture. Non-renewable resources should be used sparingly and renewable replacements should be sought.

Principles of action

Implementation of these overall goals is based on the following principles of action:

- **Subsidiarity principle**. The tasks must be accomplished at the appropriate level. In Switzerland, the cantonal and municipal authorities are responsible for implementing the conservation of biological diversity, on their own initiative or through delegation.
- **Precautionary principle**. This principle is one of the foundations of the environmental act. It aims to prevent harm even when the absence of scientific certainty makes it difficult to predict the likelihood of harm occurring and reverses the onus of proof: under the precautionary principle it is the responsibility of an activity proponent to establish that the proposed activity will not (or is very unlikely to) result in significant harm.
- **Principle of causality**. Those responsible for an accident must take responsibility for the consequences. The internalisation of costs should reflect real prices so that an accurate evaluation can be made. Whenever an alteration is inevitable, corresponding compensatory measures should be taken.

2.1.3 The new system of financial equalisation and division of tasks between the Confederation and the cantons (NFA)

The new system of financial equalisation and division of tasks between the Confederation and the cantons (NFA) has brought about a change in the policy underpinning environmental subsidies. From 2008 on, the Confederation and cantons will prepare programme agreements together, defining which environmental targets they intend to reach and the amount of federal subsidies available for this.

FOEN, in collaboration with the cantons, laid down the basis for the new subsidy policy, which is organised according to eight focal areas:

- Conservation of natural and cultural heritage;
- Restoration of aquatic ecosystems;
- Protection against noise;
- Protection against natural hazards;
- Protective forests;
- Forest biodiversity;
- Forestry; and
- Protected areas.

Each focal area includes quantitative and qualitative goals and targets as well as indicators. This framework defines the basis for negotiation of a multiyear programme agreement between cantonal authorities and FOEN. Thereby,

FOEN supports the cantons in achieving a commonly agreed outcome instead of subsidising activities according to their costs.

The Confederation ensures strategic control and monitoring of the implementation; the cantons, on the other hand, are free to define the ways and means by which they plan to achieve the agreed goals. A first series of programme agreements for the period 2008–2011 is already in force (see section 2.5).

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2.2 The implementation of the CBD through the legal framework

Switzerland implements the provisions of the CBD directly within its legal framework.

The acts and ordinances are available online in the classified compilation of federal acts, some are also available in English[96].

The **Federal Constitution** (1999, SR 101) is the keystone of Switzerland's legislative framework and contains several provisions regarding the conservation of nature and landscape. The constitution anchors sustainable development as a basic principle (art. 73), fixes competences and principles with regard to various aspects of biodiversity (protection of the environment, art. 74; forests, art. 77; protection of nature and mire landscapes of national importance, art. 78; protection of fauna, art. 79; non-human gene technology, art. 120 and 197 no. 7) and regulates the multifunctionality of Switzerland's agriculture (art. 104).

The **Federal Act on Protection of Nature and Cultural Heritage** (1966, RS 451, last revised in 2006) aims at protecting native animal and plant species, biotopes and habitats of high ecological value, as well as landscapes. The act determines rules for ECAs in agriculture and regulates the establishment of national parks, regional nature parks and nature discovery parks. Incentives supporting implementation are provided and guarantee Non Government Organisations (NGOs) the right of appeal concerning the protection of nature. The act is completed by the following ordinances:

- The Ordinance on the Protection of Nature and Cultural Heritage (1991, SR 451.1) lists habitats and species to be protected.
- The Ordinance on the Inventory of Landscape and Natural Monuments of National Importance (1977, SR 451.11) lists landscapes and natural monuments of national importance.
- The Ordinance on Alluvial Zones of National Importance (1992, SR 451.31) lists alluvial zones of national importance.
- The Ordinance on Raised Bogs and Transitional Mires of National Importance (1991, SR 451.32) lists raised bogs and transitional mires of national importance.
- The Ordinance on Fenlands of National Importance (1994, SR 451.33) lists fenlands of national importance.
- The Ordinance on Mire Landscapes of Particular Beauty and National Importance (1996, SR 451.35) lists mire landscapes of national importance.

96 SR, http://www.admin.ch/ch/e/rs/rs.html, status March 2010.

- The Ordinance on Amphibian Spawning Areas of National Importance (2001, SR 451.34) lists amphibian spawning areas of national importance.
- The Ordinance on Parks of National Importance (2007, SR 451.36) regulates the planning, establishment and management of parks of national importance.
- The Ordinance on the Protection of Dry Meadows and Pastures of National Importance (2010, SR 451.37) includes a list of dry grasslands of national importance.

The **Federal Act on the National Park in Canton Grison** (1980, SR 454, last revised in 2005) regulates the protection status of the first Swiss national park founded in 1914.

The **Federal Act on Hunting and Protection of Wild Mammals and Birds** (1986, SR 922.0, last revised in 2008) targets the conservation of game and its habitats. The act enumerates the species that may be hunted and defines periods closed for hunting. Further, the act introduces large federal hunting reserves (no-hunting areas). Several ordinances refer to the act on hunting:

- The Ordinance on Hunting and Protection of Wild Mammals and Birds (1988, SR 922.01) regulates the procedure for the introduction of species into the wild.
- The Ordinance on Waterbirds and Migratory Birds of International and National Importance (1991, SR 922.32) includes a list of protected areas of international and national importance for waterbirds and migrants.
- The Ordinance on Federal Hunting Reserves (1991, SR 922.31) defines the federal hunting reserves.

The **Federal Act on Fishery** (1991, SR 923.0, last revised in 2008) aims at preserving or restoring the natural habitats of fish, crayfish and organisms they feed on.

- The Ordinance to the Federal Act on Fishery (1993, SR 923.01, last revised in 2009) specifies the provisions of the act and contains the Red List of endangered fish and crayfish species. Further, the Ordinance enumerates species, varieties and strains of fish and crayfish whose presence is likely to have a negative impact on the fauna. The Ordinance also regulates the technical knowledge required for fishing.

The **Federal Act on the Protection of the Environment** (1983, SR 814.01, last revised in 2009) protects people, animals and plants, their biocenosis and their biotopes against harmful impacts. Further, the Act stipulates the sustainable management of natural resources, in particular regarding biological diversity and the fertility of soils. The Act imposes environmental impact assessment and a precautionary approach regarding the handling of organisms, metabolites and waste within the environment.

- The Ordinance on the Environmental Impact Assessment (1988, SR 814.011) includes a list of installations subject to environmental impact assessment and stipulates the decision-making process.
- The Ordinance on Handling of Organisms in the Environment (2008, SR 814.911) aims to protect people and the environment, in particular animals and plants as well as their communities and habitats, against harmful effects or nuisances caused by the release of organisms (including IAS, pathogens and genetically modified organisms (GMO); for the latter, see Federal Act on Non-human Gene Technology, below) in the environment. The Ordinance contributes to the conservation of biological diversity as well as soil fertility. It provides for an authorisation system for the release and marketing of GMO, pathogens and certain IAS, as well as for general environmental surveillance with regard to GMO and IAS.

The **Federal Act on Non-human Gene Technology** (2003; SR 814.91, last revised in 2005) aims at protecting people, animals and plants, as well as biodiversity and the sustainable use of it, against misuse and harmful impacts of GMO. The Act establishes the step-by-step principle, i.e. GMO can only be introduced into the environment for clearly delimited research studies, and only placed on the market once the required familiarity with these organisms has been proven, *inter alia* by confined use.

- The Cartagena Ordinance (2004; SR 814.912.21) completes the measures required to implement the Cartagena Protocol on Biosafety by governing the export of GMO.

The **Federal Act on Forests** (1991, SR 921.0, last revised in 2006) takes into account the interests of nature conservation by protecting forest biodiversity and ensuring the conservation of the forested area of the country. The Act prescribes the sustainable use of forest resources and sets the legal basis for the creation of forest reserves.

The **Federal Act on Agriculture** (1998, SR 910.1, last revised in 2008) stresses the importance of the conservation of biological diversity in agro-ecosystems and the maintenance of a high quality environment. It supports integrated production and organic farming. Further, the Act sets the legal basis for financial contributions to ECAs on utile agricultural area.

- The Ordinance on Direct Agricultural Subsidies (1998, RS 910.13) defines the requirements for granting direct payments to farmers. These payments are divided in two groups:
  - General payments are conditional upon proof of ecological performance (PEP). For example, 7 % of the utilized agricultural area has to be converted to ecological compensation area to receive the payment.
  - Ecological direct payments create, for their part, an additional incentive and reward voluntary environmental services provided by farmers.

- The Ordinance on Environmental Quality (2001, RS 910.14) aims at promoting ecological quality and the establishment of a network of compensation areas in order to promote the diversity of flora and fauna as well as to improve ecosystem functioning.
- The Ordinance on Plant Protection (2001, SR 916.20, last revised in 2009) aims at protecting *inter alia* trees and shrubs or endangered plant species (predominantly in agro-ecosystems) against negative impacts of organisms, such as the Common Ragweed (*Ambrosia artemisiifolia*).

The **Federal Act on the Protection of Water** (1991, RS 814.20, last revised in 2008) aims at conserving water from harmful impacts, ensuring an adequate residual flow and restoring the quality of watercourses as habitats and precious landscape elements.

The **Federal Act on Improvement of Watercourses** (1991, RS 721.100, last revised in 2008) completes the above mentioned provisions by stipulating principles for river restoration.

- The Ordinance on the Improvement of Watercourses (1994, RS 721.100.1, last revised in 2008) also aims at providing adequate space for watercourses to improve ecosystem functioning and the conservation of flora and fauna.

The **Federal Act on Spatial Planning** (1979, SR 700, last revised in 2008) coordinates land-use activities. Master plans and cantonal structural plans must take into account aspects related to the conservation of nature and landscapes. The Act is predominantly implemented by cantonal authorities.

The **Federal Act on the Reduction of CO_2-Emissions** (1999, SR 641.71, last revised in 2009) aims to reduce Switzerland's CO_2-emissions of fossil fuels and to contribute to reduce harmful effects on the environment including biodiversity.

2.3 National Action Plans and Programmes

In Switzerland, the implementation of conservation activities lies with cantonal authorities (see section 2.1.1). NGOs contribute significantly to the implementation of action plans and/or conservation activities in the field. This report cannot deal with all these activities comprehensively. This section focuses, therefore, on national action plans. So far, the following general action plans and programmes have been developed and are being implemented:

Sustainable development strategy[97]

The Federal Council reviewed Switzerland's strategy for sustainable development and published a third edition of the report "Sustainable Development Strategy: Guidelines and Action Plan 2008–2011".

The new Strategy provides guidance for eight key challenges: climate change and natural hazards; energy; spatial planning and transport; economy, production and consumption; use of natural resources; social cohesion, demography and migration; public health, sport and promotion of physical activity; and the global challenges regarding development cooperation and the environment.

The action plan includes 30 specific measures. With regard to biodiversity, for instance, the Confederation is committed to exploring opportunities for establishing a more comprehensive strategy of conservation. Based on this measure, Parliament mandated FOEN to develop a National Biodiversity Strategy. The process started in January 2009.

Swiss Landscape Concept[98]

The Swiss Landscape Concept (SLC) was adopted by the Federal Council in 1997. The SLC is a strategy that defines constraining objectives for all the federal services which have spatially relevant activities.

The main goal of the SLC is spatial planning that puts a high premium on the landscape, especially where diversity has been impoverished in recent decades, but also where high cultural, natural and landscape values are preserved today.

The 16 general objectives of the SLC are specified by sectoral objectives and specific measures within the various sectoral policies of the Confederation. The general objectives address natural values, cultural values and the sustainable management of the landscape.

97 Swiss Federal Council, 2008: Sustainable Development Strategy: Guidelines and Action Plan 2008–20111, Report of 16 April 2008 (download: pdf, 318 kB, http://www.are.admin.ch/themen/nachhaltig/00262/00528/index.html?lang=en).

98 FOEN: Swiss Landscape Concept, http://www.landschaftskonzept.ch/e/_start.htm, status June 2009, (languages en, fr, de, it).

The impact of the SLC is currently being assessed with a view to revising the concept.

Landscape 2020[99]

The strategic guidelines which make up “Landscape 2020” form the technical basis for FOEN to guide decision-making processes within the various sectoral policies that have impacts on land and land use.

In “Landscape 2020”, FOEN depicts its vision of the evolution of Switzerland’s landscapes up to 2020, and provides guidance on how to interlink the vision with the principle of sustainable development as well as with existing strategies and programmes in order to achieve the goals.

The strategic guidelines include a system of hierarchically arranged objectives for the conservation of nature and the landscape at the national level. They are rooted in Switzerland’s legal framework and aim at translating the 16 SLC objectives into action on the ground.

National ecological network (Réseau écologique national, REN)[100] [101]

The destruction and fragmentation of natural habitats (e.g. due to traffic infrastructure) is one of the major threats to Switzerland’s biodiversity. Therefore, it is important to identify and maintain connectivity between the wildlife habitats that still exist and biodiversity hotspots.

The REN provides a vision for habitat interconnectedness on a national scale. The network was created from existing data, computer models, as well as the verification and completion of the dataset. This last aspect was done in close collaboration with local specialists and the concerned cantonal authorities. The network is presented on maps (scale 1:100 000 and 1:500 000).

99 Swiss Agency for the Environment, Forests and Landscape 2003, Landscape 2020 – Guiding Principles. Berne.
SAEFL (2003), Landschaft 2020 – Erläuterungen und Programm, Synthese zum Leitbild des BUWAL für Natur und Landschaft [Landscape 2020 − Explanations and Programme; Synthesis on Guiding Principles of SAEFL for Nature and Landscape], Berne.
Stremlow, M.; Iselin, G.; Kienast, F.; Klay, P.; Maibach, M. 2003: Landschaft 2020 – Analysen und Trends, Grundlagen zum Leitbild des BUWAL für Natur und Landschaft [Landscape 2020 − Analyses and trends; foundations for Guiding Principles of SAEFL for Nature and Landscape] SAEFL Environment series, no. 352,Berne.

100 Berthoud G., Lebeau R. P., Righetti A. 2004: Réseau écologique national REN. Rapport final. Cahier de l’environnement no 373. Office fédéral de l’environnement, des forêts et du paysage, Berne. 132 p. (languages: f, d, download: pdf, 2470 kB; http://www.bafu.admin.ch/publikationen/publikation/00540/index.html?lang=fr).

101 Holzgang, O.; Pfister, H.P.; Heynen, D.; Blant, M.; Righetti, A.; Berthoud, G.; Marchesi, P.; Maddalena, T.; Müri, H.; Wendelspiess, M.; Dändliker, G.; Mollet, P. & U. Bornhauser-Sieber 2001: Les corridors faunistiques en Suisse. Cahier de l'environnement n° 326,,Office fédéral de l’environnement, des forêts et du paysage (OFEFP), Société suisse de Biologie de la Faune (SSBF) & Station ornithologique suisse de Sempach, Berne, 120 p. (languages: fr, de, download: pdf, 1967 kB, http://www.bafu.admin.ch/publikationen/publikation/00476/index.html?lang=fr).

Parks of national importance[102]

New parks of national importance (i.e. national parks, regional nature parks and nature discovery parks) are to be established in Switzerland. The aim is to protect and enhance exceptional habitats and particularly attractive landscapes, to encourage sustainable tourism and regional development, and to allow the public to experience the natural environment.

In addition to the ecological benefits, parks have positive economic effects. For example, tourism revenues generated directly by the Swiss National Park in Canton Grison average CHF 10 million per year, with an additional CHF 7 million in indirect benefits (employment and incomes).

The process of establishing a park comprises four stages, in each of which a product is to be prepared:

Stage 1: assessment of feasibility (product: feasibility study);

Stage 2: project development (product: management plan for establishment);

Stage 3: establishment (product: charter);

Stage 4: operation and evaluation (products: reports, evaluation, revised charter).

The federal authorities only recognise parks that arise from regional initiatives and are backed by the local community. Regional initiatives are to be supported and overseen by the cantons.

General environmental objectives

Over the next two years, FOEN will be preparing a set of general environmental objectives, based on the existing legal framework. These will be specified in detail for sectors that are in a position to make a substantial contribution to the achievement of the general objectives. A first set of environmental objectives was published for the agricultural sector (see section 2.3.1).

2.3.1 Action plans and programmes on agricultural biodiversity

Ecological compensation/PEP and Natural Resource Programme [103]

Since 1993, the promotion of ecological issues, especially the enhancement of the diversity of fauna and flora, has become a main aim of the Swiss agricultural policy.

Direct payments are one element in the valuation of special ecological services. Since 1999, farmers have access to these payments only if they fulfil

102 Remund Rinke S., Ossola C., Walder B.S., Blaser A. 2008: Parks of national importance. Guidelines for the planning, establishment and operation of parks. The environment in practice no. 0802. Federal Office for the Environment, Berne. 108 pp.; (Languages: en, fr, it, de, download: pdf, 803 kB, http://www.bafu.admin.ch/publikationen/publikation/00082/index.html?lang=en).

103 FOEN: Compensation écologique: http://www.bafu.admin.ch/landschaft/00522/01649/01650/index.html?lang=fr, (languages: fr, de, it).

the proof of ecological performance. Requirements include regulations concerning the application of pesticides, the balance of the nutrient budget, crop rotation, livestock husbandry and the maintenance of ECAs. The condition is to set aside 7 % of the farmland as ECA, including different types of extensively used grassland, hedgerows and bushes, wild flower strips or other elements.

The Federal Office for Agriculture has additionally launched the Natural Resource Programme (Ressourcenprogramm des Bundes). The Programme aims at encouraging and supporting farmers in implementing environmental measures that go further than the legal requirements, especially regarding minimising the use of fertilisers and the consumption of energy in agriculture, soil conservation as well as the preservation and promotion of biological diversity.

Master plan for arable land[104]

The master plan for arable land is to date the only effective instrument which guarantees a quantitative protection for agricultural soils at the national level. The aim of the plan is the long-term maintenance of soil fertility for agricultural production. Indirectly, the plan contributes to the conservation and maintenance of natural resources (water, air, biodiversity), ecological compensation and diversity of landscapes.

The federal offices, the cantonal authorities and the municipalities must take into account the mandatory master plan for their activities relating to spatial planning.

General environmental objectives for agriculture[105]

The Federal Office for the Environment and the Federal Office for Agriculture (FOAG) jointly identified a set of general environmental objectives for agriculture. The objectives are based on existing legal requirements as reflected in various acts, ordinances, international treaties and decisions of the Federal Council.

The general objectives are organised according to the following priorities: biodiversity and landscape, climate and air, water, and soil. An overview of the agriculture-related environmental objectives is provided in Appendix II.

Agricultural Policy 2011

The Agricultural Policy 2011 (AP11) is a political action programme that defines goals and targets for the year 2011. The goals of the policy are i) to increase the competitive strength of Switzerland's agriculture, ii) to allow for a

104 Office fédéral du développement territorial ARE: Plan sectoriel des surfaces d'assolement, www.are.admin.ch, status June 2009.

105 OFEV et OFAG 2008: Objectifs environnementaux pour l'agriculture. A partir de bases légales existantes. Connaissance de l'environnement n° 0820. Office fédéral de l'environnement, Berne: 221 p. (download: pdf, 6584 kB, http://www.bafu.admin.ch/publikationen/publikation/00097/index.html?lang=fr, languages: fr, de).

socially acceptable adjustment process and iii) to continue the ecological development.

Based on an analysis of developments in Swiss agriculture, the AP11 aims to increase efforts to reduce losses of nitrogen and phosphorous and improve efficiency in using pesticides and energy in order to avoid negative impacts on the environment. Furthermore, the production of energy from biomass (crop residues and manure) shall be promoted and the incentives for ecological compensation and ecological quality have been increased.

The conservation and sustainable use of plant genetic resources for food and agriculture continues to be a priority in the National Plan of Action (NPA-PGRFA, see section 2.3.7).

Future development of the direct payment system

In future, direct payments will have to be directed in a consequent way towards services of public interests, as requested by society. Measures without specific objectives are to be replaced by more targeted ones. Thus the effectiveness and efficiency of the direct payments system will be improved, while remaining directly bound to the Proof of Ecological Performances (see above).

A concept, which is currently in elaboration, proposes to organise direct payments according to the 5 following pillars:

1. Contributions to the **cultivated landscape** to sustain an open rural landscape;
2. Contributions to ensure **food security** for maintaining production capacities in the case of supply shortfalls;
3. Contributions to **biodiversity** for its preservation and promotion;
4. Contributions to **landscape quality** for safeguarding, promoting and the further development of diverse cultivated landscapes; and
5. Contributions to **animal welfare** to improve animal husbandry beyond the requirements of the federal act on the protection of animals.

It is planned to submit the concept, which has been adopted by the Federal Council in Mai 2009, to parliamentary consultation in 2011 and to come into force in 2014.

Strategy for the production, conversion and use of biomass in Switzerland[106]

Biomass is a vital renewable resource, in particular in the form of foodstuffs. It also has, however, a great importance as construction material, as a raw material for many convenience products and as a source of energy. The

106 OFEN, OFAG, ARE, OFEV (2009) Stratégie relative à la production, la transformation et l'utilisation de biomasse en Suisse. (Download: pdf, 459 kb, http://www.news.admin.ch/NSBSubscriber/message/attachments/15397.pdf).

Swiss potential of biomass production is considerable, however, limited by the availability of productive surfaces.

In order to secure sustainability of biomass production and use, the Swiss federal office of energy, the Federal office for agriculture, the Swiss federal office for spatial development and the Federal Office for the environment have adopted a strategy for the production, conversion and sustainable use of biomass, which will serve as a basis for the adjustment to the various policies at the national level.

The strategic objectives include among others the promotion of biomass production to secure supply in food, feed and energy as well as the conservation of nature.

2.3.2 Action plans and programmes on forest biodiversity

Swiss National Forest Programme (Swiss NFP)[107]

The Swiss National Forest Programme is a political action programme. It contains long-term visions for the desired state of the forest and, based on these visions, quantified objectives for the year 2015. The Swiss NFP also defines the strategies to be adopted to enable the fulfilment of these objectives and the necessary measures and instruments.

The future focus of Switzerland's forest policy shall lie on stable protection forests and the conservation of biological diversity. The forestry sector will enjoy greater freedom and scope; however, in return, it must become more efficient.

The Swiss NFP was developed as part of a participatory process and is currently in revision.

2.3.3 Action plans and programmes on inland waters biodiversity

Guiding Principles for Swiss Watercourses[108]

In the Guiding Principles for Swiss Watercourses – issued by the Federal Office for the Environment FOEN, the Federal Office for Agriculture (FOAG), and the Federal Office for Spatial Development (OSD) – the goals for the development of Switzerland's watercourses are outlined for experts and other

107 FOEN 2004: Swiss National Forest Programme (Swiss NFP), Environmental documentation No. 363,,Swiss Agency for the Environment, Forests and Landscape, Berne. 117 pp (download: pdf, 982 kB, http://www.bafu.admin.ch/publikationen/publikation/00527/index.html?lang=en, languages: en, fr, de, it).

108 SAEFL/FOWG (Ed.), 2003: Guiding Principles for Swiss watercourses. Promoting sustainable watercourse management. Berne, 12 pp. (download: pdf, 1006 kB, http://www.bafu.admin.ch/publikationen/publikation/00404/index.html?lang=e, languages: en, fr, de, it).

interested readers. By taking an integrated approach, the federal authorities wish to set an example and at the same time to promote sustainable watercourse management at all levels.

The Guiding Principles outline measures that can be adopted by cantonal, regional and local authorities. They list examples of good practice for professionals and other interested citizens. Emphasis is placed on three development goals: i) adequate space for watercourses, ii) adequate water flows and iii) adequate water quality.

For the vitality of our fish: A programme in ten points[109]

Since 1980, trout captures have decreased by two-thirds in Swiss rivers. This is a clear indicator that habitats have degraded since that time. To counteract this development, the project “fishnet+” (Fischnetz+) launched a programme in ten points, which is published in collaboration with the Swiss Federal Institute of Aquatic Science and Technology (Eawag) and the Federal Office for the Environment FOEN. The programme recommends measures at the cantonal and local levels for improving the state of fish populations in rivers. The programme adopts an integral approach by addressing the following issues: I) adequate space for watercourses, II) improved and interconnected habitats for fish, III) combined measures for ecology and flood control, IV) hydropower use to take account of preserving fish fauna, V) river banks to be as large as possible, VI) wastewater treatment adapted to new challenges, VII) careful and targeted use of pesticides, VIII) measures to combat fish diseases, IX) restocking if, but not more than, necessary, and X) management of fish-eating birds, in collaboration with stakeholders.

Integrated Water Resources Management (IWRM) Plans

Integrated Water Resources Management (IWRM) plans are implemented in Switzerland on river basins where such management is required. This is done at national and transboundary levels. An ecosystem approach in water management has been implemented for many years in Switzerland through a whole set of acts and ordinances.

Since the revision (per 1st January 1999) of the Ordinance on Water Protection (1991, SR 814.201), the cantons have become responsible for establishing the necessary amount of land for rivers and streams to ensure that they can function naturally. A brochure produced by the federal government specifies the amount of land required, clarifying the width of the river corridor (river, banks and land strips beside the river). The federal government makes financial resources available for the ecological management of river corridors. This financial support is in the form of

109 Fischnetz+, Eawag. OFEV, 2007: Pour la vitalité de nos poissons de rivière: Un programme en 10 points, Berne 24 pp. (download: pdf, 1704 kB, http://www.bafu.admin.ch/publikationen/publikation/00926/index.html?lang=fr, languages: fr, de, it).

agricultural direct payments and revitalisation projects linked to flood protection. Additional funding is being supplied by the cantons.

2.3.4 National species action plans, programmes and priorities

The Red List programme[110]

Since 1991, Red Lists have been enshrined in the Nature and Cultural Heritage Protection Ordinance. Reference is made to them in particular for the designation of biotopes meriting protection.

The Red Lists are regularly updated according to the Red List programme. Currently, lists are available for the following: breeding birds, reptiles, amphibians, dragonflies, grasshoppers, fish and cyclostomes, threatened animal species, ferns and flowering plants, bryophytes, lichens and fungi.

Lists will be published in the near future for the following: *Charales*, terrestrial molluscs, *Papilionoidea*, spiders, bats and mammals in general.

Strategy on invasive alien species[111] [112] [113] [114]

Guidelines for the control of IAS have been adopted by the Federal Office for the Environment (FOEN). The guidelines are the basis for the future elaboration of a strategy that aims at i) reducing the impacts of alien species on human health and on biodiversity, ii) controlling the costs for action and iii) providing practitioners with guidance for action in the field.

In order to achieve these goals, a monitoring system emphasising early detection of IAS is being established, the exchange of information, scientific research and practical guidance is being boosted, a coordination platform has been set up and the implementation of existing legislation is being strengthened.

The following plans and programmes have been established and are being implemented:
Alien plant species were classified according to their invasiveness. Species included on the Black List disperse easily, propagate efficiently and cause damage in the areas of biodiversity, health, and/or economy, or have the

110 FOEN: Red Lists, http://www.bafu.admin.ch/artenvielfalt/01010/index.html?lang=en, status June 2009,languages: en, fr, de, it. (the Red Lists can be downloaded from this page).
111 FOEN: Invasive species, http://www.bafu.admin.ch/artenvielfalt/01027/index.html?lang=en, status June 2009,languages: en, fr, de, it.
112 Wittenberg, R. (ed.) 2005: An inventory of alien species and their threat to biodiversity and economy in Switzerland. CABI Bioscience Switzerland Centre report to the Swiss Agency for Environment, Forests and Landscape (download: pdf, 4474 kB, http://www.bafu.admin.ch/publikationen/publikation/00028/index.html?lang=en, language: en).
113 Schaffner U., 2005: What makes a species invasive? Environmental Documentation No. 191. Swiss Agency for the Environment, Forests and Landscape, Berne. 92 p. (download: pdf, 833 kB, http://www.bafu.admin.ch/publikationen/publikation/00299/index.html?lang=en, language: en).
114 Stucki P, Zaugg B. 2006: Plan d'action national pour les écrevisses, Office fédéral de l'environnement, Berne, 41 pp. (download: pdf, 1395 kB, http://www.bafu.admin.ch/fischerei/00698/00733/index.html?lang=fr&download=NHzLpZig7t,lnp6I0NTU042l2Z6ln1ae2IZn4Z2qZpnO2Yuq2Z6gpJCDdX18gGym162dpYbUzd,Gpd6emK2Oz9aGodetmqaN19XI2IdvoaCVZ,s-.pdf, languages: fr, de).

potential to do so. In general, these species have to be controlled. The following 20 species are currently on the Black List of Switzerland: *Ailanthus altissima, Ambrosia artemisiifolia, Artemisia verlotiorum, Buddleja davidii, Elodea nuttallii, Heracleum mantegazzianum, Impatiens glandulifera, Lonicera japonica, Ludwigia grandiflora, Lysichiton americanus, Polygonum polystachyum, Prunus serotina, Reynoutria japonica (= Polygonm cuspidatum = Fallopia japonica), R. sachalinensis, Rhus typhina, Robinia pseudoacacia, Rubus armeniacus, Senecio inaequidens, Solidago canadensis s.l. (*incl*. S. altissima), S. gigantea (= S. serotina)*.

The Watch List of alien plant species of Switzerland lists species with the potential to cause damage or are already causing damage in neighbouring countries, and/or are on an official Black List or similar list in these countries. The spread and the effects of these species should be regularly documented. If necessary, control measures should be taken. The following 20 species are currently on the Watch List of Switzerland: *Amorpha fruticosa, Bunias orientalis, Cornus sericea (C. stolonifera), Cyperus esculentus, Elodea canadensis, Helianthus tuberosus, Lonicera henryi, Lupinus polyphyllus, Mahonia aquifolium, Prunus laurocerasus, Pueraria lobata, Sedum spurium, Senecio rupestris* and *Trachycarpus fortunei*.

For all 20 species on the Black List and for some on the Watch List, two-page information leaflets (in German) are published; most are also available in French and Italian[115].

Regarding fauna, an action plan for the control of the Ruddy Shelduck (*Tadorna ferruginea*) was adopted and is being implemented. Further, the national action plan for crayfish includes measures to combat alien crayfish species (i.e. *Astacus leptodactylus*, *Orconectes limosus*, *Pacifastacus leniusculus and Procambarus clarkii*) that are vectors for the crayfish plague (*Aphanomyces astaci*). The invasion by the grey squirrel (*Sciurus carolinensis*) in Italy is being observed with the goal of avoiding its spread in southern Switzerland.

2.3.5 Action plans for the conservation of plant species

Data sheets for the conservation of flowering plants and ferns[116]

Detailed surveys of 142 species of threatened plants in Switzerland have been undertaken with the goal to check *in-situ* status of the species, population size, habitat conditions, and threats. Based on this work, conservation data sheets have been prepared for each species. Data sheets include a description, information on ecology, altitudinal range, phytosociology, and habitat type, an index of ecological values, distributions and threats in Europe and Switzerland, causes of decline and possible

115 CPS/SKEW, Invasive Plants, Information Sheets, www.cps-skew.ch, status March 2007
116 Swiss Commission for Wild Plant Conservation CPS/SKEW: Plant conservation database, http://www.cps-skew.ch/english/conservation_plans.htm, status June 2009.

conservation measures, as well as a map of the species' distribution in Switzerland (using 3 km grid squares).

The first series of 132 data sheets have been published by the Federal Office for the Environment. The complete collection of 142 data sheets is made available online by the Swiss Commission for Wild Plant Conservation CPS/SKEW[117].

Data sheets for the conservation of mosses[118]

A series of data sheets on species of mosses protected by virtue of the Ordinance on the Protection of Nature and Cultural Heritage (see section 2.2) was published by the Federal Office for the Environment (FOEN), the National Inventory of the Swiss Moss Flora (NISM) and the Research Group for Environmental Monitoring (FUB).

The data sheets include a species description, information about their ecology, and a distribution map. The sheets show the threats to the species and propose conservation activities.

Data sheets have been prepared for the following species: *Barbula asperifolia, Breutelia chrysocoma, Bryum versicolor, Drepanocladus vernicosus, Frullania parvistipula, Leucobryum glaucum aggr., Phaeoceros laevis* subsp. *carolinianus, Riccia breidleri, Ricciocarpos natans, Sphagnum* sp.*, Tayloria rudolphiana.*

2.3.6 Action plans for the conservation of animal species

Swiss species recovery programme for birds[119]

The survival of 50 out of the 195 species of breeding birds in Switzerland depends on the implementation of specific conservation activities (i.e. conservation programmes). Therefore the Swiss species recovery programme for birds was launched[120]. Its objective is to intensify conservation activities in favour of the 50 species of birds identified as being of priority.

The programme is implemented by the Swiss Ornithological Institute and BirdLife Switzerland in collaboration with the Federal Office for the Environment (FOEN). The steering group includes representatives of the two organisations as well as of federal and cantonal authorities.

117 CPS/SKEW: Swiss Commission for Wild Plant Conservation, www.cps-skew.ch > plant conservation > data sheets, status March 2010.
118 Hofmann H, Müller N, Schnyder N 2006: Fiches protection des espèces – Mousses. Fichier-PDF: télécharger sous www.nism.uzh.ch, rubrique Naturschutz.
119 OFEV: Conservation des espèces: Espèces prioritaires et plans d'action, www.bafu.admin.ch, statut janvier 2008.
120 Station ornithologique suisse: Programme de conservation des oiseaux en Suisse 2007 – 2010. www.vogelwarte.ch, statut janvier 2008.

Documentation describing the characteristics of the 50 targeted species is available[121]. National action plans for the western capercaillie *Tetrao urogallus* and the middle spotted woodpecker *Dendrocopos medius* are in place.

Management plans for large carnivores

National management plans for Switzerland's large carnivores have been drawn up by the Federal Office for the Environment (FOEN) in collaboration with cantonal authorities and relevant stakeholders. Plans are available for the Eurasian lynx (*Lynx lynx*)[122], the wolf (*Canis lupus*)[123] and the brown bear (*Ursus arctos*)[124].

The management plans take into account the legal protection of these species; they also aim at providing suitable habitats for the species, as well as avoiding conflict with livestock farming. The management plans foresee the payment of allowances for damages caused by lynx, wolves and brown bears.

Management plan for the beaver [125]

Beavers (*Castor fiber*) are protected by national act as well as by international agreements. In order to promote the conservation of beavers in Switzerland, the Federal Office for the Environment FOEN has adopted a concept for the management of the species (March 2004). In addition to conservation measures, the concept foresees the payment of allowances for damages caused by beavers.

FOEN coordinates activities at the national level, including relocation and reintroduction.

Action and management plans for aquatic fauna[126]

The Federal Office for the Environment FOEN has issued several action plans for the conservation of Switzerland's aquatic fauna. The plans aim at providing guidance to the cantonal authorities and other stakeholders for planning and implementing activities in the field.

The action plans address the conservation of native crayfish species (*Astacus astacus*, *Austropotamobius pallipes* and *Austropotamobius torrentium*) and the eradication, containment and control of invasive crayfish (*Astacus leptodactylus*, *Pacifastacus leniusculus*, *Orconectes limosus* and *Procambarus clarkii*).

Action plans for the conservation of fish species are available for: common nase (*Chondrostoma nasus*), European bullhead (*Cottus gobio*), grayling

121 Rehsteiner U ,Spaar R, Zbinden N (Eds.) 2004 : Eléments pour les programmes de conservation des oiseaux en Suisse. Centre de coordination du Programme de conservation des oiseaux en Suisse, Association Suisse pour la Protection des Oiseaux ASPO/BirdLife Suisse et Station ornithologique suisse, Zurich et Sempach. 76 pp.
122 OFEV: Gestion des prédateurs: Gestion du lynx, www.bafu.admin.ch, statut juin 2009.
123 OFEV: Gestion des prédateurs: Gestion du loup, www.bafu.admin.ch, statut juin 2009.
124 OFEV: Gestion des prédateurs: Gestion de l'ours, www.bafu.admin.ch, statut juin 2009.
125 OFEV: Faune sauvage de A à Z: Le castor, www.bafu.admin.ch, statut juin 2009.
126 OFEV: Conservation des espèces, www.bafu.admin.ch, statut juin 2009.

(*Thymallus thymallus*), asper (*Zingel asper*), spirlin (*Alburnoides bipunctatus*), souffia (*Leuciscus souffia*), and lamprey (*Lampetra fluviatilis*).

2.3.7 National action plans and programmes regarding the conservation of genetic resources

Four related initiatives were launched at the national level for the implementation of FAO's Global Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture: the National Plan of Action (NPA-PGRFA), the Swiss Commission for Cultivated Plant Conservation SKEK/CPC, the Swiss National Database for the Conservation of Plant Genetic Resources (see section 1.2.4), and the promotion of native wild flower seeds in ECAs.

National Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture (NPA-PGRFA)[127]

The National Plan of Action specifies the implementation of FAO's Global Plan of Action on Plant Genetic Resources for Food and Agriculture (GPA) in Switzerland.

In a pilot phase (1999–2002) necessary national structures were established in close cooperation with the Swiss Commission for Cultivated Plant Conservation (SKEK/CPC). During this phase, activities were focused on inventories of crops, the regeneration of gene banks, the setting-up of the first conservation programmes as well as on the establishment of methodological baselines.

The second phase of the NPA-PGRFA (2003–2006) targeted an equal working level for all crops, especially regarding the inventories, the conservation status and the documentation.

For the current, third phase (2007–2010) priorities are the identification of as yet unknown material, the completion of the final national inventories, a systematic description of the material and the continuation of the data transfer onto the national database[128].

Swiss Commission for Cultivated Plant Conservation (SKEK/CPC)

The SKEK/CPC is a network of private organisations, public entities and people who work in the field of sustainability and the conservation of crop plants traditionally used in Switzerland for food and agriculture. Its task is to inventory the genetic diversity of cultivated plants and to transmit this cultural heritage to future generations. Within the NPA-PGRFA, the SKEK/CPC contributes to the development of the national strategies for the conservation of crop plants and the coordination of the various NPA-PGRFA projects.

127 Swiss Commission for the Conservation of Cultivated Plants: http://www.cpc-skek.ch/deutsch/d_index.htm, status June 2009,,languages: fr, de, it, (en).
128 Schierscher-Viret B, Klejer G 2007: Etat des ressources phytogénétiques en Suisse. Revue suisse Agric.39/2007.

Swiss National Database for the Conservation of Plant Genetic Resources[129]

The Swiss National Database for the Conservation of Genetic Resources (BDN) aims at supporting the conservation activities by providing access to information in order to coordinate and document activities, and at allowing for a coherent monitoring and evaluation of projects. The information included in the BDN is designed with three types of partners in mind: i) organisations responsible for the control and management of the BDN; ii) conservation organisations and iii) the public, considered in the broad sense, including scientists as well as interested private persons.

Concept for the conservation of livestock breeds[130]

In 1998, a working group commissioned by the Federal Office for Agriculture (FOAG) developed a concept for preserving the diversity of livestock breeds in Switzerland; their findings are summarised in a final report. The project included establishing an inventory, describing all the breeds present in Switzerland and allotting each one a ranking in terms of its degree of endangerment.

A definition of “Swiss” breeds was also given; the cultural value and economic importance of these breeds was assessed and it was determined whether there was any need to introduce measures to ensure their continued survival.

In 1999, the new Federal Act on Agriculture and the new Federal Decree on Livestock Breeding entered into force. This new legislation provided the necessary prerequisites for supporting endangered Swiss breeds through appropriate measures.

Production and use of wild flower seed

Since 1990, the use of wild flower seed has increased greatly in Switzerland mainly due to the new agricultural policy for ecological compensation. An inquiry carried out by the Swiss Commission for Wild Plant Conservation CPS/SKEW showed that only a small proportion of the plant material on sale was of Swiss origin. The introduction of non-native seed can lead to erosion of native genetic variation by crossing between native and introduced plants. In 1994, to call attention to this problem, the Commission drew up the “Recommendations for the production and use of seeds adapted to local ecological conditions”. The recommendations were up-dated in 2001.[131]

129 Swiss Commission for the Conservation of Cultivated Plants: Base de données nationale, http://www.cpc-skek.ch/francais/banque_donnee/banque_donnee.htm, status June 2009, languages: fr, de, it.

130 FOAG: Genetische Ressourcen bei den landwirtschaftlichen Nutztieren, Bern, 31 pp. (download: pdf, 120 kb, http://www.blw.admin.ch/themen/00013/00082/00087/index.html?lang=de&download=M3wBPgDB/8ull6Du36WenojQ1NTTjaXZnqWfVpzLhmfhnapmmc7Zi6rZnqCkkIN0fnuAbkBXrZ6lhuDZz8mMps2gpKfo, language: de).

131 Swiss Commission for Wild Plant Conservation CPS/SKEW: Recommendations, http://www.cps-skew.ch/english/recommendations.seeds.htm, status June 2009.

Besides these initiatives concerning genetic resources for food and agriculture, Switzerland is supporting the conservation and sustainable use of microbial genetic resources through the establishment of a microbial culture collection[132].

2.3.8 National approach regarding access to genetic resources and benefit sharing (ABS)

Access to genetic resources in Switzerland is covered by a number of national acts and ordinances (section 2.2). The majority of restrictions on access to genetic resources imposed by the Swiss legislation are motivated by a concern for nature conservation and broadly conform to CBD Article 15[133]. For the access to its genetic resources, Switzerland so far does not require prior informed consent of a national competent authority. Access and benefit sharing for *ex-situ* genetic resources that are covered by the multilateral system of the International Treaty on Plant Genetic Resources for Food and Agriculture (IT-PGRFA) and that are stored in national gene banks are accompanied by the standardised material transfer agreement of the IT-PGRFA. For genetic resources and uses that are not covered by the IT-PGRFA, Switzerland continues to implement the Bonn Guidelines on Access and Benefit-Sharing, mainly based on the following approach:

- The Federal Office for the Environment (FOEN) established a **national working group on ABS** that includes all relevant stakeholders in order to coordinate the national implementation work of ABS and to further elaborate the international regime on ABS[134].
- The Swiss Academy of Sciences (SCNAT) supported by FOEN developed a **good practice tool on ABS for academic research** and is running an awareness-raising programme within the scientific community on ABS[135].
- The **ABS-management tool** supported by the State Secretariat for Economic Affairs (SECO) offers a practical solution to users and providers of genetic resources involved in ABS activities[136].
- All major botanic gardens in Switzerland are associated with the **International Plant Exchange Network (IPEN)** and visitors to botanic gardens are informed about legal acts and obligations concerning the

132 CCOS, Culture Collection of Switzerland, www.ccos.ch, status March 2010.
133 Ducor P 2003: L'accès aux resources génétiques en droit suisse. Cahier de l'environnement no 359 Office fédéral de l'environnement, des forêts et du paysage, Berne. 63 p.
134 FOEN, Federal Office for the Environment, www.bafu.admin.ch/biotechnologie/01773/03695/index.html?lang=fr, status March 2010.
135 SCNAT, Swiss Academy of Sciences, www.abs.scnat.ch, status March 2010.
136 IISD International Institute for Sustainable Development (2007) Best Practice Standard and Handbook for Implementing Genetic Resource Access and Benefit-sharing Activities, State Secretariat for Economic Affairs SECO, www.iisd.org/pdf/2007/abs_mt.pdf.

transfer of plant material according to the ABS provisions of the CBD and other national and international obligations[137].

In addition, the revised Swiss Patent Act contains provisions concerning the declaration of the source of genetic resources and traditional knowledge in patent applications[138]. With regard to other legally binding ABS user measures, Switzerland mandated a study that demonstrates that additional measures could be included in different laws and ordinances to ensure benefit-sharing[139]. These measures need further analysis and the decision on which measures will eventually be included in the Swiss legislation also depends on the further elaboration on and negotiation of the ABS international Regime.

2.3.9 National monitoring programmes

Sound data on status and trends of biodiversity are a prerequisite for effective decision making and the planning of activities for conservation and sustainable use of its components.

The main programmes and action plans contributing to data compilation on the status and trends of biodiversity in Switzerland include:

- **Biodiversity Monitoring Switzerland** (BDM): BDM is a long-term programme launched by Switzerland's federal government to record the country's biological diversity. BDM is based on 33 indicators, representing important, measurable segments of biodiversity. Just like the Dow Jones Average points towards economic trends, BDM indicators reveal where nature is headed and provide data on the conservation status of biodiversity within Switzerland[140].
- **Monitoring of Sustainable Development** (MONET): The indicator system MONET shows Switzerland's progress on the road to sustainable development. MONET is a joint activity of the Federal Statistical Office (FSO), the Federal Office for the Environment (FOEN) and the Federal Office for Spatial Development (ARE)[141].

137 Association des jardins et collections botaniques suisses Hortus botanicus helveticus (2008) Les plantes aussi partent en voyage, www.bafu.admin.ch/publikationen/publikation/00575/index.html?lang=fr.

138 Swiss Federal Institute of Intellectual Property, Revised Patent Law of Switzerland: New Provisions on the Declaration of the Source of Genetic Resources and Traditional Knowledge in Patent Applications, www.ige.ch/e/jurinfo/documents/j10017e.pdf.

139 VERA SCHMIDT (2009) Study on Existing Legal Means under the Swiss Legal System for Providers of Genetic Resources and Users, in particular as a matter of Property Law (2009). The publication is available on the Swiss Information System Biodiversity (www.sib.admin.ch)

140 Biodiversity Monitoring Switzerland (BDM): www.biodiversitymonitoring.ch, status March 2010.

141 Monitoring of Sustainable Development (MONET): www.bfs.admin.ch, status March 2010.

- **Agro-Environmental Monitoring** (AEM): AEM aims at evaluating how agricultural practices influence the environment. AEM is a product of the Federal Office for Agriculture (FOAG)[142].
- **National Forest Inventory** (NFI): NFI is the main survey of the state of Swiss forests.[143] On more than 6 000 systematically distributed plots, information on the state of forests (excluding forest health) is recorded at regular intervals. NFI is part of the Swiss Forest Monitoring programme along with the Long-Term Forest Ecosystems Research (LWF), the Sanasilva Inventory (SSI), and the Forest Insect and Disease Survey (FIDS).

  NFI is a programme of the Federal Office for the Environment that is implemented by the Swiss Federal Institute for Forest, Snow and Landscape Research[144].
- **Sanasilva**[145] assesses forest health annually on a 16x16 km sub-grid of the National Forest Inventory (Sanasilva). The NFI grid has also been used for soil and vegetation surveys.
- **National River Monitoring and Survey Programme** (NADUF)[146]: The National River Monitoring and Survey Programme (NADUF) tracks the concentrations of substances occurring in selected Swiss watercourses.

  NADUF is a project run jointly by FOEN, the Swiss Federal Institute of Aquatic Science and Technology (EAWAG) and the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL).
- **Monitoring Spatial Development Programme** (*observation du territoire*)[147]: The programme systematically monitors the evolution of spatial development in Switzerland. The programme is conducted by the Federal Office for Spatial Development (ARE) and completes existing statistical sources, especially those derived from cantonal sources. The principle goals of the programme include:
  - Establishing a statistical baseline and an indicator system (data);
  - Assessing the evolution of spatial structure (monitoring and analyses); and
  - Evaluating the measurements applied (controlling).
- **National Landscape Monitoring** (*Landschaftsbeobachtung Schweiz*, LABES): The programme, established by the Federal Office for the Environment, aims at monitoring the status and trends of Switzerland's

142 AEM, Agro-Environmental Monitoring, www.blw.admin.ch, status March 2010, languages: fr, de.
143 WSL, National Forest Inventory, www.lfi.ch, status June 2009.
144 WSL, National Forest Inventory, www.lfi.ch, status March 2010, languages: en, fr, de.
145 WSL, Inventaire Sanasilva 2002 - L'état des forêts est stable, www.wsl.ch, status June 2009.
146 NADUF, National River Monitoring and Survey Programme, http://www.bafu.admin.ch/hydrologie/01831/01840/index.html?lang=en, status March 2010, languages: en, fr, de, it.
147 Monitoring Spatial Development Programme, observation du territoire, www.are.admin.ch/themen/raumplanung/00246/index.html?lang=fr, status March 2010, languages: fr, de, it.

landscapes on the basis of 37 periodically updated indicators. The results of LABES serve to identify measures to curb unwanted developments. Today, a total of 17 indicators have been elaborated, for instance regarding different types of land-use, landscape fragmentation, urban sprawl, and light emissions. Additional indicators will be available in 2012, targeting traditional forms of land-use, authenticity, accessibility of recreational areas, the quality of landscapes in residential areas as well as regarding the perception of landscapes. The previous monitoring programme "Landscape under pressure"[148], which includes indicators on the variety within landscapes, will be integrated into LABES.

- **National Air Pollution Monitoring Network** (NABEL)[149]: NABEL measures air pollution at 16 locations in Switzerland. The stations are distributed throughout the country and monitor pollution at typical locations (e.g. city-centre streets, residential areas, rural stations). NABEL measures indicator pollutants of national significance (e.g. nitrogen dioxide, ozone, fine particles (PM10), etc.), for which ambient air quality standards have been established in the Ordinance on Air Pollution Control (LRV). The monitoring network commenced operations in stages, the first in 1979. A modernisation programme undertaken between 1989 and 1991 saw NABEL expanded from 8 to16 stations.
- **Swiss Soil Monitoring Network** (NABO)[150]: NABO is an instrument used for early detection of negative trends and for evaluating the effectiveness of soil protection measures.

  NABO is operated jointly by FOEN and FOAG. The network is managed on behalf of these federal agencies by Agroscope ART Reckenholz-Tänikon, the Swiss Federal Research Station for Agroecology and Agriculture.
- **National Climate Observing System**: Switzerland has a long tradition in the observation of climate. Systematic long-term measurement series provided by Swiss institutions make a significant contribution to the Global Climate Observing System (GCOS) and the Global Atmosphere Watch (GAW). The Federal Office of Meteorology and Climatology, MeteoSwiss[151], is responsible for coordinating climatological observations carried out in Switzerland by federal offices, research institutes and universities.

148 Office fédéral du développement territorial: Le paysage sous pression, www.are.admin.ch, status June 2009.
149 NABEL, National Air Pollution Monitoring Network, www.bafu.admin.ch/luft/00612/00625/index.html?lang=en, status March 2010, languages: en, fr, de, it.
150 NABO, Swiss Soil Monitoring Network, http://www.bafu.admin.ch/boden/00972/index.html?lang=en, status March 2010, languages: en, fr, de, it.
151 Federal Office of Meteorology and Climatology MeteoSwiss, www.meteoschweiz.admin.ch/web/en/climate.html, status March 2010, languages: en, fr, de, it.

2.3.10 National data

Data on species diversity

Data on species diversity are managed and made publicly available by the following organisations, which, with the exception of the Swiss Ornithological Institute, all receive significant assistance from the federal government:

- **Swiss Commission for the Conservation of Wild Plants (CPS/SKEW)**[152]**:** CPS maintains a database with information on 142 plant species. The database provides information on the current area of distribution, existing and planned actions, existing and planned *in situ* measures, existing *ex situ* cultures, and bibliographic references.
- **Centre for the Swiss Floristic Network (CRSF/ZDSF)**[153]: The database maintained by this organisation includes all plant species of Switzerland and provides information on the current area of species distribution, the Red List conservation status, synonyms, and also provides pictures of the species.
- **National Inventory of Swiss Bryophytes (NISM)**[154]: The database on Swiss bryophytes contains 158 798 entries on locations of bryophytes in Switzerland, dating from 1800 till now. The NISM homepage comprises a checklist of mosses, and provides information on the current area of distribution of the species as well as an overview on moss herbaria in Switzerland.
- **Coordination Offices for the Protection of Bats (KOF/CCO)**[155]: The KOF homepage comprises a description of Switzerland's bats, many practical tips for their conservation as well as educational material.
- **Coordination Office for Amphibian and Reptile Conservation in Switzerland (karch)**[156]: The data centre provides detailed descriptions of Switzerland's amphibians and reptiles, their distribution as well as practical tips for conservation activities.
- **Database on Swiss fungi (swissfungi)**[157]: The database produced by this organisation gives an overview of the current state of evidence for fungi occurring in Switzerland based on records by voluntary collaborators of the Swiss mapping project. The following information can be obtained for each species: complete scientific name including author, number of recordings per year, and spatial distribution of recordings.

152 CPS/SKEW, Swiss Commission for the Conservation of Wild Plants, www.cps-skew.ch, status March 2010, languages: en, fr, de, it.
153 CRSF/ZDSF, Centre for the Swiss Floristic Network, www.crsf.ch, status March 2010, languages: fr, de, it.
154 NISM, National Inventory of Swiss Bryophytes, www.nism.unizh.ch, status March 2010, languages: de.
155 KOF/CCO, Bat Conservation Switzerland, www.fledermausschutz.ch, status March 2010, languages: de.
156 karch, Coordination Office for Amphibian and Reptile Conservation in Switzerland, www.karch.ch, status March 2010, languages: de.
157 swissfungi, Database on Swiss fungi, www.wsl.ch, status March 2010, languages: en, fr, de.

- **Swiss lichen database (swisslichen)**[158]: The database provides an overview of the distribution of the species, information on their conservation status (also available for the cantonal and communal level) and additional information for the planning of conservation activities.
- **Swiss Centre for the Cartography of Fauna (CSCF/SZKF)**[159]: The CSCF gathers, manages and disseminates information on the distribution and ecology of fauna in Switzerland, and collaborates with public and private institutions of environmental protection, nature and landscape to ensure the conservation of species and their habitats. Data on Swiss fauna are available using a cartographical server.
- **Swiss Ornithological Institute**[160]: The primary tasks of the Swiss Ornithological Institute, a private foundation, include:
  - Monitoring the distribution, abundance and status of bird species occurring in Switzerland throughout the year;
  - Conducting scientific studies on the ecology and migration of species;
  - Improving living conditions for threatened species.

Data on landscapes

- **Project "Data-centre Nature and Landscape"** (DNL): The purpose of the project DNL at the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) is to integrate existing national biotope inventories (bogs, flood plains, meadows, etc.) into a database and connect it to further data sources of FOEN. Particularly the linkage of the data with all scientific and political processes shall be documented, e.g. using metadata. Web interfaces allow access to DNL data and other thematically related databases for spatial analysis using GIS (geographic information system) functionality. Semantic structures implementing ontologies offer open and intuitive search facilities.

Georeferenced data

- **Ecogis**[161]: Ecogis is an easy-to-use map server of the Federal Office for the Environment (FOEN) that provides environmental data using GIS. This data is provided by FOEN or by other offices like the Federal Office for Spatial Development, the Federal Roads Office (FEDRO), or Swisstopo, the Federal Geo-Information Centre. Users may see on a map various information related to the environment and biodiversity, such as protected areas, forests and watercourses, etc.

158 swisslichen, Swiss lichen database, www.swisslichens.ch, status March 2010, languages: de.
159 CSCF/SZKF, Swiss Centre for the Cartography of Fauna, www.cscf.ch, status March 2010, languages: en, fr, de, it.
160 Swiss Ornithological Institute, www.vogelwarte.ch, status March 2010, languages: en, fr, de.
161 FOEN, Federal Office for the Environment, ecoGIS, www.ecogis.admin.ch, status March 2010, languages: fr, de.

- **Federal Office of Topography (swisstopo)**[162]: Swisstopo is the competence centre of the Swiss Confederation responsible for geographical reference data and all products derived from this data. Swisstopo's national map series enjoys international recognition. Swisstopo offers various products and services, including aerial photographs and satellite images, cartographic and geological services.

2.4 National indicators

Switzerland has developed a comprehensive set of indicators through various monitoring programmes based on national needs (see section 2.3.9). An overview of these indicators according to the goals of the 2010 target framework is provided in Appendix IV.

In order to obtain a comprehensive overview on the state of the environment, and its trends, FOEN is establishing an overarching system for environmental observations, i.e. the Swiss Environment Observation System[163]. The system aims at coordinating the work of the many specialists involved in sectoral monitoring programmes in order to secure data management in the long term, to periodically update the data, and to ensure coherent communication. Reports on the state of the environment are published on FOEN's website[164].

2.5 Financial resources for nature and landscape conservation

2.5.1 An overview of funding

Domestic funding for nature conservation is tracked through indicator M7 of the Swiss BDM. The indicator is derived from the Federal Finance Administration's annual "Publication of the public finances of Switzerland", which provides information on expenditures at the federal and cantonal levels as well as by communities.

Along with other issues such as water supply, environmental protection, watercourse regulation and avalanche control structures, nature conservation is part of the superordinate "environment and regional planning" expenditure category. The nature conservation domain covers expenses for biotopes, landscape protection, conservation measures within agricultural landscapes, Switzerland's National Park and other protected areas. It also includes administrative costs; for example, expenses for personnel and materials.

Spending on nature and landscape conservation tripled between 1990 and 1998, predominantly due to the introduction of ecological compensation in agriculture, and appears to have remained more or less stable since then.

162 swisstopo, Federal Office of Topography, www.swisstopo.admin.ch, status March 2010, languages: en, fr, de, it.
163 Federal Office for the Environment: Observation de l'environnement, www.environment-switzerland.ch, status June 2009.
164 FOEN, Federal Office for the Environment, www.bafu.admin.ch/umwelt/index.html?lang=fr, status March 2010, languages: fr, de, it.

Between 2001 and 2005, the federal government contributed roughly CHF 10 million a year to the Foundation for the Preservation and Management of Near-natural Cultural Landscapes.

The federal government pays compensation to communities affected by the loss in the exploitation of hydrodynamic resources for power production, insofar as these losses are a consequence of conservation and protection measures for valuable landscapes of national importance. Spending by the federal government in this area has tripled since the mid-1990s and amounted to CHF 3.1 million in 2006.

Game management and damage caused by animals cost the federal government roughly CHF 1.8 million a year in the 1990s. Today, the amount has increased to around CHF 2.7 million.

The “species conservation” category in the hunting and fisheries domain includes costs for preventive measures against large carnivores. As part of the government’s 2003 budget restriction programme, species conservation implementation subsidies were reduced, above all in large carnivore management. These subsidies are aimed at maintaining and promoting species diversity of wild animals (species protection projects, particularly for ungulates, carnivores and migratory birds, but also other mammals and birds). In 2006, these subsidies amounted to CHF 3.2 million.

Within the framework of its 2011 Agricultural Policy, Switzerland’s government has decided to continue its support of the National Action Plan relating to genetic resources. This National Action Plan was developed to implement the FAO’s World Food Summit Plan of Action adopted in June 1996.

A recent study conducted by the Federal Institute of Research (WSL), Pro Natura and the Swiss Forum Biodiversity estimates the financial resources required for the protection and maintenance of biotopes of national importance according to legal standards. The amount required would be CHF 148 - 183 million. This is more than double the sum allotted today by the Confederation and the cantons. The study concludes that it is impossible to satisfy legal requirements with the existing level of funding. Furthermore, a non-recurring investment of CHF 700 - 1 500 million would be necessary to rehabilitate the biotopes of national importance so as to restore their original quality[165].

This list is incomplete. It does not capture other types of spending that cannot be specifically signalled as conservation spending; for example, the cost of green bridges that result from road building projects.

A new project launched by the Federal Statistical Office (FSO) aims to record all expenditure relating to the environment (both governmental and private). The FSO intends to include the ecological dimension in the overall public

165 Forum Biodiversité Suisse: Les coûts d'une protection conforme aux exigences légales des biotopes d'importance nationale, http://www.biodiversity.ch/f/publications/biotopschutzkosten/index.php, status June 2009.

accounts; for example, the cost of prevention of air and water pollution, noise protection or waste disposal.

The decision on which items of expenditure do or do not impact nature protection is based on the European classification of environmental protection activities and expenditure (CEPA 2000). The expenditure listed refers to CEPA Code 6: “protection of biodiversity and landscape”.

Tables 18–20, below, provide an overview of expenditure coming under the nature conservation domain.

2.5.2 New financial equalisation and division of tasks between the Confederation and the cantons (NFA)

A first series of programme agreements between the Confederation and the cantons has been negotiated, and entered into force in 2008 (see section 2.1.3). The programme agreements define the objectives for each sector and the financial framework up to 2011.

In order to promote the conservation of biodiversity at the cantonal level, the Confederation will support cantonal activities from 2008–2011 with a total of CHF 114 million. These financial resources will be used by the cantonal authorities to promote the conservation of biotopes of national importance (43 %), to manage protected areas (16 %), to conserve species and their habitats (9 %), as well as other activities, including the conservation of inland ecosystems, the establishment of ecological networks, the management of invasive alien species, and the management of amphibian spawning areas (22 %).

Table 18: Federal subsidies impacting nature conservation paid under the nature conservation domain (in thousands of CHF) (Source: BDM indicator M7, status October 2008).

Federal subsidies in thousands of CHF	1999	2000	2001	2002	2003	2004	2005	2006
Nature and landscape conservation	45 105	43 553	45 808	48 250	45 890	49 918	51 124	48 020
Compensatory amounts for loss in the exploitation of hydrodynamic power	1 334	1 628	2 037	3 065	3 065	3 065	3 129	3 129
Fund for the Preservation and Management of Near-natural Cultural Landscapes	–	–	10 000	10 000	9 900	9 850	10 000	–
Compensation to enterprises involved in non-military community service for conscientious objectors	–	410	349	703	728	828	914	1 195

Table 19: Federal subsidies impacting nature conservation paid under other domains (in thousands of CHF) (Source: BDM indicator M7, status October 2008).

Federal subsidies in thousands of CHF	1999	2000	2001	2002	2003	2004	2005	2006
Hunting and fisheries								
Support measures under the Federal Fisheries Act	565	638	640	653	683	680	690	699
Game management and damage caused by animals	1 797	1 860	2 210	2 260	2 287	2 335	2 413	2 703
Species protection	1 839	3 331	3 707	4 423	4 435	3 950	3 608	3 177
Agriculture: animal husbandry								
Preservation of plant genetic resources	–	1 368	1 223	1 353	2 475	2 813	3 375	3 239
Agriculture: direct payments								
Payments for ecological compensation	100 674	108 130	118 417	122 347	124 927	125 665	126 023	126 976
Payments based on the Environmental Quality Ordinance (ÖQV)	–	–	–	8 934	14 638	23 007	27 442	30 256
Payments for the extensive production of cereal and oilseed rape	35 135	33 398	32 526	31 938	31 255	30 824	31 516	31 094
Payments for extensively used meadows on fallow farmland	17 652	17 150	–	–	–	–	–	–
Payments for organic farming	11 637	12 185	23 488	25 484	27 135	27 962	28 601	28 672

2.6 Specific information requested in COP-8 decisions

VIII/5 (Article 8(j)), Para 2: on national participation of indigenous and local communities, and associated capacity-building

There are no indigenous communities in Switzerland as defined by article 8(j) of the Convention. Local communities are fully integrated into national participation and associated capacity-building (see section 2.1.1).

VIII/21, Para 3: on marine and coastal – deep seabed

Marine and coastal biodiversity is not relevant for the implementation of the CBD at the national level. With regard to deep seabed, the Swiss Federal Institute of Technology Zurich conducts some basic research, which, however, does not adversely impact deep seabed ecosystems. No activity with negative impact on these ecosystems has been identified to date.

VIII/24, Para 4: on provision of financial support to developing countries, to enable them to implement the programme of work on protected areas

Switzerland supports the conservation of biodiversity through various contributions and donations as well as through bilateral cooperation (see section 2.5.1). However, it is not possible to directly relate this support to protected areas.

Specific examples include cooperation activities of the Swiss Agency for Development and Cooperation in the Mekong region, its support to the Regional Community Forestry Training Centre for Asia and the Pacific (RECOFTC) and the Biodiversity Conservation in the Ural Ecoregion project, as well as many others.

VIII/28, Para 5: on the application of the voluntary guidelines on biodiversity-inclusive environmental impact assessment

Environmental Impact Assessment (EIA) is firmly anchored in Switzerland's legal framework (Federal Act on the Protection of the Environment, Ordinance on the Environmental Impact Assessment, see section 2.2). Furthermore, Switzerland is a party to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention).

The application of EIA was reviewed in 2004. The evaluation examined the effects of EIA on the implementation of environmental protection regulations and consent procedures, and developed concrete proposals for improvements.

The study concluded that the EIA is a vital coordination tool, ensuring the enforcement of environmental legislation – especially precautionary environmental protection in connection with consent procedures. The EIA also helps during the project planning process to ensure that the environmental impacts of major construction projects are reduced to an absolute minimum.

The study also identified weaknesses of the EIA: particular opportunities for improvement were identified in the area of procedural management and in the services provided by the authorities[166].

The revised Ordinance on the Environmental Impact Assessment with simplified procedures, entered into force in December 2008.

166 Sager F, Schenkel W 2003: Evaluation de l'étude de l'impact sur l'environnement Documents environnement n° 175 Office fédéral de l'environnement, des forêts et du paysage, Berne (download: pdf, 594 kB, http://www.bafu.admin.ch/publikationen/publikation/00268/index.html?lang=fr, languages: fr, de).

3 SECTORAL AND CROSS-SECTORAL INTEGRATION OR MAINSTREAMING OF BIODIVERSITY CONSIDERATIONS

The mainstreaming of environmental issues into sectoral policies is an ongoing process. Over the next years the Federal Office for the Environment (FOEN) will prepare a set of general environmental objectives. These will be specified in detail for sectors that are in a position to make a substantial contribution to the achievement of the general objectives; for instance, agriculture (see section 1.1).

The role of agriculture for the conservation of biodiversity and the creation of genetic diversity, as well as the impact of intense farming on biological diversity, is depicted in section 1.1. The ways and means biodiversity is addressed within agricultural policy is described in section 2.3.1. Forestry is addressed in the sections 1.3 and 2.3.2 and fishery in sections 1.1 and 2.3.3.

This section describes the extent to which biodiversity has been integrated into the various sectoral and cross-sectoral policies. Further, an overview on goals and targets, where available, is given.

3.1 Spatial development

In a densely populated country, such as Switzerland, spatial planning is a crucial issue for biodiversity conservation and sustainability. In Switzerland, land-use change is a major threat to biodiversity.

Spatial planning is carried out within the framework of the Act on Spatial Planning (see section 2.2). The Act anticipates the concepts of sustainable development and clearly distinguishes between urban, agricultural and natural areas in order to avoid urban sprawl.

The development of Switzerland's territory and its landscapes is monitored by the Federal Office for Spatial Development (ARE) and, since 1989, through the project "Landscape under pressure" by ARE, in collaboration with FOEN. The Spatial Development Report published in 2005[167] by ARE shows that urban sprawl continues unabated, primarily at the expense of agricultural land; out of 280 000 ha of urbanised land, 175 000 ha (63 %) lies in construction zones and 105 000 ha (37 %) outside these zones. The third Spatial Development Report (1989–2003) published in 2007[168] concludes that, during the period considered, a total of 2 087 328 fruit trees disappeared and 920 km of brooks and rivers were covered. On the other hand, 2 448 km of hedges were planted and the forest area increased by 46 464 ha. In the years considered, the length of roads and paths increased by 59 656 km, in other words one and a half time the circumference of planet Earth. Although positive developments such as the renaturation of brooks and rivers are observed,

167 Federal Office for Spatial Development (ARE), Federal Department of Environment, Transport, Energy and Communications (DETEC), 2005: Spatial Development Report 2005 - Abridged version. 34 pp.

168 Bundesamt für Raumentwicklung / Bundesamt für Umwelt (Hrsg., 2007): Landschaft unter Druck. 3. Fortschreibung 1989–2003. Bern

Switzerland's landscape remains strongly under pressure, especially in the Central Plateau.

Taking this into consideration, the Guidelines and Action Plan 2008–2011 of the revised sustainable development strategy aims at limiting the built-up area at 400 m^2 per capita. Further, a Swiss spatial concept is being drawn up that aims at conserving attractive landscapes as essential economic, ecological and cultural assets of Switzerland.

3.2 Transport and mobility

Swiss transport policy is based on the principle of sustainable development. Transport infrastructure should meet mobility, cost, efficiency and public service requirements without adversely affecting the environment. The advantages offered by different modes of transport are to be exploited by promoting public transport, expanding non-motorised transport and shifting freight transport from road to rail. Environmental impacts and energy consumption are to be reduced[169]. In addition, the various modes of transport should bear not only the operating costs but also the associated external costs.

Specifically targeting biodiversity, the construction of wildlife crossings on traffic routes and the restoration of wildlife corridors of national importance are a key priority of Switzerland's transport and mobility policy.

3.3 Tourism and leisure

In Switzerland, tourism is predominantly managed by the private sector, with the federal government setting the framework in the context of location or "site" promotion for Switzerland and as a strategic sector of the economy.

Tourism policy, which comes under the responsibility of SECO, is based on the concept of environmentally friendly regional planning. Due to the high level of tourism development, emphasis is laid on the further development of existing tourist infrastructure with the goal of conserving attractive landscapes as the basic resource of tourism, especially the rural and close-to-nature landscapes.

In recent years, leisure activities have rapidly evolved due to the development of new sports (fun sports), thus increasing the pressure on the natural environment. With the goal of conserving and creating areas of unspoiled nature as well as promoting ongoing consciousness-raising and collaboration among stakeholders, the Federal Office for the Environment (FOEN) has adopted a strategy for sports and tourism with the three dimensions "infrastructure and mobility", "sport and tourism activities" and "goods and services".

169 DETEC 2005: Federal Department of the Environment, Transport, Energy and Communications (DETEC), Die Mobilität nachhaltig gestalten und sinnvoll koordinieren, Bern, 2005.

Forests are especially attractive for sports and leisure activities. The Federal Office for the Environment conducted a study on the monetary recreation value of Swiss forests. Based on data from an opinion poll carried out in a forest monitoring programme in the whole of Switzerland, the study provides information on the appreciation of recreation services by the Swiss population in the entire Swiss forest, using the travel cost method. The resulting monetary recreation value of CHF 10 billion corresponds to the functional value of forest recreation.[170]

Further, the FOEN published a resource-kit on leisure in forests, which encompasses empirical statistics, instruments, checklists and examples.[171]

3.4 Energy, hydropower and renewables

SwissEnergy is a concept with clearly defined quantitative objectives, and a comprehensive strategy for promoting efficient energy use and the use of renewable energy in all sectors.

The production of energy from renewable sources may negatively affect biodiversity. The following principles contribute to avoiding unwanted impacts:

Hydropower: Hydropower is the major domestic energy source. The potential will be capitalised upon by building new small-scale hydro-electric plants, and by modernising and further developing existing plants. However, this must be done with consideration of the need for conservation of the environment, as depicted in the Guiding Principles for Swiss Watercourses (see section 2.3.3), including the importance of watercourses as migration pathways and of adequate residual water[172].

Wind energy: In order to find a consensus between the interests of the Confederation, the cantons, the energy service companies and environmentalists, the “Concept Wind Energy for Switzerland” was drawn up by the Swiss Federal Office of Energy SFOE, the Federal Office for the Environment FOEN and the Federal Office for Spatial Development ARE, with the participation of stakeholders from the relevant sectors. The concept defines criteria for the site selection for wind power stations.[173]

Biofuels: Although biofuels are not explicitly included as part of the Swiss environmental policy to reach the targets of the Kyoto Protocol, some collectives and/or companies, however, consider that the main objective of biofuel development is to partially replace diesel and petrol in order to:

170 Ott W, Baur M 2005: Der monetäre Erholungswert des Waldes. Umwelt-Materialien Nr. 193. Bundesamt für Umwelt, Wald und Landschaft, Bern. 68 S.

171 Bernasconi A., Schroff U. 2008: Loisirs et détente en forêt. Bases, instruments, exemples. Connaissance de l’environnement no 0819. Office fédéral de l’environnement, Berne. 69 p.

172 Vogel, U., Kirchhofer, A., Breitenstein, M., 2004: Restwassermengen – Was nützen sie dem Fliessgewässer? / Débits résiduels – quel bénéfice pour les cours d'eau?, BUWAL, Schriftenreihe Umwelt Nr. 358.

173 L'association pour la promotion de l'énergie éolienne en Suisse: http://www.wind-energie.ch/fileadmin/PDF/Accueil/KonzeptWindenergieCH-d.pdf, status June 2009.

- achieve the targets in terms of the greenhouse effect (i.e. the reduction of CO_2 emissions);
- ensure a durable and secure supply (reduced dependence on fossil fuels);
- promote renewable energies.

The development of biofuels also aims at offering new possibilities to the agricultural policy, oriented towards the maintenance of viable rural areas and a multifunctional agriculture.

On 30 January 2008, the Federal Council adopted the revision of the Mineral Oils Tax Ordinance (Oimpmin). The new Oimpmin entered into force on 1 July 2008. In particular, it specifies, based on a full lifecycle assessment, the list of "fuels from renewable raw materials" and the terms regarding proof of positive ecological balance and acceptable social conditions of production.[174] Biofuels eligible for tax reductions have to emit – over their full lifecycle – at least 40 % less greenhouse gases than fossil fuels, they must not have a stronger impact on the environment than fossil fuels and must not threaten tropical forests or biodiversity.

3.5 Soils

Many kinds of chemical and physical pressures on soil are irreversible. Moreover, it is very difficult to establish acceptable limits to such pressures. Therefore, in soil protection the precautionary principle must take priority: if at all possible, soil degradation should be avoided from the start. The soil should receive particular protection in places where there is a threat of major impacts, such as, for example, on building sites, and in woodland, cropland, gardens and green spaces.

The Swiss Ordinance on the Pollution of Soil provides a statutory foundation for soil protection in Switzerland. The Ordinance stipulates that during cultivation or building the soil must be treated in such a way that it suffers no lasting damage. Consequently, the federal government and the cantons, together with the construction, agricultural and forestry sectors, have developed a range of instruments and precautionary measures. These include training consultants to advise developers on major construction projects, and making greater use of new, soil-friendly cultivation methods.

Precautionary action is also key to protecting soil from chemicals, as pollutants which do not readily degrade cause contamination which is practically irreversible. A broad spectrum of measures has already led to a noticeable reduction in the input of pollutants in the last twenty years, especially in the case of inorganic substances. Little is known as yet about contamination by persistent organic pollutants (POPs). Various ordinances restrict the input of pollutants to a tolerable level.

174 Biofuels Platform: http://www.biofuels-platform.ch, status June 2009.

The statutory measures and restrictions are supplemented by the voluntary action of countless individuals, meaning, for example, amateur gardeners who forgo the use of pesticides and apply fertiliser only sparingly. It is a declared aim of the federal government to raise popular awareness of the importance of soil protection.

3.6 Defence

The Federal Department of Defence, Civil Protection and Sport (DDPS) is the biggest landowner in Switzerland. The areas owned by DDPS are often of high ecological value either because they are situated in isolated regions, are not intensively used or are shielded from other land uses (e.g. construction etc.).

In 2004, the DDPS approved a new set of guidelines on the protection of the environment. They are based on the principle of sustainable development and include general provisions regarding the conservation of habitats and landscapes as well as regarding pollution generally. These guidelines are used as the basis for all activities of the DDPS.

3.7 Environment related taxes

The promotion of sustainably produced products and their consumption requires a systematic implementation of the polluter-pays principle and therewith the internalisation of external costs into the prices of goods and services. Due to methodological difficulties in assigning external costs to specific goods and services, environmental taxes are limited to products where this is possible.

The development of environmental taxes in Switzerland is monitored through the MONET indicator system (see section 2.3.9).

Environmental tax revenue has increased since 1990 owing to new taxes, an increase in existing taxes, as well as an increase in unsustainably produced products and services. Environmental tax revenue amounted to CHF 9.6 billion in 2006 (1.98 % of GDP), coming from taxes on energy and transportation (52.5 and 40.1 %, respectively), taxes on resources (4.8 %) and on emissions (2.6 %).

3.8 Innovation, research and training for sustainable development

Knowledge and how that knowledge is used are two of the most precious resources in designing sustainable development processes. The Federal Council wishes to meet targets in this area mainly by focusing on the formulation and implementation of its education, research and innovation policy. Where the Federal Institutes of Technology (Eidgenössische Technische Hochschulen, ETH) are concerned, the emphasis is on research into and the early recognition of natural hazards; the reliability and

sustainability of materials and systems; the study, planning and continued development of resource conservation, and resource and energy consumption; as well as Switzerland's infrastructure and spatial planning regulations. Meanwhile, the Swiss National Science Foundation (SNSF) is to concentrate on basic research (environmental sciences) and targeted national research programmes such as those on the climate and on North-South relations, and National Research Programme (NRP) 54, "Sustainable Development of the Built Environment" or NRP 59 "Benefits and Risks of the Deliberate Release of Genetically Modified Plants". Switzerland's participation in the European Union's framework research programmes on sustainability, conservation and renewable energies is also an important element of its commitment to education, research and innovation.

The Federal Office for the Environment (FOEN) encourages, based on its strategy "Education and Training 2008–2011"[175], the integration of environmental issues in basic and professional training. FOEN supports training projects of the cantons and implements activities in close collaboration with its partners (Sanu – training for sustainable development[176]; FEE – Foundation for Environmental Training[177]; SILVIVA – Foundation for Environmental Training and Forest[178]; and the training centre of the World Wide Fund For Nature WWF).

3.9 Cooperation

Switzerland's environmental cooperation policy is predominantly developed by the Swiss Agency for Development and Cooperation (SDC) and the State Secretariat for Economic Affairs (SECO) with the support of the Federal Office for the Environment (FOEN).

The **Swiss Agency for Development and Cooperation** (SDC) is Switzerland's international cooperation agency within the Federal Department of Foreign Affairs (FDFA). In operating with other federal offices concerned, SDC is responsible for the overall coordination of development activities and cooperation with Eastern Europe, as well as for the humanitarian aid delivered by the Swiss Confederation. Development cooperation aims to alleviate poverty by helping people in partner countries help themselves. Development activities focus on promoting economic and government autonomy, improving production conditions, helping to solve environmental problems, and providing

175 FOEN, 2007: Stratégie Éducation et formation OFEV pour les années 2008–2011, Berne, 16pp. (download: pdf, 310 kB, http://www.bafu.admin.ch/umweltbildung/index.html?lang=fr&download=NHzLpZig7t,lnp6I0NTU042l2Z6ln1ae2IZn4Z2qZpnO2Yuq2Z6gpJCFdX55fGym162dpYbUzd,Gpd6emK2Oz9aGodetmqaN19XI2IdvoaCVZ,s-.pdf, languages: fr, de).

176 Sanu, training for sustainable development, www.sanu.ch, status March 2010.

177 FEE, Foundation for Environmental Training, www.educ-envir.ch, status March 2010.

178 SILVIVA, Foundation for Environmental Training and Forest, www.silviva.ch, status March 2010.

better access to education and basic health care for the most disadvantaged population groups.

The **State Secretariat for Economic Affairs** (SECO) is the Confederation's competence centre for all core issues relating to economic policy, i.e. trade related concerns. The Directorate for "Economic Development Cooperation" of SECO is responsible for sustainable economic development and supports the integration of developing countries, and countries with economies in transition, into the global economy. It seeks to promote sustainable economic growth by supporting stable macroeconomic conditions, encouraging investment and trade, and by building basic infrastructure. SECO's priority in the field of biodiversity protection is to support programmes which entail capacity building and technology transfer to ensure developing countries have the opportunity to develop biotrade, to get access and share benefits of genetic resources, to treat wastewater and conserve ecosystems, i.e. through the development of REDD (Reducing Emissions from deforestation and degradation) mechanisms, and enhance forest biodiversity certification.

3.9.1 Cooperation activities according to selected thematic issues of the CBD

Switzerland has partially integrated biodiversity as a cross-cutting issue within its cooperation strategies and programmes, e.g. in SDC's 2010 Strategy, its Global Programme Climate Change or SECO's Agenda 2010 Poverty reduction. The following section provides information on selected (i.e. not representative) activities implemented by SDC and SECO according to CBD's programmes of work.

Agriculture

The Swiss Agency for Development and Cooperation (SDC) concentrates its support on promoting sustainable, efficient smallholder farming and locally organised forest management, giving priority to research and advisory services that benefit poor rural dwellers. Optimised production and marketing that are continually adapted to change help farmers and their families to make a better living. Sustainable management of natural resources is crucial for long-term income preservation. SDC supports its partners in the participatory development of rules that are appropriate for local conditions and traditions.

Each year, the SDC spends roughly CHF 150 million on agricultural programmes in developing countries, in priority countries for bilateral development cooperation and through its multilateral contributions to international organisations and research networks working in agriculture and agricultural development (WFP, FAO, CGIAR, etc.). This funding has become even more crucial in view of the fact that several donors have decreased their agricultural funding over the past twenty years. Switzerland uses its strong

position in agriculture to establish partnerships and encourage developing countries' efforts. Small farms, which are often run by women, offer the best potential for reducing poverty and hunger in rural areas and contributing food supplies for urban areas. In addition, investment in international agricultural research has a crucial catalytic effect. Each year, the SDC provides about CHF 12 million to the Consultative Group on International Agriculture Research (CGIAR). Every franc the CGIAR receives generates the equivalent of nine francs for the poorest inhabitants of least developed countries. The national research institutions and advisory services in developing countries are generally weak and benefit from the technical assistance and crop diversity protection expertise provided by the CGIAR and related institutions.[179]

SECO has been active in promoting the development and application of broadly accepted sustainability standards which include indicators to guarantee the respect of biodiversity related issues. Among the processes and standards supported are the Common Code for the Coffee Community (4C), the Better Cotton Initiative (BCI), the Roundtable on Responsible Soy and the Roundtable on Sustainable Biofuels.

Forests

Of the natural resources, the forest plays a most crucial role. While representing in itself a multifunctional ecosystem characteristic of the rural countryside, the forest not only makes a vital contribution to the preservation of the climate, to the protection against natural hazards, to tourism, etc., but also – in its function as element of the rural production system – plays a huge role in poverty alleviation. Forests provide societies worldwide with products such as wood for heat and for housing, drinking water, feeding grounds for wildlife, fruits, game, humus, and medicinal plants, to name only a few.

Since many international processes with relevance for forests are ongoing, Switzerland follows the development of those international negotiation processes with most potential for international binding commitments with regard to forests.

Switzerland, through its three agencies FOEN, SECO and SDC, supports with the UN Forum on Forests the ongoing international process aimed at making sustainable management of forests subject to binding regulations. In this process, the internationally recognised instrument known as the National Forest Programme is for many countries the national reference concept for the forest sector. In the context of the growing interest of forests in the global climate debate, so called Readiness Plans for REDD+ are supported by SECO in the context of the World Bank Forest Carbon Partnership Facility. They appear to be more cross-sectoral and of greater policy importance for their likeliness to attract more financial means for national implementation.

179 SDC: Agriculture and rural development, www.sdc.admin.ch, state March 2009.

Both instruments, the National Forest Programme and the Readiness Plan, represent a political action programme targeted and calculated to sustainably regulate the economic, ecological and social demands being placed on the forest. Switzerland supports the formulation of such Forest Programmes and Readiness Plans while underscoring the importance of biological diversity of forests for their adaptive potential. While highlighting the importance of forests for buffering set-backs in technological innovation in emission reductions, Switzerland accords high importance to governance issues such as clear tenure rights, and insists that it is essential for the sustainability of any forest strategy that local and regional governments, communities and the private sector are integrated into a participative process from the very beginning.

With respect to internationally managed programmes and studies, Switzerland supports decentralised management of natural resources and a devolution of rights to lower levels of government, with higher responsibility and access to forests for the local population, for instance by supporting the Nepal Swiss Community Forestry Programme.

On the multilateral level, SDC supports the Programme on Forests (PROFOR) of the World Bank that aims at enhancing forests' contribution to poverty reduction, sustainable development and protection of environmental values and services. SECO supports the Forest Carbon Partnership Facility of the World Bank (FCPF) and the International Tropical Timber Organisation (ITTO). An overview of projects supported by Switzerland within the ITTO is given in the Internet portal[180].

In partner countries, SDC supports and promotes:[181]

- small-farmer and community initiatives for sustainable forest management, for the regeneration of degraded forests, and for afforestation;
- approaches for multifunctional land use (common use of forest and pastureland, agroforestry, trees for the production of food, for building, fuel, animal feed or green manure, environmental and tourism services) with the following aspects:
  - compensation for community service or renunciation on behalf of the community;
  - collaboration in regulation and legislation procedures for multifunctional land use;
  - equitable cooperation between state institutions and the population;
  - national and sub-national networks to promote the interests of local communities;
  - subsidiarity, i.e. appropriate regulations at the local level for forest and land use;

180 Tropical Forests, www.tropicalforests.ch, status March 2010.
181 SDC: Forest and land use - Risk reduction and adaptation rolled into one, www.deza.admin.ch, status June 2009

- development of alternatives for energy and food supply, and for the generation of rural income.

As part of its efforts to provide new know-how, SDC promotes:

- activities with a direct impact on operational programmes and policy dialogue;
- country and theme-specific coordination of multilateral and bilateral actors in climate and forest related fields.

SECO supports the development of sustainable supply chains of biodiversity related (forest) products and services (see Chapter "Trade" below).

Inland Waters

SDC is aware of just how serious the water situation is and places the use of water for people and their food security at the centre of its work. Agency activities cover the protection of water sources and their ecosystems, in line with the principles of the Integrated Water Resources Management (IWRM) worldwide programme.

SDC addresses water in terms of “water for people” by supporting national and regional strategies that promote the two mainstays of all socio-economic development: drinking water and sanitation. “Water for food” is SDC’s second pillar within the water sector. Its importance is based on the fact that food security is totally dependent on the availability of sufficient water for farming purposes. However, unfortunately, agriculture’s use of water is still extremely inefficient, not to mention the pollution caused by fertilisers and pesticides and their impact on consumption. Therefore, SDC’s programmes stress improving farming practices and protecting water-producing ecosystems.

SDC’s website on Capitalization of Experiences of “Water, Land and People”[182] aims at sharing and deepening the knowledge base of SDC and partners in order to improve development strategies and policies with regard to Integrated Water Resource Management (IWRM) with emphasis on the aspect “Water for Food”. During 2005–2006, learning groups in Bolivia, India and Mali analysed specific topics related to water management based on the experience of its members.

The State Secretariat for Economic Affairs (SECO) supports projects mainly for the rehabilitation of basic economic and social infrastructure. It also funds projects related to inland water ecosystems; for instance, the “Monitoring Program on Conservation of Lake Ohrid” (Macedonia/Albania), a joint monitoring programme between the Hydrobiological Institute in Ohrid (responsible for monitoring the lake water quality) and the Swiss Federal Institute of Aquatic Science and Technology (Eawag). The project promotes exchange of knowledge on analytical methodology and lake water monitoring.

182 SDC, Swiss Agency for Development and Cooperation, "Water, Land and People", www.waterlandpeople.net/en/index.htm, status March 2010.

Drylands

SDC supports the UNCCD mandate by earmarking CHF 58 million a year for development projects and programmes that target the particular problems of arid areas. Numerous projects are designed to preserve water and fertile land by means of sustainable agricultural production and forestry. Local stakeholders are trained in handling sparse resources, support is provided for agricultural research projects and institutional reforms are prepared in the field of environmental management.

An example of SDC's engagement is the "Three Nations Namib Desert Transfrontier Conservation Area" (implemented by Conservation International). In this project, Conservation International seeks to productively involve rural communities in conservation and natural resource utilisation as well as local economic development. The Transfrontier Conservation Areas (TFCA) are seen as having a great potential to alleviate poverty and enable communities to manage their natural resources in a sustainable way. Supported by the Southern African Development Community (SADC), this concept allows cross-border issues to be tackled through the prism of natural resources management.

Mountain Ecosystems

Sustainable mountain development has a long tradition and special significance in Switzerland. For centuries, local populations have lived in mountain regions in an ongoing struggle with the forces of nature, shaping strategies and policies to achieve balanced, sustainable development. Systems of resource management were steadily improved and modified in the past in response to natural disasters, overuse and raw exploitation. This has led to a relatively high degree of stability in natural and cultural landscapes, providing a basis of subsistence for local populations. Switzerland has a great deal of mountain experience and many instruments for promoting sustainable development in mountain regions.

Over the last 20 years, the Swiss Agency for Development and Cooperation SDC has established substantial development cooperation programmes with partly or completely mountainous countries, such as Nepal, Pakistan, India, Peru, Bolivia, Kyrgyzstan and Tajikistan. Over the years, specific sectoral, multisectoral, and integrated programmes, focusing on different aspects of sustainable mountain development, have been implemented and supported in all these countries. In addition, related initiatives, networks, partnerships and international centres such as the International Centre for Integrated Mountain Development (ICIMOD) and the Central Asian Mountain Partnership Program (CAMP) were established and supported at the regional level.

The International Centre for Integrated Mountain Development was established in 1983 at the initiative of Switzerland, Germany and UNESCO, in close cooperation with eight regional member countries: Afghanistan,

Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan. As an intergovernmental organisation, ICIMOD is able to reach across borders to aid the poor in mountain regions. Part of its activities involves helping people to cope with the challenges of globalisation and enjoy the benefits of new technological advances. The other part involves dealing with the dramatic effects of climate change. As a case in point, ICIMOD has drawn up an inventory of dangerous glacial lakes, where rising temperatures can cause catastrophic flooding in the valleys below. ICIMOD uses this inventory to develop early warning systems and build the infrastructures needed to counter this threat. The SDC makes an annual contribution of USD 500 000 in support of ICIMOD activities.

The Central Asian Mountain Partnership Program (CAMP) is currently being implemented in Kyrgyzstan, Kazakhstan, and Tajikistan and to a lesser extent in Uzbekistan and Turkmenistan. It is an example of an SDC regional mountain initiative. CAMP's mission is to promote the sustainable use of renewable natural resources through research and development, capacity building, networking and communications, with the aim of advancing economic development, social welfare and ecological sustainability.

Trade

Since 2002, SECO has invested some CHF 7 million in the development and implementation of the concept of "biotrade". Developing countries, in particular Bolivia, Colombia, Peru, South Africa and Vietnam, have been supported to develop exportable products and services derived from local biodiversity, under sustainable management plans. The programme is implemented by UNCTAD, ITC, IFC, national and regional biotrade associations as well as the global Union for Ethical Biotrade. Switzerland's technical assistance includes product identification, value chain improvement, market access and regulatory measures such as lobbying for a simplification of the EU's novel food regulation.

Access and benefit-sharing

Further, SECO has developed, through an open stakeholder consultation process, the "ABS management tool", a best practice standard and handbook for implementing genetic resources access and benefit-sharing activities. This practitioners' handbook is available for free in English, French and Spanish[183].

3.9.2 Federal spending on global concerns

Between 1991 and 2010, Switzerland contributed a total of CHF 374 million to the Global Environment Facility (GEF, pilot phase till GEF-4). With a total budget of USD 3.1 billion, GE-4F funds are allocated as follows: 36 % to biodiversity, 33 % to climate change, 14 % to international waters, 3 % to land

183 ABS Management Tool: Download: pdf, 838 kB, http://www.iisd.org/abs/, languages: en, fr, es, status June 2009.

degradation, 9 % to cross-cutting issues, 3 % to ozone depletion and 3 % to persistent organic pollutants.

Public foreign aid includes funds for biodiversity conservation pursuant to the Rio Convention on Biological Diversity. For example, Switzerland makes donations to the Global Crop Diversity Trust, which has made it its mission to ensure the conservation of crop diversity worldwide.

Table 20: Federal spending on global concerns (in thousands of CHF) (Source: BDM indicator M7, status October 2008).

Federal spending on global concerns in thousands of CHF	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Public foreign aid (only as regards biodiversity!)	–	–	36 699	44 758	46 437	45 825	62 046	58 465

3.10 Convention processes

Switzerland has, amongst others, ratified the following international and regional conventions and agreements:

- Convention concerning the Protection of the World Cultural and Natural Heritage (WHC, concluded in Paris (France), 23.11.1972, date of ratification: 17.9.1975, entry into force for Switzerland: 17.12.1975).
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, concluded in Washington (USA), 3.3.1973, date of ratification: 9.7.1974, entry into force for Switzerland: 1.7.1975).
- Convention on Wetlands of International Importance especially as Waterfowl Habitat (concluded in Ramsar (Iran), 2.2.1971, date of ratification; 16.1.1976, entry into force for Switzerland: 16. 5. 1976).
- International Convention for the Regulation of Whaling (concluded in Washington (USA), 2. 12. 1946, date of ratification: 29.5.1980, entry into force for Switzerland: 29. 5. 1980).
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention, concluded in Bern, 19.9.1979, ratification: 12.3.1981, entry into force for Switzerland: 1. 6. 1982).
- Antarctic Treaty and the Protocol on Environmental Protection to the Antarctic Treaty (treaty: concluded in Washington (USA), 1.12.1959, date of ratification: 15. 11. 1990, entry into force for Switzerland: 15.11.1990).
- United Nations Framework Convention on Climate Change (UNFCCC, concluded in New York (USA), 9.5.1992, date of ratification: 10.12.1993, entry into force for Switzerland: 21.3.1994).
- Convention on Migratory Species (CMS, Bonn Convention, concluded in Bonn (Germany), 23.6.1979, date of ratification: 7.4.1995, entry into force for Switzerland: 1.7.1995).
- Convention on Biological Diversity (CDB, concluded in Rio de Janeiro (Brazil), 5.6.1992, date of ratification: 21.11.1994, entry into force for Switzerland: 19.2.1995).
- International Plant Protection Convention (IPPC, concluded in Rom (Italy), 6.12.1956, revised in Rom 28.11.1979, date of ratification: 26.9.1996, entry into force for Switzerland: 26.9.1996).
- United Nations Convention to Combat Desertification (UNCCD, concluded in Paris (France), 17.6.1994, date of ratification: 19.1.1996, entry into force for Switzerland: 26.12.1996).

- Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention, concluded in Espoo (Finland), 25.2.1991, date of ratification: 16.9.1996, entry into force for Switzerland: 10.9.1997).
- Alpine Convention (concluded in Salzburg (Austria), 7.11.1991, date of ratification: 28.1.1999, entry into force for Switzerland: 28.4.1999).
- Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA, concluded in The Hague (Netherlands), 15.8.1996, date of ratification: 15.10.1996, entry into force for Switzerland: 1.11.1999).
- Cartagena Protocol on Biosafety (concluded in Montréal (Canada), 29.1.2000, date of ratification: 26.3.2003, entry into force for Switzerland: 11.9.2003).
- Kyoto Protocol to the United Nations Framework Convention on Climate Change (Kyoto Protocol, concluded in Kyoto (Japan), 11.12.1997, date of ratification: 9.7.2003, entry into force for Switzerland: 16.2.2005).
- United Nations Convention on the Law of the Sea (UNCLOS, concluded in Montego Bay (Jamaica), 10.12.1982, date of ratification: 1.5.2009, entry into force for Switzerland: 31.5.2009).

4 CONCLUSIONS

4.1 Progress Towards the 2010 Biodiversity Target

Goal 1. Promote the conservation of the biological diversity of ecosystems, habitats and biomes

Protected areas established on federal edicts for the purpose of biodiversity conservation are limited to 2.19 % of the territory with additional 4 % devoted to the conservation of selected animal groups. Additional protected areas are created at cantonal and communal level. Many protected areas are too small for an effective conservation of biodiversity. In order to meet Goal 1, additional efforts and resources are needed for the protection of areas of particular importance for biodiversity as well as for translating the vision of the national ecological network into reality.

In order to promote the conservation of biological diversity the Federal Parliament mandated the Federal Office for the Environment to elaborate a new and overarching National Biodiversity Strategy. The elaboration of the strategy has started in January 2009.

Goal 1 will not be met by 2010.

Goal 2. Promote the conservation of species diversity

Switzerland implements a series of programmes for the conservation of species (see sections 2.3.3, 2.3.4, 2.3.5, 2.3.6) and has a sound baseline for the evaluation of their diversity (section 1.1.2) based on assessments and the national data centres (section 2.3.10) and various monitoring programmes (section 2.3.9) as well as the Red List programme (Appendix II).

According to the Biodiversity Monitoring Switzerland (BDM), the total number of species remains more or less stable, with species losses being compensated by new establishments. The establishments occur naturally, are due to the reestablishment of species formerly living in Switzerland, or are a result of intentional or unintentional releases. The Red Lists of endangered species of Switzerland show that more and more species are becoming threatened. Further, it is also observed that populations of common species are declining, predominantly due to habitat loss and fragmentation as well as due to pollution (e.g. nutrient load) from various sources.

Goal 2 will not be met by 2010.

Goal 3. Promote the conservation of genetic diversity

Important efforts are being conducted to inventory the animal and plant genetic diversity in agriculture (see section 1.2.4 and 2.3.7), and activities for the conservation of these genetic resources are planned and are being implemented with the support of the Federal Office for Agriculture. Switzerland

has therewith established a sound baseline for the future conservation of genetic resources in agriculture.

The situation regarding valuable species of wild living animals, plants and microorganisms, as well as the conservation and utilization of these genetic resources is a completely different one, with only scattered information available (see sections 1.3.6, 1.4.5 and 1.6.4). Today, the awareness of the role of genetic diversity, especially regarding the resilience of ecosystems, is not sufficiently recognised.

Goal 3 will be partially met by 2010.

Goal 4. Promote sustainable use and consumption.

Sustainable development is a main objective of the Swiss Constitution and many policy instruments have been developed and are being implemented in all sectors. Therefore, progress towards goal 4 can be observed, e.g. the agricultural area managed according to the provisions of organic farming has increased since 1996 (section 1.2.1) as has the certified forest area (1.3.7) and the consumption of organically produced products (section 1.2.6).

However, when taking a global approach, it appears that Switzerland is importing a considerable share of its consumed natural resources from other countries. This allows Switzerland to avoid a significant overexploitation of its own natural resources. Switzerland's footprint has more than doubled since the 1960s up to a total of 5.59 global hectares per capita, with the biocapacity of a mere 1.28 global hectares per capita. Recognising that trade in natural resources with developing countries offer potentials and benefits for the social and economic development, Switzerland has, however, so far not taken adequate measures to avoid impacts on biodiversity abroad.

Goal 4 will not be met by 2010.

Goal 5. Pressures from habitat loss, land-use change and degradation, and unsustainable water use, reduced.

Switzerland has developed instruments governing land-use planning, such as the Swiss Landscape Concept, the guiding principles of Landscape 2020, and the Sustainable Development Strategy (section 1.1). However, in practice spatial land-use planning has not been able to cope with urban sprawl and transportation infrastructures, with an ongoing loss and fragmentation of habitats as a consequence.

The loss and fragmentation of habitats is pronounced in the agricultural area (see section 1.2.1), with additional pressures resulting from intensive agricultural practices and the systematic destruction of structures important for biodiversity (see section 1.2.2), thus resulting in loss of specialised species. To counteract this ongoing development, a set of environmental objectives for the agricultural sector was developed and activities are being implemented accordingly (see Appendix II - Further Information).

The Swiss forestry policy has been a great success with the forest area having increased of more than 45 % since the late 19th century (see section 1.3.1).

54 % of Switzerland's watercourses are in an eco-morphologically natural or near-natural state. Strongly affected watercourses are found in the densely populated alpine valleys below 600 m asl., (46 %) the Central Plateau (38 %) and the Jura (36 %), whereas the share is lower for the alpine region (15 %) due to vast natural areas at higher elevation (see section 1.4.7).

The quality of surface water has been improving. Phosphorous loads are decreasing, nitrate loads appear to have levelled and the loads of heavy metal are tending to fall; this follows the prohibition of phosphorous in detergent washing products (1985), extension of the water treatment network and the use of new treatment technologies, and new ecological measures in agriculture (section 1.4.10). However, despite the progress observed in water quality, pressure on inland waters biodiversity remains high due to micropollutants, artificial barriers, the loss of natural dynamics as well as the loss of natural banks, which form important migratory pathways throughout the country (section 1.4.7).

Goal 5 will not be met by 2010.

Goal 6. Control threats from invasive alien species

To date, actions to control invasive species have been developed and implemented predominantly at the cantonal level, with financial support by the Confederation for areas additionally protected by federal edicts.

At the federal level, limited instruments are as yet available, i.e. national guidelines that would guide cantonal authorities in elaborating invasive alien species strategies are in place for the Ruddy Shelduck and crayfishes only (section 2.3.4).

Goal 6 will not be met by 2010.

Goal 7. Address challenges to biodiversity from climate change and pollution

An adaptation strategy to climate change that will specifically address biodiversity is currently being prepared, based on the report of the Advisory Body on Climate Change (OcCC, section 1.1.4). The strategy will take into account the publication of the Swiss Biodiversity Forum on conflicts and synergies in developing measures for climate change adaptation and conservation of biodiversity [184].

Switzerland has made significant progress in decoupling environmental pressures and economic growth, in particular with regard to conventional air pollutants (SO_x, NO_x), water abstraction, and the use of fertilisers and

184 Biodiversité et climat: conflits et synergies au niveau des mesures. Prise de position de l'Académie suisse des sciences naturelles (SCNAT), 2008. ISBN-978-3-907630-32-7

pesticides. This is the result, in particular, of an ambitious, long-term legislative and institutional policy regarding the environment that stresses the principles of cooperation, causality (the polluter pays and user pays principles) and prevention.[185]

Switzerland has made significant progress towards goal 7, however, further efforts will be needed in translating the climate adaptation strategy into targeted action in the field.

Goal 7 will be partly met by 2010

Goal 8. Maintain capacity of ecosystems to deliver goods and services and support livelihoods

Whereas the maintenance of a healthy environment as living space for humans, animals and plants is firmly anchored in Switzerland's legislation, the term ecosystem service is only just starting to emerge. Awareness of the interlinkages between ecosystem services and biodiversity is rising.

Some ecosystem services, e.g. the protection of infrastructure provided by forests in mountainous areas, or the provision of clean drinking water by forests or agricultural land (section 1.3.12) are valued and secured in the long term, whereas others, such as pollination (section 1.2.10) are at risk.

There is an urgent need for additional research on the interlinkages between biodiversity and ecosystem services in order to foster the integration of ecosystem services in Switzerland's environmental policy.

Goal 8 will not be met by 2010

Goal 9. Maintain socio-cultural diversity of indigenous and local communities

Switzerland has no indigenous as understood by the Convention. Switzerland's local communities are not address specifically, but are fully into national implementation activities (section 2.1.1). The protection of traditional knowledge, innovations and practices as well as the rights of the indigenous and local communities is an important pillar of Switzerland's technical cooperation.

Goal 9 will be partly met by 2010

Goal 10. Ensure the fair and equitable sharing of benefits arising out of the use of genetic resources

Switzerland encourages users of genetic resources from other countries to enter into formal agreements on access and benefit-sharing, in accordance with CBD provisions and the Bonn Guidelines and developed specific tools to help users and providers to comply with the ABS-provisions of the CBD. Switzerland applies the Multilateral System for benefit-sharing of the International Treaty on Plant Genetic Resources for Food and Agriculture for

185 OECD Environmental performance revies: Switzerland, p. 109

plant genetic resources located in its national genebanks (sections 1.2.4, 2.3.1, 2.3.7, 2.3.8). Moreover, the Swiss Patent Act requires the disclosure of the source of the genetic resources and traditional knowledge in patent applications. The majority of restrictions on access to genetic resources imposed by the Swiss legislation are motivated by concern for nature conservation but there is no PIC procedure according to the provisions of Article 15 of the CBD. (section 2.3.8).

Switzerland considers that the adoption of an international regime on access and benefit-sharing will further clarify the baseline for goal 10 and facilitate activities for its achievement. Never the less, Switzerland considers that Goal 10 will be partly met by 2010.

Goal 11: Parties have improved financial, human, scientific, technical and technological capacity to implement the Convention

Switzerland's cooperation policy addresses sustainable development as a main issue, with the conservation and sustainable use of biodiversity being addressed within sectoral and/or thematic strategies and programmes. Financial resources (Table 20) and technologies are transferred at various levels (section 3.9), including to international institutions and organisations, regional initiatives, as well as bilateral programmes and projects.

Switzerland has made significant progress towards Goal 11, however, further efforts will be needed to mainstream biodiversity within all sectors of international cooperation.

Goal 11 will be partly met by 2010

4.2 Progress towards the goals and objectives of the strategic plan of the CBD

Goal 1: The Convention is fulfilling its leadership role in international biodiversity issues.	
1.1 The Convention is setting the global biodiversity agenda.	Switzerland promotes the implementation of the Convention at an international and regional level. Special effort is made to secure mutual supportiveness of the various instruments and processes targeting the conservation and sustainable use of biodiversity.
1.2 The Convention is promoting cooperation between all relevant international instruments and processes to enhance policy coherence.	
1.3 Other international processes are actively supporting implementation of the Convention, in a manner consistent with their respective frameworks.	
1.4 The Cartagena Protocol on Biosafety is widely implemented.	Switzerland implements the Cartagena Protocol.
1.5 Biodiversity concerns are being integrated into relevant sectoral or cross-sectoral plans, programmes and policies at the regional and global levels.	Switzerland supports the mainstreaming of biodiversity through its regional and global activities.
1.6 Parties are collaborating at the regional and subregional levels to implement the Convention.	Switzerland is committed to the regional and subregional implementation of the Convention, e.g. through its engagement for the Berne Convention, the Pan-European Biological and Landscape Diversity Strategy, the project Streamlining European 2010 Biodiversity Indicators (SEBI) and many others.
Goal 2: Parties have improved financial, human, scientific, technical, and technological capacity to implement the Convention.	
2.1 All parties have adequate capacity for implementation of priority actions in national biodiversity strategy and action plans.	Switzerland has adequate capacity for implementation of national priority actions and supports capacity building in partner countries through its technical cooperation.
2.2 Developing country parties, in particular the least developed and the small island developing States amongst them, and other parties with economies in transition, have sufficient resources available to implement the three objectives of the Convention.	Switzerland provides support to partner countries at various levels, including international organisation and institutions, as well as regional and bilateral programmes and projects. Federal spending on global concerns is listed in Table 20.

2.3 Developing country parties, in particular the least developed and the small island developing States amongst them, and other parties with economies in transition, have increased resources and technology transfer available to implement the Cartagena Protocol on Biosafety.	Switzerland provides support to partner countries at various levels, including international organisation and institutions, as well as regional and bilateral programmes and projects.
2.4 All parties have adequate capacity to implement the Cartagena Protocol on Biosafety.	Switzerland has adequate capacity to implement the Cartagena Protocol on Biosafety.
2.5 Technical and scientific cooperation is making a significant contribution to building capacity.	Technical and scientific cooperation is well developed and makes a significant contribution to building capacity.
Goal 3: National biodiversity strategies and action plans and the integration of biodiversity concerns into relevant sectors serve as an effective framework for the implementation of the objectives of the Convention.	
3.1 Every party has effective national strategies, plans and programmes in place to provide a national framework for implementing the three objectives of the Convention and to set clear national priorities.	Switzerland developed the Swiss Landscape Concept (1997) in view of fulfilling Switzerland's international obligations under the United Nations Convention on Biological Diversity (CBD). Further instruments and tools were put in place in order to address and implement the provisions of the Convention, including a comprehensive legal framework, cross-sectoral and sectoral strategic and programmatic baselines, a Biodiversity Monitoring Programme as well as a new instrument for financial equalisation and division of tasks between the Confederation and the cantons Currently an additional overarching National Biodiversity Strategy is elaborated.
3.2 Every party to the Cartagena Protocol on Biosafety has a regulatory framework in place and functioning to implement the Protocol.	Switzerland has a regulatory framework in place to implement the protocol.
3.3 Biodiversity concerns are being integrated into relevant national sectoral and cross-sectoral plans, programmes and policies.	Biodiversity concerns are integrated into relevant sectoral and cross-sectoral policies. The new national biodiversity strategy will further improve the mainstreaming of biodiversity in Switzerland's plans, programmes and policies.

3.4 The priorities in national biodiversity strategies and action plans are being actively implemented, as a means to achieve national implementation of the Convention, and as a significant contribution towards the global biodiversity agenda.	Switzerland implements the Convention and contributes towards the global biodiversity agenda through its existing framework depicted in sections 2 and 3.
Goal 4: There is a better understanding of the importance of biodiversity and of the Convention, and this has led to broader engagement across society in implementation.	
4.1 All parties are implementing a communication, education, and public awareness strategy and promoting public participation in support of the Convention.	Switzerland supports CEPA in implementing activities in support of the Convention. However, a distinct CEPA strategy has so far not been elaborated. CEPA will be further addressed by the new national biodiversity strategy.
4.2 Every party to the Cartagena Protocol on Biosafety is promoting and facilitating public awareness, education and participation in support of the Protocol.	Biosafety is an issue of ongoing public discussion and debate. There are several governmental Internet sites providing information on all aspects of biosafety. This information is supplemented by sites from NGOs, the scientific community as well as the private sector.
4.3 Indigenous and local communities are effectively involved in implementation and in the processes of the Convention, at national, regional and international levels.	Switzerland has no indigenous communities as defined by the CBD. Local communities are effectively involved (2.1.1).
4.4 Key actors and stakeholders, including the private sector, are engaged in partnership to implement the Convention and are integrating biodiversity concerns into their relevant sectoral and cross-sectoral plans, programmes and policies.	Key actors and stakeholders such as NGOs, the private sector and the broader public are engaged in activities contributing to the implementation of the Convention and have integrated biodiversity concerns into their respective plans, programmes and policies. However, the awareness of the role of the Convention in setting the global agenda needs to be strengthened, especially at the local level.

4.3 Conclusions

Despite significant efforts at all levels, Switzerland will not meet the biodiversity targets in their entirety as adopted by the Convention.

One of the main obstacles encountered in the conservation and sustainable use of biodiversity is the fact that the concept of biodiversity with its enormous impact on all ecosystem functions provides the very basis for our existence, is not anchored within the broader public.

A further hurdle is the widespread view that sufficient efforts are already being undertaken to conserve biodiversity in Switzerland. This view may have its roots in the fact that Switzerland's policy framework is very highly developed and its weaknesses are not recognised because biodiversity loss in Switzerland is a creeping, but ongoing, process, which is hardly noticed.

The Convention plays an important role in raising awareness of biodiversity, especially regarding the determined efforts to mainstream biodiversity concerns not only at the international and regional level, but also at the national level. In recent years, new national instruments were developed, including a system of parks of national importance, the financial equalisation and division of tasks between the Confederation and the cantons, and, most recently, the national biodiversity strategy that is being drawn up. However, all these instruments will need time to have an effect on biodiversity.

Based on experience and an assessment of the threats to biodiversity in Switzerland, priority fields of concern can be identified, including:

- Raising awareness of the role of biodiversity for our existence;
- Accounting for ecosystem services within the policy framework;
- Strengthening the mainstreaming of biodiversity, especially in the private sector;
- Securing adequate and good quality space for biodiversity;
- Strengthening the commitment for international biodiversity conservation, sustainable use of its component and the sharing of benefits arising out the utilization of genetic resources among all relevant national stake-holders.

5 APPENDIX I - INFORMATION CONCERNING REPORTING PARTY AND THE PREPARATION OF THE NATIONAL REPORT

Reporting Party

Contracting Party	Switzerland
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SUBMISSION	
Signature of officer responsible for submitting national report	
Date of submission	10th of August 2010

This report was prepared by the Federal Office for the Environment (FOEN) in cooperation with the other Government Departments concerned at federal level and with representatives of the scientific community.

6 APPENDIX II - FURTHER INFORMATION

6.1 Endemic animal species of Switzerland

Phylum	Family	Species	Country
MOLLUSCA	Chondrinidae	*Chondrina generosensis*	CH/I
	Clausiliidae	*Charpentiera dyodon*	CH
	Helicidae	*Trichia biconica*	CH
	Hydrobiidae	*Bythiospeum alpinum*	CH
	Hygromiidae	*Trichia caelata*	CH
	Milacidae	*Tandonia nigra*	CH/I
DIPLOPODA	Glomeridae	*Haploglomeris montivaga*	CH
	Julidae	*Ophyiulus solitarius*	CH
		Ophyiulus rubrodorsalis	CH/I
		Leptoiulus faesi	CH
		Leptoiulus sarasini	CH
		Cylindroiulus generosensis	CH/I
	Craspedosomatidae	*Helvetiosoma helveticum*	CH
		Helvetiosoma blanci	CH
		Helvetiosoma montemorensis	CH
		Oroposoma granitivagum	CH/I
		Oroposoma ticinense	CH
	?	*Niphatrogleuma wildbergeri*	CH
	Polydesmidae	*Polydesmus rothi*	CH
ARANAE	Linyphiidae	*Metopobactrus nadigi*	CH
		Metopobactrus schenckeli	CH
		Trichoncus helveticus	CH
	Theridiidae	*Enoplognatha jacksoni*	CH
	Gnaphosidae	*Gnaphosa rhenana*	CH
	Zoridae	*Zora nigrimana*	CH
ORTHOPTERA	Acrididae	*Chrysochraon keisti*	CH
LEPIDOPTERA	Elachistidae	*Perittia weberella*	CH
	Geometridae	*Glacies wehrlii*	CH
	Psychidae	*Dahlica goppensteinensis*	CH
		Dahlica simplonica	CH/ I?
		Dahlica vaudella	CH
		Dahlica wherlii	CH/ I?
		Brevantennia siederi	CH/I
		Rebelia ferruginans	CH
	Tortricidae	*Eana freii*	CH
		Eana incognitana	CH
		Pammene engadinensis	CH
	Yponomeutidae	*Kessleria helvetica*	CH
		Argyresthia huguenini	CH
		Argyresthia marmorata	CH
LEPIDOPTERA RHOPALOCERA	Nymphalidae	*Erebia christi*	CH/I
COLEOPTERA	Carabidae	*Boldoriella tedeschii*	CH/I
		Duvallius longhii	CH/I
		Nebria crenatostiata	CH/I
		Trechus laevipes	CH/I
		Trechus piazzolii	CH/I
		Trechus pochoni	CH
		Trechus tenuilimbatus	CH
		Trichaphaenops sollaudi	CH
DIPTERA	Tipulidae	*Tipula tulipa*	CH
		Nephrotoma helvetica	CH
Number of endemic animal species			**51**

Source: FOEN 2008

6.2 Overview of the Red Lists of endangered species of Switzerland

Status April 2009, footnotes see next page

Threatened species of Switzerland	Extinct, regionally extinct		Critically endangered, endangered, vulnerable		Near Threatened		Least concern		Red List - species [1]		Number of species evaluated [2]		Number of known species [3]	Data deficient species
Categories of threat	Ex, RE		CR, EN, VU		NT		LC		Ex, RE+ CR + EN + VU					DD
Animals [5]	131	5%	949	35%	333	12%	1 311	48%	1 080	40%	2 724		2 729	5
Mammals	3	4%	27	33%	15	18%	37	45%	30	37%	82		82	0
Mammals (excl. bats)	2	4%	15	27%	4	7%	35	63%	17	30%	56		56	0
Bats	1	4%	12	46%	11	42%	2	8%	13	50%	26		26	0
Breeding birds	6	3%	71	36%	24	12%	94	48%	77	39%	195		195	0
Reptiles	0	0%	15	79%	0	0%	4	21%	15	79%	19		19	0
Amphibians	1	6%	13	72%	1	6%	3	17%	14	78%	18		20	2
Fish and Cyclostomes [6]	8	15%	24	44%	9	16%	14	25%	32	58%	55		55	0
Molluscs	3	1%	87	32%	50	19%	130	48%	90	33%	270		270	0
Gastropods	2	1%	79	32%	42	17%	121	50%	81	33%	244		244	0
Bivalves	1	4%	8	31%	8	31%	9	35%	9	35%	26		26	0
Crustaceans	0	0	3	1	0	0	0	0	3	100%	3		3	0
Decapods [6]	0	0%	3	100%	0	0%	0	0%	3	100%	3		3	0
Insects	110	5%	709	34%	234	11%	1 029	49%	819	39%	2 082		2 085	3
Bees	67	12%	192	33%	37	6%	279	49%	259	45%	575		575	?
Ants	3	2%	43	33%	17	13%	69	52%	46	35%	132		132	?
Papilionidae	0	0%	100	52%	13	7%	79	41%	100	52%	192		192	0
Crane flies	2	1%	44	29%	21	14%	84	56%	46	30%	151		151	?
Ground beetle, Tiger beetle	32	6%	116	23%	72	14%	285	56%	148	29%	505		505	0
Hydrophilidae	0	0%	97	63%	12	8%	46	30%	97	63%	155		155	0
Neuroptera	0	0%	21	18%	10	9%	85	73%	21	18%	116		116	?
Locusts	3	3%	37	36%	19	19%	43	42%	40	39%	102		105	3
Dragon flies	2	3%	24	33%	12	17%	34	47%	26	36%	72		72	0
Mayfly	1	1%	35	43%	21	26%	25	30%	36	44%	82		82	?
Ferns and Flowering Plants [7]	51	2%	939	32%	429	15%	1 534	52%	990	34%	2 953		3 144	191
Ferns [7]	5	7%	22	31%	7	10%	38	53%	27	38%	72		148	76
Flowering Plants	46	2%	917	32%	422	15%	1 496	52%	963	33%	2 881		2 881	0
Bryophytes [7]	15	2%	401	40%	67	7%	512	51%	416	42%	995		1 093	98
Marchantiophyta	3	1%	117	46%	15	6%	117	46%	120	48%	252		259	7
Bryopsida	12	2%	283	38%	52	7%	394	53%	295	40%	741		832	91
Hornwort	0	0%	1	50%	0	0%	1	50%	1	50%	2		2	0
Lichen [7]	38	5%	257	36%	107	15%	311	44%	295	41%	713		1 700	987
Epiphytic Lichens	22	4%	208	40%	84	16%	200	39%	230	45%	514		521	7
Terricolous Liches	16	8%	49	25%	23	12%	111	56%	65	33%	199		1 179	980
Macrofungi [7]	1	0%	936	32%	143	5%	1 876	63%	937	32%	2 956		4 960	2 004

Fauna + Flora	236	2%	3 482	34%	1 079	10%	5 544	54%	3 718	36%	10 341	13 626	3 285

1) Red List statistic of evaluated, data sufficient taxa (species and sub-species); percentages rounded off

2) Total of all evaluated, data sufficient taxa

3) Total of all evaluated and non evaluated taxa that breed in Switzerland (incl. DD and NE)

4) Total of all non-evaluated species (NE), like native synanthropic species, introduced alien invasive species or species lacking taxonomic validation

5) Animals 1994, Breeding Birds 2001, Dragon flies 2002, Amphibians und Reptiles 2005, Locusts and Fish 2007

6) Species of fish, Cyclostomes and Decapods 2007

7) Flowering Plants 2002, Lichen 2002, Bryophytes 2004, Macrofungi 2008

6.3 Summary of environmental objectives in the agriculture sector

	General environmental objectives	Agriculture-related environmental objectives
Biodiversity and landscape		
Biodiversity	Conservation and development of native species and their habitats	Agriculture contributes substantially to the conservation and promotion of biodiversity. There are three aspects to biological diversity: 1. species and habitat diversity, 2. genetic diversity within species, and 3. functional biodiversity. (1) Agriculture safeguards and promotes those native species and habitat types in their natural range that occur mainly on land used for agricultural purposes or depend on agricultural use. Efforts are made to conserve and foster populations of target species. Efforts are made to conserve and foster populations of character species by making suitable habitats available with sufficient surface area and of the required quality and spatial distribution. (2) Agriculture conserves and fosters the genetic diversity of native wild species found mainly on land used for agricultural purposes. It also makes a substantial contribution to the conservation and sustainable use of native crop varieties and native farm animal breeds. (3) Agricultural production maintains the ecosystem services provided by biodiversity.
Landscape	Conservation, promotion, further development and protection from urban sprawl of the variety of natural and cultural landscapes with their specific regional characteristics and their importance for biodiversity, recreation, identity, tourism and location attractiveness.	Conservation, promotion and further development of the variety of cultural landscapes with their specific regional characteristics and importance for biodiversity, recreation, identity, tourism and location attractiveness, by means of (1) the prevention, through appropriate management, of encroachment, (2) a diversity of sustainably used and accessible agricultural landscapes, (3) the conservation, promotion and further development of region-specific, characteristic, natural, near-natural and human-built elements.
Space for watercourses	Sufficient space for watercourses on the basis of the “Guiding Principles for Swiss Watercourses” with banks appropriate to the watercourse in accordance with the Modular Stepwise Procedure.	Sufficient space for watercourses in agricultural areas on the basis of the “Guiding Principles for Swiss Watercourses” with banks appropriate to the watercourse in accordance with the Modular Stepwise Procedure.

Climate and air		
Greenhouse gases	Stabilisation of the concentration of greenhouse gases in the atmosphere at a level that will prevent dangerous disturbance of the climate system.	Reduction of carbon dioxide, methane and nitrous oxide emissions from agricultural activities.
Nitrogenous air pollutants (ammonia, nitrogen oxides)	(1) Precautionary limitation of emissions to the extent that this is technically and operationally possible and economically viable. (2) No excessive ambient pollution, i.e. no exceedance of load limits such as ambient air quality limit values, critical loads, critical levels and air quality guidelines. Stricter emission limits to be imposed if, despite precautionary emission control, excessive ambient pollution occurs.	Ammonia emissions from agriculture amount to a maximum 25 000 tonnes of nitrogen per annum.
Diesel soot particles	Reduction of total diesel soot particle emissions in Switzerland to 100 tonnes per annum.	Agricultural diesel soot particle emissions amount to a maximum of 20 tonnes per annum.
Water		
Nitrate	(1) Maximum 25 mg of nitrate per litre in waters that serve as a source of potable water or whose use as such is intended. (2) Reduction of nitrogen input to waters by 50 % from the 1985 baseline.	(1) Maximum 25 mg nitrate per litre in waters that serve as a source of potable water, or whose use as such is intended, in cases where the inflow is mainly from agricultural land. (2) Reduction of nitrogen input of agricultural origin to waters by 50 % from the 1985 baseline.
Phosphorus	The oxygen (O_2) content of lakes must not be less than 4 mg per litre at any time and at any depth. It must be sufficient to allow less sensitive organisms to occupy the bottom of the lake all year round and in the most natural possible density (unless there are exceptional conditions of natural origin).	The total phosphorus content of lakes, in cases where the input is mainly of agricultural origin, is less than 20 µg P per litre (unless there are exceptional conditions of natural origin).
Plant protection products	(1) No impairment of human health or the environment from plant protection products. (2) Maximum 0.1 µg of organic plant protection products and relevant metabolites per litre and per substance in surface waters as well as in groundwater that serves as a source of potable water or whose use as such is intended. Other values, based on the assessment of individual substances during the authorisation procedure, remain reserved. (3) Reduction to the greatest possible extent of the risk to the environment from plant protection products, taking the local natural circumstances into account.	(1) No impairment of human health or the environment from the agricultural use of plant protection products. (2) Where the input of plant protection products is mainly of agricultural origin: Maximum 0.1 µg of organic plant protection products and relevant metabolites per litre and per substance in surface waters as well as in groundwater that serves as a source of potable water or whose use as such is intended. Other values, based on the assessment of individual substances during the authorisation procedure, remain reserved. (3) Reduction to the greatest possible extent of the risk to the environment from plant protection products used for agricultural purposes, taking the local natural

		circumstances into account.
Medicinal products	No impairment of human health or the environment from medicinal products.	No impairment of human health or the environment from veterinary medicinal products whose input is mainly from agriculture.
Soil		
Pollutants in soil	No impairment of soil fertility and health by inorganic or organic pollutants.	(1) No impairment of soil fertility and health by inorganic or organic pollutants of agricultural origin. (2) The rate of input to the soil of individual pollutants of agricultural origin is less than the rate of their removal by plants and degradation in the soil.
Soil erosion	(1) No impairment of soil fertility by erosion. (2) No impairment of waters and near-natural habitats by washed-out soil.	(1) Zero exceedance of reference values for erosion, and prevention of erosion due to concentrated runoff from arable land. (2) No impairment of soil fertility by erosion of land used for agricultural purposes. (3) No impairment of waters and near-natural habitats by soil washed out from land used for agricultural purposes.
Soil compaction	No impairment of soil fertility by soil compaction.	Avoidance of lasting compaction of land used for agricultural purposes.

7 APPENDIX III - PROGRESS TOWARDS TARGETS OF THE GLOBAL STRATEGY FOR PLANT CONSERVATION

Section 2.1 provides an overview on the principles of federalism in the implementation of legislation and activities for the conservation and sustainable use of biological and landscape diversity in Switzerland. As mentioned above, there are activities on all levels of the federal state and, furthermore, by partners from non government organisations, the private sector and the scientific community.

The information given in this section is weighted towards the federal perspective and does not reflect the measures and activities implemented at cantonal and municipal level.

Target 1: A widely accessible working list of known plant species, as a step towards a complete world flora

The working list of Switzerland's known vascular plant species is maintained by the "Centre du Réseau Suisse de Floristique (CRSF)[186]" and accessible on the Internet.

The main goal of the CRSF is to compile information on the distribution of vascular plants of Switzerland in a national data bank and to make available these data to public and private institutions working in the various fields of nature conservation. Further, the CRSF provides a wide spectrum of information about the flora of Switzerland, including distribution maps, the Red List of flowering plants and ferns, photographs and other information.

Target 2: A preliminary assessment of the conservation status of all known plant species, at national, regional and international levels

The Red List of threatened ferns and flowering plants of Switzerland 2002 lists all indigenous and neophyte species in Switzerland, together with their category of threat according to the IUCN criteria[187].

Of the 3144 evaluated taxa, 990 (31.5 %) are on the Red List (categories EX, RE, CR, EN and VU). An additional 429 (13.6 %) species are listed as Nearly Threatened (NT). 1534 taxa (48.8 %) are considered as not threatened (LC); for another 191 (6.1 %) no data for a precise classification is available (DD). Fifty species out of 990 on the Red List are extinct in Switzerland (RE), 180 are considered as Critically Endangered (CR), 321 as Endangered (EN) and 438 as Vulnerable (VU). Red List species are found in all regions and habitats of Switzerland, but percentages are much higher in the Central Plateau Equally, higher percentages are found for wetland plants and species growing

186 CRSF, Centre du Réseau Suisse de Floristique, www.crsf.ch, status March 2010.

187 Moser D, Gygax A, Bäumler B, Wyler N, Palese R 2002: Liste Rouge des fougères et plantes à fleurs menacées de Suisse. Ed. Office fédéral de l'environnement, des forêts et du paysage, Berne; Centre du Réseau Suisse de Floristique, Chambésy; Conservatoire et Jardin botaniques de la Ville de Genève, Chambésy. Série OFEFP L'environnement pratique. 118 pp.

in meadows on poor and dry (or seasonally dry) soil. Plants growing in alpine habitats and woodland are generally much less threatened.

Target 3: Development of models with protocols for plant conservation and sustainable use, based on research and practical experience

Data sheets were drawn up for the conservation of 142 priority species of flowering plants and ferns, 11 protected moss species as well as 9 rare tree species with the goal to provide conservationists with basic information for activities in the field. For this purpose, the sheets include a detailed description of the species, information on their ecology, phytosociology and the conservation status. Furthermore, they include a distribution map, specify the threats, and propose practical conservation measures. The data sheets are available online:

- Swiss Commission for Wild Plant Conservation CPS/SKEW (flowering plants and ferns)[188];
- National Inventory of Moss Species[189];
- Project for the promotion of rare tree species[190].

Target 4: At least 10 per cent of each of the world's ecological regions effectively conserved

Protected areas established for the purpose of biodiversity conservation (i.e. the National Park and Biotopes of national importance) are limited to 2.19 % of the territory with additional 4 % devoted to the conservation of selected animal groups (i.e. reserves for waterbirds and migrants as well as the federal hunting reserves). Additional protected areas are created at cantonal and communal level. Many protected areas are too small for an effective conservation of biodiversity. In order to meet target 4, additional efforts and resources are needed for the protection of areas of particular importance for biodiversity as well as for translating the vision of the national ecological network into reality. An overview of Switzerland's biodiversity protected areas is given in Table 21.

188 CPS/SKEW, Swiss Commission for Wild Plant Conservation (flowering plants and ferns), www.cps-skew.ch; > Plant conservation > data sheets, status March 2010, languages: de, fr.
189 NISM, National Inventory of Moss Species, www.nism.uzh.ch; >Naturschutz > Merkblätter Artenschutz Moose, status March 2010, languages: de.
190 SEBA, Project for the promotion of rare tree species, www.seba.ethz.ch; > Dossier, status March 2010, languages: de, fr, it.

Table 21: Biodiversity protected areas based on federal edicts.

Biodiversity conservation areas [a]	Surface/ha	% of country's' area [b]	Number
National Park & Biotopes of national importance			
Swiss National Park	17'033	0.41 %	1
Federal Inventory of Raised Bogs and Transitional Mires	1'524	0.04 %	545
Federal Inventory of Fenlands	19'218	0.46 %	1'170
Federal Inventory of Alluvial Zones	22'639	0.54 %	283
Federal Inventory of Amphibian Spawning Areas	13’886	0.34 %	828
Federal Inventory of Dry Grasslands and pastures	21'398	0.52 %	2934
Reserves for Water- and Migratory Birds & Hunting Reserves			
Federal Inventory of Reserves for Waterbirds and Migratory Birds	22'164	0.54 %	36
Federal Hunting Reserves (i.e. no hunting areas)	150’920	3.63 %	41
Total biodiversity conservation areas (net without overlaps):	*256'891*	*6.19 %*	*5838*

a) Additional protected areas are created at cantonal and communal level based on programmes for biotopes of regional and local importance as well as through the establishment of forest reserves.

b) Protected areas may overlap so that cumulated surfaces may appear wider than the effective surface (net surface).

Source: Federal Office for the Environment, Species Management Division (2010).

Target 5: Protection of 50 per cent of the most important areas for plant diversity assured

Switzerland has so far not specifically identified important plant areas. It is probable that many of them lie in existing protected areas (see target 4).

Target 6: At least 30 per cent of production lands managed consistent with the conservation of plant diversity

The total agricultural area in use in Switzerland is 10 652 km^2 (2006) and covers 25.7 % of the national territory. Of this, 11.1 % is managed organically and a further 11.25 % is designated as ecological compensation areas.

Mountain pastures are of particular importance for plant diversity. These pastures (5 400 km^2) are not included in the total agricultural area mentioned above.

Further, Switzerland's forestry is committed to sustainable forest management, with about 70 % of the forest area certified according to the Forest Stewardship Council (FSC, 650 000 ha), the Q-Label Swiss Quality/Agro Marketing Suisse, the Programme for the Endorsement of Forest Certification Schemes (PEFC, 360 000 ha) or with a combination of schemes.

Target 7: 60 per cent of the world's threatened species conserved in situ

Species conservation measures prioritize species facing global extinction, since they — unlike species threatened at a national level — will be gone forever once they have disappeared from the face of the Earth. Currently, at least 30 mosses and vascular plants redlisted by the IUCN as "threatened" or "vulnerable" occur in Switzerland, a number that has remained constant for the past 15 years.

Tulipa aximensis, a tulip species already classified as extinct by the IUCN, has survived to this day in the central part of the canton of Wallis, where precious few specimens discovered in 1997/98 now make up the world's last known population. The moss species *Distichophyllum carinatum* is found in only six localities worldwide, of which the one in Switzerland was reported to be extinguished, until the species was rediscovered there on occasion of a BDM-commissioned search in 2005.

Another tulip species, *Tulipa didieri*, the forget-me-not species *Myosotis rehsteineri*, are the most critically endangered plant species worldwide occurring in Switzerland. Their populations are all very small and at great risk.

Target 8: 60 per cent of threatened plant species in accessible ex situ *collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes*

Each botanical garden publishes its "index seminum" in which accessible collections are listed and made available to other gardens. However, an overview of existing live collections in Switzerland does not exist.

Target 9: 70 per cent of the genetic diversity of crops and other major socio-economically valuable plant species conserved, and associated indigenous and local knowledge maintained

The National Action Plan specifies the implementation of FAO's Global Plan of Action on Plant Genetic Resources for Food and Agriculture (GPA) in Switzerland.

In a pilot phase (1999–2002) necessary national structures were established in close cooperation with the Swiss Commission for Cultivated Plant Conservation (CPC). During this phase, activities were focused on inventories of crops, regeneration of gene banks, setting-up of initial conservation programmes as well as on the establishment of methodological baselines.

The second phase of the NPA-PGRFA (2003–2006) targeted the achievement of an equal working level for all crops, especially regarding the inventory, conservation and documentation.

For the current, third phase (2007–2010) priorities are set as follows: identification of as yet unknown material, the completion of the final national inventories, a systematic description of the stored material and the continuation of the data transfer onto the national database[191].

Target 10: Management plans in place for at least 100 major alien species that threaten plants, plant communities and associated habitats and ecosystems

Activities for the eradication or mitigation of invasive plant species are conducted at the cantonal level predominantly. There are no national management plans in place for invasive species yet. In order to support stakeholders at all levels, FOEN has assigned the Swiss Commission for Wild Plant Conservation CPS/SKEW to develop a series of information sheets covering species listed on the Black List and priority species of the Watch List (see section 2.3.5). The information sheets include a habitat description, the current spread, the threats for native species, measures to prevent and/or combat establishment of a species, as well as further links to technical literature. The information sheets are available online:

- Swiss Commission for Wild Plant Conservation[192].

Target 11: No species of wild flora endangered by international trade

Switzerland harbours 76 species of wild plants included in CITES appendixes (73 species of *Orchidaceae*[193], 3 species of *Cyclamen* and *Adonis vernalis*). None of these species are endangered by international trade.

Target 12: 30 per cent of plant-based products derived from sources that are sustainably managed

The total area of agricultural land managed organically increased from 5 % in 1996 to 11.1 % in 2006.

Further, 70 % of Switzerland's forest area is certificated according to the Forest Stewardship Council (FSC), the Q-Label Swiss Quality/Agro Marketing Suisse or the Programme for the Endorsement of Forest Certification Schemes (PEFC) or a combination of the schemes.

191 Schierscher-Viret B, Klejer G 2007: Etat des ressources phytogénétiques en Suisse. Revue suisse Agric.39/2007.
192 CPS/SKEW, Swiss Commission for Wild Plant Conservation, www.cps-skew.ch; > invasive alien plants > Info sheets, status March 2010, languages: de, fr.
193 Wartmann BA 2008: Die Orchideen der Schweiz - Ein Feldführer. 2., überarbeitete Auflage. Haupt Verlag, Bern. 246 Seiten.

Target 13: The decline of plant resources, and associated indigenous and local knowledge innovations and practices that support sustainable livelihoods, local food security and health care, halted

Not applicable.

Target 14: The importance of plant diversity and the need for its conservation incorporated into communication, education and public awareness programmes

Activities are conducted at the cantonal and municipal level as well as by many NGO's.

Target 15: The number of trained people working with appropriate facilities in plant conservation increased, according to national needs, to achieve the targets of this Strategy

Plant ecology is part of the curricula of Switzerland's universities and the two Swiss Federal Institutes of Technology.

The Swiss Commission for Wild Plant Conservation CPS/SKEW was founded in 1991 with the aim of promoting the conservation of Swiss flora. The CPS/SKEW is a scientific commission of the Swiss Botanical Society.

The major shortcoming in plant conservation is the creeping loss of knowledge in plant systematics and systematics in general due to the suppression of many professorships. In order to counteract this development, the Swiss Systematic Society (SSS) was founded in 2005. The SSS is a scientific society open to both professionals and amateurs. The basic objective of the SSS is to make sure that expertise in systematics is guaranteed in the long term in Switzerland. More generally, the SSS wants to be an authoritative voice in discussions of systematic-related questions in this country.

Target 16: Networks for plant conservation activities established or strengthened at national, regional and international levels

There is a vast network of societies and associations for plant conservation (*in-situ* and *ex-situ*) encompassing local groups, botanical gardens, scientific organisations, national data centres, NGOs and international organisations. The main hubs of the network include:

- Swiss botanical gardens: In addition to their scientific work, botanical gardens conduct many activities for awareness raising. They are members of either the association of German-speaking botanical gardens or the botanical gardens of France and French-speaking countries, and have committed themselves to act according to the Code of Conduct of the International Plant Exchange Network (IPEN).
- Hortus Botanicus Helveticus (HBH; http://hortus-botanicus.info; fr,de): The association, created in 1996, unites 31 Swiss botanical gardens and collections. The goals of the HBH include, among others, the

conservation and development of plant collections, the implementation of activities of public interest and the maintenance and development of technical capacities and knowledge of the various institutions.

- Swiss Commission for Wild Plant Conservation CPS/SKEW[194]: The CPS/SKEW is a scientific commission of the Swiss Botanical Society which targets the conservation of the highly diverse Swiss flora.
- Swiss Commission for Cultivated Plant Conservation CPC[195]: The CPC promotes conservation of genetic diversity of cultivated plants and is responsible for the national database for the conservation and sustainable use of plant genetic resources for food and agriculture[196].
- Centre du Réseau Suisse de Floristique CRSF[197]: see target 1.

194 CPS/SKEW, Swiss Commission for Wild Plant Conservation, www.cps-skew.ch, status March 2010, languages: en, fr, de, it.
195 CPC, Swiss Commission for Cultivated Plant Conservation, www.cpc-skek.ch, status March 2010, languages: en, fr, de, it.
196 BDN, www.bdn.ch, status March 2010.
197 CRSF, Centre du Réseau Suisse de Floristique, www.crsf.ch, status March 2010, languages: en, fr, de, it.

8 APPENDIX IV - INDICATORS ACCORDING TO THE FOCAL AREAS OF THE 2010 TARGET FRAMEWORK

To assess and communicate progress towards the 2010 targets a number of indicators for all except one of the seven focal areas according to the CBD decision VII/30, annex II are available in Switzerland. The indicators have been defined and developed within the framework of the following programmes:

- BDM: Biodiversity Monitoring Switzerland of the Federal Office for the Environment[198];
- MONET: Monitoring of Sustainable Development by the Federal Statistical Office[199];
- AEM: Agro-Environmental Monitoring by the Federal Office for Agriculture[200].

On the website of the **Swiss Clearing House Mechanisms**[201] the indicators relevant to the CBD are assigned to the different focal areas as listed in the following. *Indicators used in this 4th National Report are in italics*.

Focal Area 1: Protect the components of biodiversity

- BDM-E2: Size of Areas of Defined Use
  Change in the heterogeneity of the countryside per square kilometre.
- *BDM-E3: Size of Wilderness Areas*
  Change in the total number of wilderness areas in Switzerland. The term wilderness areas is used to refer to areas on which humans have had no or almost no impact.
- BDM-E4: Length of Linear Landscape Features
  Change in the length of rivers, streams, hedgerows and woodland perimeters per square kilometre.
- *BDM-E10: Deadwood*
  Changes in the amounts of deadwood found in various forest types in Switzerland as a whole and in individual regions.
- *BDM-M1: Size of Protected Areas*
  Change in size of nature conservation areas protected by act.
- *BDM-M2: Size of Secure Protected Areas*
  Change in size of areas of national importance, which are protected at cantonal level and where relevant protection measures are enforced.
- BDM-M3: Endangered Species Living in Protected Areas

198 BDM, Biodiversity Monitoring Switzerland of the Federal Office for the Environment, http://www.biodiversitymonitoring.ch, status March 2010.
199 MONET, Monitoring of Sustainable Development by the Federal Statistical Office http://www.bfs.admin.ch/bfs/portal/en/index/themen/21/02/01.html, status March 2010.
200 AEM, Agro-Environmental Monitoring by the Federal Office for Agriculture, http://www.blw.admin.ch/themen/00010/00070/index.html?lang=fr, status March 2010.
201 Swiss Clearing House Mechanisms, www.ch-chm.ch > National Implementation of Cross-Cutting Issues > 2010 targets, status March 2010.

Change in the total number of species with more than 60 % of their habitat located in protected areas as a proportion of the total number of endangered species in Switzerland.

- *BDM-Z1: Number of Livestock Breeds and Plant Varieties*
  Change in the number of all domesticated livestock breeds and agricultural plant varieties recognised in Switzerland.
- *BDM-Z2: Proportion of Livestock Breeds and Plant Varieties*
  Change in the proportion of livestock breeds and plant varieties within the total population/total production of the breed/variety in Switzerland.
- *BDM-Z3: Species Diversity at National and Regional Level*
  Change in the total number of species of selected taxa living in the wild.
- BDM-Z4: Number of Species in Switzerland Facing Global Extinction
  Change in the total number of globally endangered species occurring in Switzerland.
- BDM-Z5: Change in the Endangerment Status of Species
  Number of species now less endangered in Switzerland minus number of species now in greater danger.
- BDM-Z6: Population Size of Endangered Species
  Change in population size of species endangered worldwide, in Europe or in Switzerland.
- *BDM-Z7: Species Diversity in Landscapes*
  Change in the mean species diversity of vascular plants, breeding birds, and butterflies per 1km^2 in the “normal” Swiss landscape.
- BDM-Z8: Population Size of Common Species
  Change in population sizes of common species in Switzerland.
- *BDM-Z9: Species Diversity in Habitats*
  Change in average species diversity of selected species within 10 m^2 areas in habitats of the following types: woodland, managed Alpine areas, meadowland, arable land, settlements and natural Alpine areas.
- *BDM-Z10: Size of Valuable Habitats (= BDM-E1)*
  Change in the size of valuable habitats protected by various federal inventories (alluvial zones, raised bogs, fenlands).
- BDM-Z11: Quality of Valuable Habitats
  Change in the mean quality of each of the valuable habitat types.
- BDM-Z12: Diversity of Species Community
  Change in the homogenisation of biocenoses; monitors the development of the diversity of species communities in Switzerland, their individual regions, and their various habitats.
- MONET: Ecological Quality of Forests
  Proportion of forest area with medium or high biotope value.
- *MONET: Forest Area*
  Proportion of forest area to the national territory.

- MONET: Breeding Bird Population
  Index of the population change of regular Swiss breeding birds (169 species) and their Red List species (38).
- *MONET: Protected Areas of National Importance*
  Proportion of protected areas of national importance to the national territory.
- *MONET: Species Diversity (= BDM-Z7)*
- *MONET: Utilized Agricultural Area (in km^2)*

Focal Area 2: Promote sustainable use

- BDM-E7: Intensity of Agricultural Land Use
  Change in domestic agricultural production area in relation to the total area under production.
- BDM-E11: Volume of Water Extracted from Watercourses
  Extraction of water >20 % from watercourses under average low-water conditions.
- *BDM-Z3: Species Diversity at National and Regional Level → see Focal Area 1*
- BDM-Z4: Number of Species in Switzerland Facing Global Extinction
- → see Focal Area 1
- BDM-Z5: Change in the Endangerment Status of Species → see Focal Area 1
- BDM-Z6: Population Size of Endangered Species → see Focal Area 1
- *BDM-Z7: Species Diversity in Landscapes → see Focal Area 1*
- *BDM-Z9: Species Diversity in Habitats → see Focal Area 1*
- *BDM-M4: Ecological Compensation Areas (see also MONET and AEM)*
  Total size of areas that contribute to maintaining and promoting diversity of species and habitats whose utilisation is governed by agreements.
- *BDM-M5: Areas Farmed Organically (see also MONET)*
  Change in total area used by organic farms in Switzerland.
- BDM-M7: Financial Resources for Nature and Landscape Conservation
  Change in total funds devoted to nature and landscape conservation in the public sector, i.e. by central government, cantons and municipalities.
- *MONET: Consumption of Organic Products*
  Proportion of expenditure on organic food to total expenditure on food.
- *MONET: Organic Agriculture (see also BDM-M5)*

  Proportion of organically managed land to the total utilised agricultural area.
- MONET: Ecological Quality of Forests → see Focal Area 1
- MONET: Built up Area per Capita in m^2

- MONET: Built up Area in km^2
- *MONET: Forest Area → see Focal Area 1*
- MONET: Ecologisation of the Tax System
  Proportion of the income of environmental taxes to total taxes and social security contributions.
- MONET: Environmental Taxes
  Proportion of the income of federal, cantonal and municipal taxes, of which the tax object has verifiable negative environmental impacts, to the gross domestic product.
- MONET: Diversity of Land Use and Land Cover
  Mean number of transitions between types of land use of single ha per km^2.
- *MONET: Ecological Compensation Areas (see also BDM-M4 and AEM)*
  Proportion of ecological compensation areas to the total utilised agricultural area.
- *AEM: Ecological Compensation Areas and their Quality (see also BDM-M4 and MONET)*
- AEM: Land Cover

Focal Area 3: Address threats to biodiversity

- BDM-E5: Diversity of Land Use and Land Cover
  Change in the heterogeneity of the countryside per square kilometre.
- BDM-E6: Nutrient Supply in the Soil
  Changes in the mean values of nutrient indicators of plants in 10 m^2 grid squares.
- BDM-E7: Intensity of Agricultural Land Use
  Change in the intensity of use of Switzerland's agricultural land based on crop plant yields by area, and livestock numbers.
- *BDM-E8: Forest Area Dominated by Non-Indigenous Trees*
  Change in the proportion of woodland featuring non-indigenous tree species (exotics) or dominated by such species (over 60 % exotics).
- BDM-E9: Area of Artificially Regenerated Young Woodland
  Change in artificially regenerated woodland as a proportion of the total area of regenerated woodland (artificial and natural) in the territory in question.
- *BDM-E12: Proportion of Adversely Affected Watercourses*
  Change in the total number of watercourse sections with artificial embankments and engineered beds as a proportion of all watercourses.
- *BDM-E13: Water Quality of Watercourses and Captive Water*
  Change in the content of inorganic and organic substances and in the water temperature in Swiss watercourses and captive water.
- *BDM-E14: Proportion of Polluted Waterways*

Change in the proportion of waterways that are within the legal limits or do not exceed them by more than 50 %.

- *BDM- E15: Landscape Fragmentation*
  Changes in landscape fragmentation in Switzerland and the regions.
- *MONET: Nitrate Concentration in Groundwater*
- *MONET: Phosphorus Concentrations in Freshwater*
- MONET: Expenditure for Waste Water Disposal
  Federal, cantonal and municipal expenditures for waste water discharge and treatment.
- MONET: Concentration of Nitrogen Dioxide
- MONET: Concentration of Ozone
- MONET: Concentration of Fine Particulate Matter
- MONET: Emissions of NOx, NH2, NMVOCs
- MONET: Consumption of Fossil Fuels
  Gross consumption per capita in kilowatt-hour.
- *MONET: Emission of Greenhouse Gases in CO_2-equivalents*
- MONET: CO_2-Intensity of Economy
  CO_2 emissions compared to the gross domestic product in grams per Swiss franc
- *MONET: Heavy Metal Contamination of Soils*
  Proportion of sampling sites exceeding at least one of the legal guideline values for cadmium, copper or zinc.
- MONET: Ecological Quality of Forests → see Focal Area 1
- *MONET: Forest Area → see Focal Area 1*
- MONET: Settlement Area → see Focal Area 2
- MONET: Settlement Area per Capita → see Focal Area 2
- AEM: Nitrogen Balance of Agriculture
  N-input, N-output and N-balance according to the OECD.
- *AEM: Nitrate Concentration in Groundwater (= MONET, see also BDM-E13)*
- *AEM: Phosphorus Concentration in Soils and Surface Waters (see also MONET and BDM-E13)*
- AEM: Energy Consumption of Agriculture and Greenhouse Gas Emissions (see also MONET)
- *Energy Consumption in MJ/ha and greenhouse gas emissions resulting from Agriculture*
- AEM: Use of Pesticides in Tonnes per Agent

- *AEM: Groundwater Pollution by Pesticides and Veterinary Drugs*
- *AEM: Soil Quality*
  Contamination by heavy metals and other pollutants.

Focal Area 4: Maintain goods and services from biodiversity to support human well-being

- BDM-E5: Diversity of Land Use and Land Cover → see Focal Area 3
- *BDM-M4: Ecological Compensation Areas (see also MONET and AEM)→ see Focal Area 2*
- MONET: Ecological Quality of Forests → see Focal Area 1
- *AEM: Soil Quality → see Focal Area 3*

Focal Area 5: Protect traditional knowledge, innovations and practices

- *BDM-Z10: Size of Valuable Habitats (= BDM-E1) → see Focal Area 1*
- *BDM-M1: Size of Protected Areas → see Focal Area 1*

Focal Area 6: Ensure fair and equitable sharing of benefits arising out of the use of genetic resources

No indicators available.

Focal Area 7: Ensure provision of adequate resources

- BDM M6: Implementation of environmental regulations
  The indicator will show the degree to which regulations are implemented in Switzerland (not available yet).
- MONET: Total Official Development Assistance
  Official development assistance compared to the gross national income.
- MONET: Official Development Assistance to Least Developed Countries
  Percentage of the bilateral official development assistance that goes to least developed countries (as defined by the UN).
- MONET: Attitude towards Development Assistance
  Number of persons who want to increase the expenditures for official development assistance.

9 APPENDIX V: PROGRESS TOWARDS TARGETS OF THE PROGRAMME OF WORK ON PROTECTED AREAS

Section 2.1 provides an overview on the principles of federalism in the implementation of legislation and activities for the conservation and sustainable use of biological and landscape diversity in Switzerland. As mentioned above, there are activities on all levels of the federal state and furthermore, by partners from non government organisations, the private sector and the scientific community.

The information given in this section is weighted towards the federal perspective and does not reflect the measures and activities implemented at cantonal and municipal level.

Targets for 2008

1.5 Effective mechanisms for identifying and preventing, and/or mitigating the negative impacts of **key threats** to protected areas are in place.

Mechanisms for identifying key threats to biodiversity in general are in place, see the section on monitoring (section 2.3.9).

2.1 Mechanisms for the **equitable sharing of both costs and benefits** arising from the establishment and management of protected areas are established.

The sharing of costs for the establishment and management of protected areas is part of the new financial equalisation and division of tasks between the Confederation and the cantons (see section 2.5.2). Further, the contributions of the Confederation towards the establishment of parks of national importance are regulated in the Ordinance on Parks of National Importance (see sections 2.2 and 2.5).

2.2 **Participation of indigenous and local communities** is full and effective, in full respect of their rights and recognition of their responsibilities, consistent with national law and applicable international obligations, and the participation of relevant stakeholders, in the management of existing, and the establishment and management of new, protected areas.

Protected areas are established in collaboration with the relevant authorities and stakeholders at all relevant levels.

3.1 **Policies** as appropriate, including use of social and economic valuation and incentives, to provide a supportive enabling environment for more effective establishment and management of protected areas and protected areas systems are reviewed and revised as appropriate.

Incentives are provided through the new financial equalisation and division of tasks between the Confederation and the cantons (see section 2.5.2). Valuation of protected areas has not been conducted yet.

3.4 Sufficient **financial, technical and other resources** to meet the costs to effectively implement and manage national and regional systems of protected areas are secured, including both from national and international sources, particularly to support the needs of developing countries and countries with economies in transition and small island developing States.

The sharing of costs for the establishment and management of protected areas is part of the new financial equalisation and division of tasks between the Confederation and the cantons (see section 2.5.2). However, the financial and human resources are insufficient to manage the protected area system in Switzerland in an adequate way.

3.5 **Public awareness, understanding and appreciation** of the importance and benefits of protected areas are significantly increased.

Information centres in privately managed protected areas are run by NGOs as well as national campaigns.

Today, the awareness within society on the importance of protected areas and the establishment of an ecological network is considered insufficient.

4.1 **Standards, criteria, and best practices** for planning, selecting, establishing, managing and governance of national and regional systems of protected areas are developed and adopted.

Standards for the establishment and management of parks of national importance have been adopted. The process of planning, establishing and operating a park of national importance comprises four stages: assessment of feasibility, project development, establishment and operation (including evaluation). For further information see: FOEN[202]

The identification of reserves for waterbirds and migrants is based on the criteria of the Ramsar Convention on Wetlands. Biotopes of national importance are identified through specific programmes using the red lists as a basis. However, no overarching criteria and best practices for managing and governance of protected have been developed yet.

Targets for 2010

1.1 **Terrestrially**, a **global network** of comprehensive, representative and effectively managed national and regional protected area system is established.

A vision for an ecological network (REN) has been established by the FOEN (see section 2.4), but the REN lacks a legal basis for its implementation.

202 FOEN, Federal Office for the Environment, www.bafu.admin.ch/paerke/04405/index.html?lang=en, status March 2010.

1.3 **Transboundary protected areas**, other forms of collaboration between neighbouring protected areas across national boundaries and regional networks, to enhance the conservation and sustainable use of biological diversity, implementing the ecosystem approach, and improving international cooperation are established and strengthened.

Switzerland takes part in the Emerald network and has designated 37 Emerald Sites and submitted full information to the Council of Europe. The Emerald Network is an ecological network to conserve wild flora and fauna and their natural habitats of Europe, which was launched in 1998 by the Council of Europe as part of its work under the Convention on the Conservation of European Wildlife and Natural Habitats. Further examples of transboundary collaboration include the Alpine Network of Protected Areas[203] and the collaboration between the *Parco* Nazionale *dello Stelvio* (Italy) and the Swiss National Park.

Switzerland supports transboundary protected areas also through its technical collaboration, e.g. the "Three Nations Namib Desert Transfrontier Conservation Area" (see section 3.9).

3.2 Comprehensive **capacity building** programmes and initiatives are implemented to develop knowledge and skills at individual, community and institutional levels, and raise professional standards.

Capacity building programmes at a national level are limited to courses in conservation biology at universities, and ranger courses. Furthermore, the federal commission for training in forestry has initiated a ranger course. The post-graduate training focuses on communication, visitor management and capitalisation of nature and landscapes.

The inter-cantonal ranger course (interkantonaler Wildhüterkurs), organised by the cantons, is a two-year training course attended parallel to employment, which is concluded with a final exam.

A federal ranger course (Eidgenössischer Wildhüterkurs) takes place each year in the form of a conference where issues of current interest are discussed.

The Swiss National Park provides on-the-job training for their rangers. Further conferences and courses are organised in collaboration with national parks of neighbouring countries. Further training is provided through exchange programmes with other parks.

3.3 The development, validation, and transfer of **appropriate technologies and innovative approaches** for the effective management of protected areas is substantially improved, taking into account the decisions of the Conference of the parties on technology transfer and cooperation.

203 ALPARC, Alpine Network of Protected Areas, www.alparc.org, status March 2010.

Technologies and innovative approaches for the management of protected areas are identified, developed, validated and transferred through specific project activities, for instance through SDC's engagement for the "Three Namib Desert Transfrontier Conservation Area" (see section 3.9).

4.2 Frameworks for **monitoring, evaluating and reporting** protected areas management effectiveness at sites, national and regional systems, and transboundary protected area levels are adopted and implemented by parties.

A framework is established for parks of national importance (see target 4.1). For further information see: FOEN[204].

4.3 National and regional systems are established to enable effective **monitoring** of protected area coverage, status and trends on national, regional and global scales, and to assist in evaluating progress in meeting global biodiversity targets.

National protected area coverage is monitored through the Swiss Biodiversity Monitoring indicators:

M1: Size of protected areas: Change in size of nature conservation areas protected by law. Conservation areas protected by law are an important instrument of nature conservation. However, many endangered species cannot be preserved solely by creating specially designated nature conservation areas protected by law.

M2: Size of "secure" protected areas: Change in size of areas of national importance, which are protected at cantonal level and where relevant protection measures are enforced. Designating areas as conservation areas on paper does not guarantee implementation on the ground. Fauna and flora will only be successfully protected when conservation measures are actually put into practice.

M3: Endangered species living in protected areas: Change in the total number of species with more than 60 % of their habitat located in protected areas as a proportion of the total number of endangered species in Switzerland. Conservation areas only really make sense if they contain species which are actually endangered. This indicator shows whether endangered species benefit from conservation areas and whether sufficient protected habitats are available for endangered species.

[204] FOEN, Federal Office for the Environment, http://www.bafu.admin.ch/paerke/04405/index.html?lang=en, status March 2010.

Targets for 2012

1.1 In the **marine** area, a **global network** of comprehensive, representative and effectively managed national and regional protected area system is established.

Switzerland has no marine areas.

1.4 All protected areas have **effective management** in existence, using participatory and science-based site planning processes that incorporate clear biodiversity objectives, targets, management strategies and monitoring programmes, drawing upon existing methodologies and a long-term management plan with active stakeholder involvement.

So far, no overarching strategy for the effective management of protected areas is in place in Switzerland. However, the elaboration of an instrument supporting the effective management of protected areas throughout the country is foreseen for 2012.

10 APPENDIX VI: ABBREVIATIONS AND ACRONYMS

ABS	Access to genetic resources and benefit sharing
AEM	Agro-Environmental Monitoring
AEM	Agro-Environmental Monitoring by the Federal Office for Agriculture
AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
ALPARC	Alpine Network of Protected Areas
ARE	Federal Office for Spatial Development
ART	Research Institute Agroscope Reckenholz-Tänikon
BAFU	Federal Office for the Environment (Bundesamt für Umwelt)
BDM	Biodiversity Monitoring Switzerland
BDN	Swiss National Database for the Conservation of Genetic Resources
CAMP	Central Asian Mountain Partnership Program
CBD	Convention on biological diversity
CEPA	Communication, Education & Public Awareness
CGIAR	Consultative Group on International Agricultural Research
CHF	Swiss Francs
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on Migratory Species
CORINE	Coordination of information on the environment
CPC	Swiss Commission for Cultivated Plant Conservation
CPS/SKEW	Swiss Commission for Wild Plant Conservation
CRSF/ZDSF	Centre for the Swiss Floristic Network (Centre du Réseau Suisse de Floristique)
CSCF/SZKF	Swiss Centre for the Cartography of Fauna
DDPS	Federal Department of Defence, Civil Protection and Sport
DNL	Data-centre Nature and Landscape
EAWAG	Swiss Federal Institute of Aquatic Science and Technology
ECAs	Ecological compensation areas
EFABIS	European Farm Animal Biodiversity Information System
EIA	Environmental Impact Assessment
ETH	Federal Institutes of Technology (Eidgenössische Technische Hochschulen)
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FCPF	Forest Carbon Partnership Facility of the World Bank
FDFA	Federal Department of Foreign Affairs
FIDS	Forest Insect and Disease Survey
FOAG	Federal Office for Agriculture
FOEN	Federal Office for the Environment
FSC	Forest Stewardship Council
FSO	Federal Statistical Office
FUB	Research Group for Environmental Monitoring
GAW	Global Atmosphere Watch

GCOS	Global Climate Observing System
GEF	Global Environment Facility
GIS	Geographic information system
GMBA	Global Mountain Biodiversity Assessment
GMO	Genetically modified organism
GPA	Global Plan of Action on Plant Genetic Resources for Food and Agriculture
HBH	Swiss association of botanical gardens (Hortus Botanicus Helveticus)
IAS	Invasive alien species
IBAs	Important Bird Areas
ICIMOD	International Centre for Integrated Mountain Development
IFC	International Finance Corporation (Member of the World bank group)
IPEN	International Plant Exchange Network
ITC	International Institute for Geo-Information Science and Earth Observation
IT-PGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
ITTO	International Tropical Timber Organisation
IWRM	Integrated Water Resource Management
karch	Coordination Office for Amphibian and Reptile Conservation in Switzerland
KOF/CCO	Coordination Offices for the Protection of Bats
LABES	National Landscape Monitoring (Landschaftsbeobachtung Schweiz)
LUBW	Baden-Württemberg State Agency for the Environment, Surveys, and Nature Conservation
LWF	Long-Term Forest Ecosystems Research
MIREN	Mountain Invasion Research Network
MONET	Monitoring of Sustainable Development
NABEL	National Air Pollution Monitoring Network
NABEL	National Air Pollution Monitoring Network
NABO	Swiss Soil Monitoring Network
NADUF	National River Monitoring and Survey Programme
NFA	New Financial equalisation and division of tasks between the Confederation and the cantons
NFI	National Forest Inventory
NFP	National Research Programme
NGO	Non Government Organisation
NISM	Swiss National Inventory of the Swiss Moss Flora
NISM	National Inventory of Swiss Bryophytes
NKS	National seed-stand registry
NPA-PGRNA	National Plan of Action for the Preservation and Sustainable Use of Plant Genetic Resources for Nutrition and Agriculture
OcCC	Swiss Advisory Body on Climate Change
OSD	Federal Office for Spatial Development
PA	Protected Area

PEFC	Programme for the Endorsement of Forest Certification Schemes
POP	persistent organic pollutant
PROFOR	Programme on Forests of the World Bank
RECOFTC	Regional Community Forestry Training Centre for Asia and the Pacific
REN	National ecological network (Réseau écologique national)
SADC	Southern African Development Community
SAEFL	Swiss Agency for the Environment, Forests and Landscape
SCNAT	Swiss Academy of Sciences
SDC	Swiss Agency for Development and Cooperation
SECO	State Secretariat for Economic Affairs
SFOE	Swiss Federal Office of Energy
SGI forests	forests of special genetic interest
SIPF	Sustainability in Protection Forests
SKEK/CPC	Swiss Commission for Cultivated Plant Conservation
SLC	Swiss Landscape Concept
SNSF	Swiss National Science Foundation
SSI	Sanasilva Inventory
SSS	Swiss Systematic Society
Swiss NFP	Swiss National Forest Programme
TFCA	Transfrontier Conservation Areas
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
WAP-CH	Swiss Forest Programme
WFP	World Food Programme
WHC	Convention concerning the Protection of the World Cultural and Natural Heritage
WSL	Swiss Federal Institute for Forest, Snow and Landscape Research
WWF	World Wide Fund For Nature / former World Wildlife Fund