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Federal Department of the Environment,
Transport, Energy and Communications DETEC

Federal Office for the Environment FOEN

Species, Ecosystems, Landscapes Division

Reference: S092-1514

Raptor and Owl Conservation in Switzerland:
Strategic Guidelines and Management Priorities

Red Kite *(Milvus milvus)* © M. Burkhardt

12 July 2019

Report of the Swiss Focal Point of the Raptors MoU

under the Convention on the Conservation of Migratory Species of Wild Animals (CMS)

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061.6-02.3-04-04-00001/00001/00022/S092-1514

Impressum

Title
Raptor and Owl Conservation in Switzerland: Strategic Guidelines and Management Priorities.

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Photos, illustrations (cover)
Red Kite (Marcel Burkhardt)

Citation
Herzog, S. (2019): Raptor and Owl Conservation in Switzerland: Strategic Guidelines and Management Priorities. Report of the Swiss Focal Point of the Raptors MoU under the Convention on the Conservation of Migratory Species of Wild Animals (CMS). 70 pp.

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Acknowledgements

We are grateful to the technical report contributors Stefan Werner, Hans Schmid, Johann von Hirschheydt and Reto Spaar as well as the workshop participants who made essential contributions to the content of these strategic guidelines and management priorities: Adrian Aebischer, Raffael Ayé, Simon Birrer, Daniela Heynen, David Jenny, Marc Kéry, Reinhard Schnidrig, Martin Schuck and Bruno Stadler. We thank Bettina Almasi and Nadine Apolloni for the information about Barn Owl conservation and monitoring of small mammal populations. Roberto Lardelli and Chiara Scandolara supported us by giving recommendations for sites in the Canton of Ticino and its specific raptor and owl species. Further species specialists who contributed to these guidelines are Patrick Scherler for the Red Kite, Jean-Nicolas Pradervand for the Eurasian Scops Owl, and Daniel Hegglin for the Bearded Vulture.

Peter Knaus, Samuel Wechsler, Bernard Volet, Nicolas Strebel, Verena Keller and Thomas Sattler provided data on current breeding populations of raptors and owls and helped with estimates of migrant numbers. Dominik Hagist produced the species distribution maps. Thank you for your support.

We are also very thankful for Elisa Salorni for her support in reviewing the regulations concerning electrocution, Jennifer Vonlanthen for clarifications on legal matters and Garrett Montgomery for proofreading.

Furthermore, we are grateful to all bird observers and species specialists who make their records available and to András Kovács and Nick P. Williams who provided the Guidelines for Preparing National or Regional Raptor Conservation and Management Strategies.

Finally, we would like to thank the members of the Technical Advisory Group to the Raptors Memorandum of Understand for their constructive and appreciated feedback on the report and the recommended activities presented during their 3rd meeting in December 2018 in Sempach, Switzerland, which was generously hosted by the Swiss Ornithological Institute.

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Summary

This report by the FOEN on raptor and owl conservation fulfils the aim of Paragraph 12 of the Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia (Raptors MoU) to prepare a national strategy or an equivalent document. The report on the strategic guidelines and management priorities of raptor and owl conservation in Switzerland defines national objectives, the relevant activities and their prioritisation to mitigate significant threats to these fascinating groups of birds. The overall aim of these strategic guidelines is to obtain and maintain a favourable conservation status for all breeding populations and migrating species that regularly pass through Switzerland. The strategic guidelines review the current situation of 21 raptor and nine owl species regularly occurring in Switzerland. Of these, four are CMS Category 1 species (Bearded Vulture, Red Kite, and the scarce migrants Pallid Harrier and Red-footed Falcon) and nine CMS Category 2 species (6 breeding species).[1] 13 of the 30 raptor and owl species were designated as CMS flagship species of Switzerland.

In Switzerland, most breeding populations of raptors and owls are currently stable or increasing. However, for some species, the good state of their populations is susceptible to additional mortality (e.g. Bearded Vulture). Some national flagship species such as the Peregrine Falcon have only survived and recovered due to conservation efforts (protection of nest sites, DDT ban). Other species like the Little Owl, the Eurasian Scops Owl, the Kestrel and the Barn Owl receive supporting measures that affect their population trend positively. Nevertheless, raptors and owls face many different threats that can be categorised in the following main groups: targeted and unintentional poisoning, electrocution, collision, decline of food availability, habitat loss, and disturbances from human activities. Lacking or ineffective legislation should be complemented in the cases of electrocution and collision, food supply and unintentional poisoning. Necessary actions and activities are described and a time frame is set for implementing the measures in order of priority. The strategic guidelines also name potential sources of funding.

[1] http://www.cms.int/raptors/sites/default/files/basic_page_documents/raptors-mou_annex3_action-plan_e.pdf

1. Introduction

"Birds of prey" include the following three taxonomic orders: *Accipitriformes* (hawks, eagles, vultures) and *Falconiformes* (falcons), which are usually called (diurnal) raptors, and *Strigiformes*, which are nocturnal owls. In these guidelines, we use raptors and owls as a synonym for "birds of prey." Species are usually listed in taxonomic order.

1.1 International context

The following context has been adapted from http://www.cms.int/raptors/en. Raptors and owls face a variety of human-induced threats such as habitat loss and degradation, illegal killing, collisions with infrastructures and electrocution by power lines (McClure et al. 2018). Whereas most owl species are sedentary, many raptors are migratory and thus particularly at risk due to the often long bi-annual journeys from their breeding grounds to their wintering areas and back. Furthermore, some species show concentrations at bottlenecks along their flyways, such as at certain mountain passes in Switzerland, which may increase the potential impact of certain threats.

The *CMS Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia* (Raptors MoU) came into effect on 1 November 2008. It aims to promote internationally coordinated actions to achieve and maintain the favourable conservation status of migratory birds of prey throughout their range in the African-Eurasian region, and to reverse their decline when and where appropriate. Switzerland signed the Raptors MoU in 2014.

The Raptors MoU was the result of a study commissioned by the United Kingdom Department for Environment, Food and Rural Affairs (Defra) in 2005. It found that more than 50% of migratory birds of prey populations in the African-Eurasian region had a poor conservation status, and many species were showing rapid or long-term declines. After a meeting to identify and elaborate an option for international cooperation on raptors in October 2007 and a second meeting of Range States in October 2008, the Raptors MoU was concluded.

The Raptors MoU currently covers 93 species of birds of prey and owls which occur in 131 Range States in Africa, Europe and Asia. The Range States have to elaborate a national strategy with the following key objectives:

- To halt and reverse the population declines of globally threatened (Critically Endangered, Endangered and Vulnerable) and Near Threatened birds of prey and to alleviate threats to them such that they are no longer globally threatened or Near Threatened;
- To halt and reverse the population declines of other birds of prey with an unfavourable conservation status within Africa and Eurasia and alleviate threats in order to return their populations to favourable conservation status;
- To anticipate, reduce and avoid potential and new threats to all bird of prey species, especially to prevent the populations of any species undergoing long-term decline.

1.2 National context

Signatories to the Raptors MoU commit to adopting and implementing conservation measures for migratory birds of prey and their habitats. The planning and implementation of the Swiss national strategy under the Raptors MoU are coordinated by the Federal Office for the Environment (FOEN), which is also in charge of the protection and conservation of Swiss fauna and flora.

These strategic guidelines and management priorities were prepared by the FOEN on the basis of a project report by the Swiss Ornithological Institute. In a workshop conducted on 31 March 2017, Swiss raptor and owl experts discussed the recommended activities and their prioritisation, based on the assessment and the review of the status of all raptor and owl species regularly occurring in Switzerland.

The assessment is based on recent census data on breeding and migrating birds, literature reviews, the Single Species Action Plan for the Little Owl and expert knowledge (workshop, consulting experts for specific species).

1.3 Overall goal and objectives of the Swiss guidelines

The overall goal of these guidelines is to obtain and maintain a favourable conservation status for all breeding populations and migrating species of raptors and owls that regularly pass through Switzerland. The guidelines aim to contribute to the conservation of raptor and owl species in Switzerland and to support their populations. To date, most raptors and owls show healthy populations with a good conservation status in Switzerland. However, habitat loss and degradation, disturbance, electrocution, illegal poisoning and further development of critical infrastructures may threaten this situation. Therefore, these guidelines establish specific aims that should help anticipate, reduce and avoid potential and new threats. They also present options for arranging implementation and financing.

2. General Information

The FOEN prepared this publication based on a project report by the Swiss Ornithological Institute, which was mandated to prepare the scientific groundwork. The national contact point and the main contributors are specified in Table 1.

Table 1: General information

Date of entry into force of the CMS Raptors MoU in Switzerland:	Switzerland [November 2014]
Period covered by the guidelines:	[2019-2035]
Territory to which the guidelines apply:	Switzerland
Designated National Contact Point: Federal Office for the Environment (FOEN) Sabine Herzog P.O. Box, CH-3003 Berne Tel: +41 58 463 03 40 Fax: +41 58 464 75 79 E-mail: sabine.herzog@bafu.admin.ch	Appointment to the CMS Scientific Council: Federal Office for the Environment (FOEN) Sabine Herzog P.O. Box, CH-3003 Berne Telephone: +41 58 463 03 40 Fax: +41 58 464 75 79 E-mail: sabine.herzog@bafu.admin.ch
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Date of Completion (and submission to the ICU of the Raptors MoU)	12.07.2019

2.1 Inventory of raptor and owl species in Switzerland

In Switzerland, 33 raptor and ten owl species have been recorded to date, of which 13 species are observed only irregularly or exceptionally (Volet 2016; Table 2). Seven species are Category 1 species in the Action Plan (Annex 3) of the CMS Raptors MoU. CMS Category 1 species are globally threatened or near-threatened species according to the latest IUCN Red List. Of the 21 species of raptors that regularly occur in Switzerland (at least in nine out of ten years), only four belong to CMS Category 1. Species that are considered to have an unfavourable conservation status at a regional level are classified in CMS Category 2. In Switzerland, seven raptor species and three owl species belong to this group, with one of these species occurring only exceptionally. Nine out of the ten owl species occur regularly in Switzerland, and eight of them are sedentary.

Table 2: List of all recorded raptor and owl species in Switzerland. MoU Category 1: Globally threatened and Near Threatened species (IUCN). Category 2: species that are considered to have unfavourable conservation status at a regional level. Category 3: all other migratory species. F: flagship species for Switzerland. B: regularly breeding; b: occasionally breeding, fb: formerly breeding. National Priority: 1: very high, 2: high, 3: moderate.

	English	Latin	MoU Category	Occurrence CH	Breeding CH	National Priority	Migration Strategy, comments
Vultures	Bearded Vulture	*Gypaëtus barbatus*	1, F	Regular	B	1	Resident (reintroduced)
	Egyptian Vulture	*Neophron percnopterus*	1	Exceptional	-	-	Scarce migrant
	Griffon Vulture	*Gyps fulvus*	3, F	Regular	-	-	Summer visitor, Migrant
	Cinereous Vulture	*Aegypius monachus*	1	Irregular	-	-	Scarce summer visitor
Eagles and Allies	White-tailed Eagle	*Haliaeëtus albicilla*	3	Irregular	-	-	Scarce migrant
	Osprey	*Pandion haliaëtus*	3, F	Regular	fb	1	Migrant, summer visitor
	Golden Eagle	*Aquila chrysaëtos*	3, F	Regular	B	2	Resident
	Lesser Spotted Eagle	*Aquila pomarina*	3	Exceptional	-	-	Scarce migrant
	Greater Spotted Eagle	*Aquila clanga*	1	Exceptional	-	-	Scarce migrant and winter visitor
	Short-toed Snake Eagle	*Circaëtus gallicus*	3, F	Regular	B	-	Migrant, summer visitor
	Booted Eagle	*Aquila pennata*	3	Regular	-	-	Scarce migrant
Kites and Harriers	Red Kite	*Milvus milvus*	1, F	Regular	B	1	Migrant, winter visitor
	Black Kite	*Milvus migrans*	2	Regular	B	3	Migrant
	Black-winged Kite	*Elanus caeruleus*	-	Irregular	-	-	Scarce migrant
	Western Marsh Harrier	*Circus aeruginosus*	3	Regular	B	-	Migrant, summer visitor
	Hen Harrier	*Circus cyaneus*	2	Regular	fb	-	Migrant, winter visitor
	Montagu's Harrier	*Circus pygargus*	2	Regular	B	-	Migrant
	Pallid Harrier	*Circus macrourus*	1	Regular	-	-	Scarce migrant

	English	Latin	MoU Category	Occurrence CH	Breeding CH	National Priority	Migration Strategy, comments
Buzzards and Hawks	Rough-legged Buzzard	*Buteo lagopus*	3	Irregular	-	-	Scarce winter visitor
	Long-legged Buzzard	*Buteo rufinus*	3	Exceptional	-	-	
	Common Buzzard	*Buteo buteo*	3	Regular	B	3	Migrant, winter visitor
	European Honey Buzzard	*Pernis apivorus*	2	Regular	B	2	Migrant
	Eurasian Sparrowhawk	*Accipiter nisus*	3	Regular	B	3	Migrant, winter visitor
	Northern Goshawk	*Accipiter gentilis*	3, F	Regular	B	3	Resident
Falcons	Common Kestrel	*Falco tinnunculus*	2	Regular	B	1	Migrant, winter visitor
	Lesser Kestrel	*Falco naumanni*	2	Exceptional	-	-	Scarce migrant
	Red-footed Falcon	*Falco vespertinus*	1	Regular	-	-	Migrant
	Eurasian Hobby	*Falco subbuteo*	2	Regular	B	2	Migrant
	Eleonora's Falcon	*Falco eleonorae*	3	Exceptional	-	-	2 records
	Peregrine Falcon	*Falco peregrinus*	3, F	Regular	B	2	Resident, winter visitor
	Saker Falcon	*Falco cherrug*	1	Exceptional	-	-	1 record
	Gyrfalcon	*Falco rusticolus*	3	Exceptional	-	-	2 records
	Merlin	*Falco columbarius*	3	Regular	-	-	Migrant, winter visitor
Owls	Tawny Owl	*Strix aluco*	-	Regular	B	-	Resident
	Eurasian Eagle Owl	*Bubo bubo*	-, F	Regular	B	1	Resident
	Northern Hawk-owl	*Surnia ulula*	3	Exceptional	-	-	Last record in 1916
	Boreal Owl	*Aegolius funereus*	3, F	Regular	B	3	Mainly resident
	Eurasian Pygmy Owl	*Glaucidium passerinum*	-	Regular	B	3	Resident
	Long-eared Owl	*Asio otus*	2	Regular	B	2	Mainly resident, winter visitor
	Short-eared Owl	*Asio flammeus*	2	Regular	fb	-	Migrant, winter visitor
	Barn Owl	*Tyto alba*	-, F	Regular	B	1	Mainly resident
	Little Owl	*Athene noctua*	-, F	Regular	B	1	Scarce resident
	Eurasian Scops Owl	*Otus scops*	2, F	Regular	B	1	Migrant

Breeding species and extinct breeding species

Currently, twelve raptor and eight owl species are breeding in Switzerland, and 19 of them are breeding regularly (Table 2). As concerns the Bearded Vulture and the Red Kite, only two Category 1 species are breeding in Switzerland. The Bearded Vulture is now one of the regular breeding species again, after becoming extinct in the late 19th century.

Another five species have become extinct since the 19th century or breed only irregularly: the Osprey (last breeding confirmed in 1914), the Western Marsh Harrier (last breeding in 1975 and 2017), the Hen Harrier (two breeding records: 1917 and 1999), Montagu's Harrier (last confirmed breeding in 1986 and 2007) and the Short-eared Owl (last breeding suspected in 1939).

The Short-toed Snake Eagle first bred in Valais in 2012. Since then, up to five pairs have attempted to breed in Switzerland.

Reintroduction programmes

The Bearded Vulture went extinct in the late 19th century. In 1986, a reintroduction programme was launched in the Alps, and young birds were released for the first time in Switzerland in 1991. The first successful brood occurred in France in 1997. In Switzerland, the number of breeding pairs increased continuously from one in 2007 to a maximum of 17 pairs in 2017. In 2015, a project began at Bellechasse (FR) to reintroduce Ospreys, which have been extinct as a breeding bird in Switzerland for approximately 100 years (Maumary et al. 2007). The program is promising. Between 2015 and 2018, a total of 42 fledglings were released.

Migrants that occur regularly

In addition to the twelve breeding species, another ten raptor species migrate regularly across Switzerland in varying numbers. Two of them are CMS Category 1 species: the rare Pallid Harrier and the regularly occurring Red-footed Falcon. Both CMS Category 2 species (the Hen Harrier and Montagu's Harrier) are rather scarce migrants in Switzerland.

Among the owls, only one, the Short-eared Owl, which is grouped in CMS Category 2, occurs as a migrating species.

2.1 National factsheet

Switzerland is a landlocked country situated in the western part of the European continent and has a territory of 41,285 km^2. Despite its small size, it encompasses a wide range of altitudes and areas with highly diverse climatic and biogeographic situations. The lowest point is Lake Maggiore in the Canton of Ticino (193 m above sea level) and the highest point is the Dufourspitze in the Canton of Valais (4,634 m above sea level). There are three geographical regions that form near-parallel strips stretching from northeast to southwest: the Alps in the south, which cover up to 63% of the national territory, the northward adjacent lowlands, known as the Central Plateau (27%), and the Jura Mountains in the north-western part of the country (10%). Many different types of landscapes can be observed within these three major regions due to varying climate conditions and land use (settlements, agriculture, forestry, etc.). Switzerland can be divided into six major biogeographic regions (Figure 1: The biogeographic regions in Switzerland.).

Approximately 30,750 km^2 are classified as "productive area," in which settlement and agriculture are possible. Forest area makes up to a third of the national territory. The rest of the country (about 25%) is covered by water bodies, mountains and "unproductive" vegetation.

The Alps form a European water tower. Whereas the Rhine River runs into the North Sea, the Rhone empties into the Gulf of Lion in the Mediterranean Sea. The Po and the Etsch flow into the Adriatic part of the Mediterranean Sea, while the Inn River joins the Danube, ending in the Black Sea. The highest peaks of the Alps are covered by ice and snow (glaciers). Middle altitudes are mainly covered by conifer forests, with a tree line ranging from 1,800 to 2,200 m. The Canton of Ticino and some southernmost parts of Grisons and Valais geographically belong to the Southern Alps. The Alps are characterised by five geological zones that belong either to sedimentary or crystalline rocks.

The Central Plateau is a molasses basin of about 40 to 50 km in width that extends from Lake Geneva to Lake Constance. The area is mainly characterised by rivers that run into the Aare, which merges with

the River Rhine at the northern border of Switzerland. Most of these rivers are corrected and straightened. Only a few areas of the original floodplains and typical vegetation have remained. The lowlands are characterised by a large number of pre-alpine lakes and many of them are heavily modified and used by humans. Nearly all wetlands and swamps are dewatered for urbanisation, industrialisation and agricultural use. Farmland is cultivated intensively and woodland is also heavily modified (from characteristic deciduous trees like beech to conifers like spruce).

The Jura is a low mountain range formed by sedimentary rocks. In Switzerland, its highest peak reaches 1,677 m (La Dôle VD). As the fold mountain is formed by limestone, a large quantity of water runs below the surface, leading to dry plains and slopes with a low density of creeks and rivers. Water accumulates only where clayey substrates occur. Most parts are covered by mixed forest, but some higher peaks are treeless due to livestock production. The Jura has many rocky cliffs.

The most important natural resources for Switzerland are wood, water, industrial rocks and minerals. The main economic factors are agriculture, raw materials, industries, energy production, financial services and tourism.

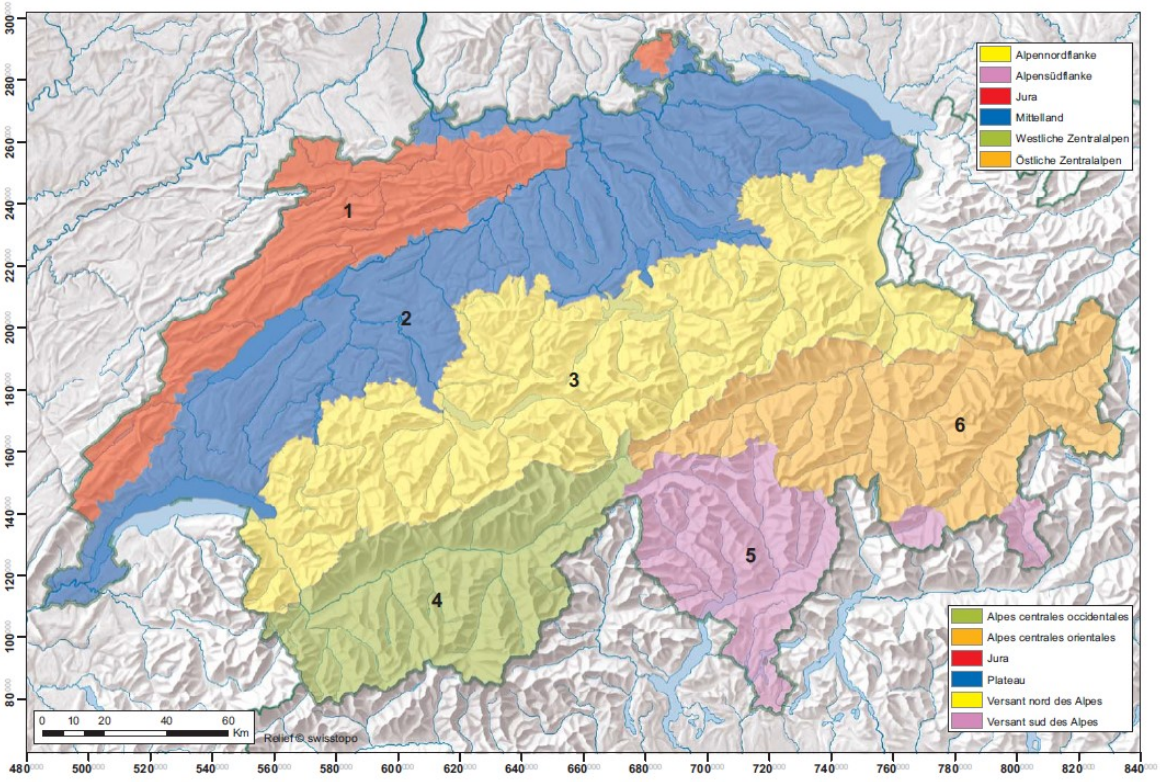

Figure 1: The biogeographic regions in Switzerland. 1: Jura, 2: Central Plateau; 3: Northern Alps; 4: Western Central Alps; 5: Southern Alps; 6: Eastern Central Alps.

The alpine main comb acts as a climatic barrier. While a humid-temperate climate occurs in the northern part, the climate is rather Continental-Mediterranean in the southern part. In general, Switzerland's climate is dominated by westerly and south-westerly winds. June and July are the months with the heaviest precipitation. North of the Alps, the amount of precipitation is about 1,000 to 2,000 mm per year, and the mean temperature lies between 1° C in January and 17° C in July. In the southern parts of Switzerland, the equivalent mean temperatures are 2 to 3° C higher. Due to the huge altitudinal differences and topography, weather and temperatures can vary greatly at the local level. Air temperature generally decreases about 0.6° C per 100 m in altitude. The central alpine valleys of the

Engadine (Canton of Grisons) and the Rhone (Canton of Valais) are the regions with the least precipitation and the longest dry periods (600-800 mm of precipitation per year).

2.2 Protection of raptors and owls in Switzerland

In Switzerland, most raptor and owl species have been well protected by law nationwide since 1926, and many of them since 1876 (Federal Act on Hunting and Protection of Wild Mammals and Birds). However, the Golden Eagle was granted full protection only as recently as 1953. Buzzards, Northern Goshawks and Sparrowhawks could be shot as a “self-help” measure to prevent “damage” until 1962 (Zbinden 1989) and up to 1,000 raptors of these species were shot annually (www.jagdstatistik.ch). Since then, most raptor and owl species show positive population trends (Figure 2).

Additionally, in 1991, so-called "Water bird and migratory bird reserves of international and national importance"[2] (WMBRO) and wildlife reserves[3] were designated based on an inventory[4] in order to implement the provisions of the convention on wetlands of international importance, especially for waterfowl habitats.[5] In both types of reserves, hunting is generally prohibited. Ten WMBRO areas are of international importance and a further 26 are of national importance. Only one of the 26 national WMBRO areas is specifically designated to protect actively migrating landbirds (the Col de Bretolet), while the others protect resting and overwintering migrant waterbirds. Col de Bretolet in the Canton of Valais is an alpine pass which is also important for certain migrating raptors species.

The no-hunting zones in wildlife[3] reserves were established mainly in the Pre-Alps and Alps nearly one and a half centuries ago to restore healthy populations of huntable mammals. During the 19th century, species such as Red Deer, Roe Deer, Chamois and Ibex became regionally extinct or nearly extinct. Nowadays, raptors feeding on carcasses profit from high ungulate densities within these zones, which cover about 4% of Switzerland’s territory.

[2] SR 922.32 Ordonnance sur les réserves d'oiseaux d'eau et de migrateurs d'importance internationale et nationale (OROEM).

[3] SR 922.31 Ordonnance concernant les districts francs fédéraux (ODF).

[4] Marti C. & L. Schifferli 1987: Inventar der Schweizer Wasservogelgebiete von internationaler Bedeutung – Erste Revision 1986.

[5] SR 0.451.45 Convention relative aux zones humides d'importance internationale particulièrement comme habitats des oiseaux d’eau.

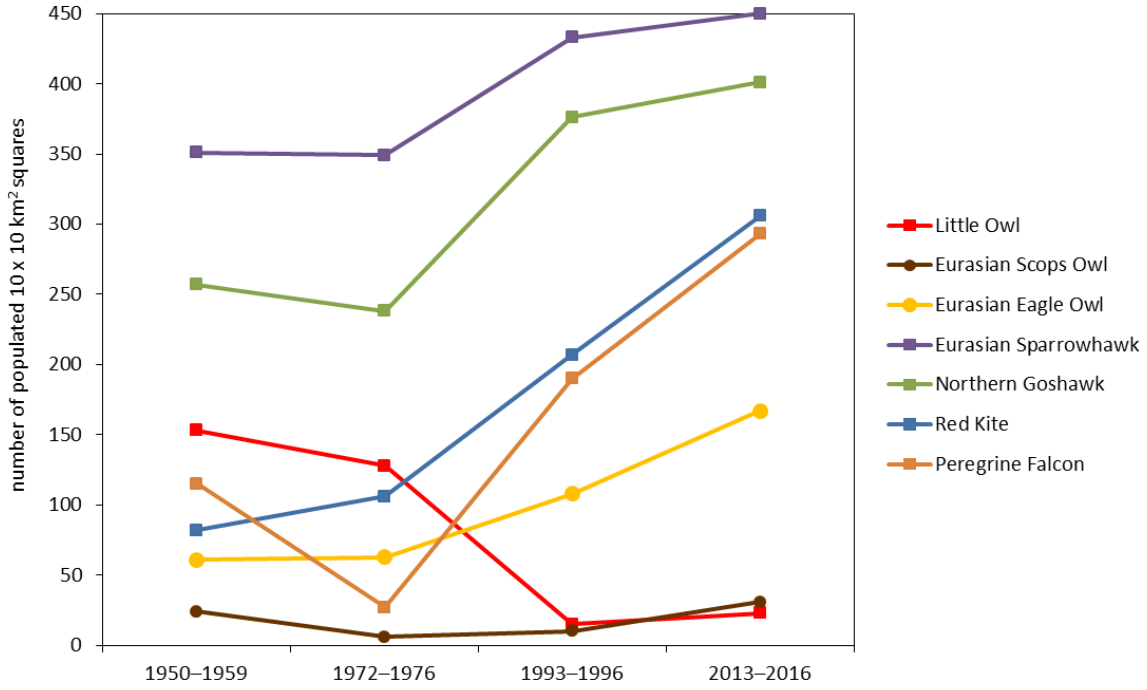

Figure 2: Development of the number of populated 10x10 km^2 squares of different raptor and owl species breeding in Switzerland during four breeding bird surveys (the maximum number of 10x10 km^2 squares is 467). This figure demonstrates the ever-changing history of the different species in Switzerland and the currently good state of most species. Data collection for the breeding bird atlases of the 1950s and 1970s was less systematic compared to those of the following breeding bird schemes. Data for the 1950s were reconstructed in the 2000s based on the diaries of observers. Therefore, the real population of raptors and owls could have been higher, especially in that decade.

Furthermore, Switzerland has a variety of national, cantonal, regional and communal protected areas. Thanks to the instrument of tranquillity zones, cantons can temporarily protect breeding sites from such disturbances as paragliders flying overhead or climbers. No other protected area is specifically designated for raptors or owls. Nevertheless, some of these areas are important for raptors and owls. Switzerland has about 5,300 km^2 of protected areas (status: 2017). However, the range of protection varies greatly: from full protection to so-called protected landscapes, which are completely accessible and open to a variety of uses. National designated areas for the protection and promotion of biodiversity in Switzerland cover 6% of the national territory (about 2,580 km^2) and further cantonal, regional and local designated areas raise this percentage to 6.5%.[6]

Important Bird Areas (IBAs) have been suggested in Switzerland by non-governmental organisations (Heer et al. 2000, Maumary et al. 2007). “For reasons unknown today, the raptor-specific criteria like bottleneck sites were not used in the designation of IBAs in Switzerland. Moreover, the designation of IBAs was based on 1993 to 1996 data. In the meantime, new data (2013 to 2016) is available. As a consequence, the IBAs proposed in 2000 are not the best areas for raptor conservation that can be proposed today. The FOEN and the Swiss Ornithological Institute have thus conducted a new analysis and identified better sites for raptor conservation. The sites are not only better suited, but there are also more sites than before."

An effective tool for raptor and owl conservation is the “Swiss species recovery programme for birds", which has been ongoing since 2003 (see Chapter 2.4.3). Other raptor and owl conservation support

[6] Ausgewiesene Gebiete zum Schutz und zur Förderung der Biodiversität in der Schweiz. FOEN Factsheet (2017).

instruments are programme agreements in the areas covered by the Federal Act on the Protection of Nature and Cultural Heritage, the Federal Act on Forest and the Federal Act on Hunting and Protection of Wild Mammals and Birds (e.g. wildlife reserves). These programmes can finance conservation efforts in forest, open land, water bodies, agriculture and settlements. In the event that projects adversely affect nature, the required compensation can be implemented for raptor conservation.

2.3 Relevant conventions/agreements and national policy instruments

2.3.1 National legal framework for the conservation of raptors and owls

Switzerland has a strong legal framework for the conservation of raptors and owls. The **Federal Constitution** (1999, SR 101[7]) entrusts the Confederation with legislating on the protection of animal and plant life and the preservation of their natural habitats and their diversity. It shall protect endangered species from extinction (Art. 78) and lay down principles on hunting and in particular on the preservation of the diversity of birds (Art. 79).

The **Federal Act on Protection of Nature and Cultural Heritage** (1966, RS 451) aims at protecting native animal and plant species, biotopes and habitats of high ecological value, as well as landscapes. This Act stipulates that the extinction of indigenous animal species must be prevented by preserving sufficiently extensive habitats (biotopes) and by other appropriate measures (Art. 18). It subjects the capture of animals living in the wild for commercial purposes to approval by the competent cantonal authority (Art. 19). The Act is completed by a set of ordinances that regulate the protection of the biotopes of national importance,[8] the mire landscapes of particular beauty and national importance and the establishment of parks of national importance. Article 12 of the Federal Act on the Protection of Nature and Cultural Heritage (NCHA) grants the right to appeal to non-profit organisations, which have been active throughout Switzerland for at least the last ten years. The environmental protection organisations' collective right of appeal is a success story of Switzerland's environmental policy. Similar provisions exist for the planning, construction or modification of installations for which an EIA is required (Art. 55, EPA).

The **Federal Act on the Trade of Protected Animal and Plant Species** (2013, SR 453) conduces to the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora CITES.

The **Federal Act on the National Park in Canton Grison** (1980, SR 454) 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) aims at conserving game and its habitats. The Act specifies that all species of animals which may not be hunted are protected by federal law (Art. 7). Therefore, all raptors and owls are protected in Switzerland. The Act and associated ordinances specify the species that may be hunted, define their closed hunting seasons (raptors and owls may not be hunted), list the illegal hunting methods and establish reserves for waterbirds and migratory birds of international and national importance as well as wildlife reserves (no hunting allowed). The Act includes a penal provision and provides for imprisonment of up to one year or a fine for violating the law (including intentional killing, intentional disturbance of nest sites and communal roost sites, egg collection and taking from the wild, the trade of protected species (and parts of them) and the use of illegal hunting methods).

The **Federal Ordinance on Hunting and Protection of Wild Mammals and Birds** (1986, SR 922.01) protects animals by prohibiting their hunting and gives detailed information about the rules for hunting

[7] The classified compilation of all federal acts and ordinances can be found here: https://www.admin.ch/gov/en/start/federal-law/classified-compilation.html

[8] Biotopes of national importance include: Alluvial Zones (1992, SR 451.31), Raised Bogs and Transitional Mires (1991, SR 451.32) Fenlands (1994, SR 451.33), Amphibian Spawning Areas (2001, SR 451.34) and Dry Meadows and Pastures (2010, SR 451.37)

huntable wildlife. It allows cantons to designate tranquillity zones to protect the wild mammals and birds if they are threatened by disturbances such as tourism and leisure activities, including skiing, climbing or paragliding (Art. 4ter). If eagles cause a verifiable loss of farm animals in Switzerland, 50% of the costs are borne by the Swiss government, and 50% by the canton in which the damage occurred (Art. 10). Raptors can only be marked for scientific reasons by specially trained individuals with permission from the FOEN (Art. 13). Furthermore, the Act specifies which data the cantons have to report to the FOEN for the purposes of compiling national hunting statistics (Art. 16) and provides information about taxidermy of protected animals.

The **Federal Act on the Protection of the Environment** (1983, SR 814.01) protects people, animals and plants, biocenosis and their biotopes against harmful impacts. In addition, the Act provides for the sustainable management of natural resources, in particular regarding biological diversity. The Act requires an environmental impact assessment (EIA). It stipulates that the environmental impact of new facilities – or the expansion of existing ones – must be assessed before approval (Art. 10a, Environmental Impact Assessment). Thus, EIAs are required by law for all projects that may adversely impact the environment, fauna and flora in Switzerland.

The **Federal Act on Forests** (1991, SR 921.0) 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 Spatial Planning** (1979, SR 700) coordinates land-use activities. Master plans and cantonal structural plans must take into account aspects related to the conservation of nature and landscapes. The recently published concept for planning wind energy infrastructure[9] is Switzerland's basic operational concept for planning purposes (structural plan). However, the concept takes only marginal account of the ecological demands of raptors and owls.

Further relevant legal bases can be found in other sectoral policies like:

- Federal Act on Agriculture (SR 910.1)
- Ordinance on Animal By-products (Verordnung über tierische Nebenprodukte, SR 1916.441.22)
- Ordinance on Electrical Lines and Cables (Verordnung über elektrische Leitungen, Leitungsverordnung, LeV; SR 734.31)
- Bird protection guidelines for contact line systems (Vogelschutz bei Fahrleitungsanlagen, Richtlinie Bundesamt für Verkehr 1.6.2016 /d/f/i https://www.bav.admin.ch/bav/de/home/rechtliches/rechtsgrundlagen-vorschriften/richtlinien/richtlinien-bahn/vogelschutz-bei-fahrleitungsanlagen.html)
- Bird protection from high-voltage open wires with rated voltage of over 1 kV (Vogelschutz an Starkstrom-Freileitungen mit Nennspannung über 1KV, VSE 2009)

2.3.2 Legal provisions for keeping raptors and owls in captivity

The **Federal Act on Hunting and Protection of Wild Mammals and Birds** (1986, SR 922.0, Art. 10) specifies that keeping protected species, including birds of prey, is subject to the approval of cantonal authorities. The **Federal Ordinance on Hunting and Protection of Wild Mammals and Birds** (1986, SR 922.01) lists the preconditions for keeping birds of prey (Art. 6), regulates falconry (Art. 6bis), prohibits the trade of protected species of birds of prey (Art. 7), and regulates the release into the wild of native and non-native species (Art. 8). The Federal Office for the Environment has issued an enforcement

[9] Konzept Windenergie 2017. Download: https://www.are.admin.ch/are/de/home/raumentwicklung-und-raumplanung/strategie-und-planung/konzepte-und-sachplaene/konzepte/anhoerung-konzept-windenergie.html

guideline to support cantonal authorities.[10] Furthermore, the keeping non-native animals is strictly regulated (Art. 8bis). Importing and keeping raptor hybrids is strictly forbidden (Annex 2).

The **Animal Protection Ordinance** (2008, SR 455.1) stipulates that in cases where animals may be kept subject to approval (Art. 89), the animals must be supervised by an animal keeper (Art. 85). Private keepers must provide a certificate of competence (Art. 192, 193).

2.3.3 National policy instruments

On 25 April 2012, the Federal Council adopted the **Swiss Biodiversity Strategy** (SBS), which was developed in light of the global Strategic Plan for Biodiversity and its Aichi Biodiversity Targets, with a special focus on mainstreaming biodiversity and on ecosystem conservation.[11] Through 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. On 6 September 2017, the Federal Council adopted the biodiversity action plan.[12]

Several acts and ordinances concerning the Environmental Impact Assessment (EIA) are included in the Nature and Cultural Heritage Protection Ordinance and are important for building projects on a national and cantonal scale. The Ordinance on the Environmental Impact Assessment (1988, SR 814.011) includes a list of installations that are subject to an EIA and stipulates the decision-making process. Furthermore, guidelines were published to harmonise the process.

Since 1991, **Red Lists** have been included in the Nature and Cultural Heritage Protection Ordinance. Reference is specifically made to them in connection with the designation of biotopes deserving protection. The Red Lists are regularly updated according to the Red List programme. The **Red List of Breeding Birds**[13] assesses the conservation status of 199 species of birds, including 22 species of birds of prey (see Table 3).

[10] Mainini B., Schütz C. 2000: Richtlinien für die Haltung und Pflege von Taggreifvögeln und Eulen. Bundesamt für Umwelt, Wald und Landschaft (BUWAL). 17 S.

[11] Swiss Confederation 2012: Swiss Biodiversity Strategy. Download: www.bafu.admin.ch/ud-1060-e

[12] Federal Office for the Environment (FOEN) (ed.) 2017: Action Plan for the Swiss Biodiversity Strategy. Bern

[13] Keller V., Gerber A., Schmid H., Volet B., Zbinden N. 2010: Liste rouge oiseaux nicheurs. Espèces menacées en Suisse, état 2010. Office fédéral de l'environnement, Berne, et Station ornithologique suisse, Sempach. L'environnement pratique n° 1019. 53 p.

Table 3: Status of raptors and owls according to the Red List of Swiss Breeding Birds (Keller et al. 2010) and the list of species with national priority.[14] Regionally Extinct (RE), Critically Endangered (CR), Endangered (EN) and Vulnerable (VU), Near Threatened (NT), Least Concern (LC). National priority: very high (1), high (2), medium (3). (*) Only very irregularly breeding and thus not included as breeding birds in these guidelines.

English	Latin	Swiss Red List category	National priority	comment
Osprey	*Pandion haliaëtus*	RE	2	
Bearded Vulture	*Gypaëtus barbatus*	CR	1	re-established
Common Scops Owl	*Otus scops*	EN	1	
Eurasian Eagle Owl	*Bubo bubo*	EN	1	
Little Owl	*Athene noctua*	EN	1	
Western Marsh Harrier*	*Circus aeruginosus*	VU*	-	last breeding: 1975, 2017
Montagu's Harrier*	*Circus pygargus*	VU*	-	last breeding: 1986, 2007
Golden Eagle	*Aquila chrysaëtos*	VU	2	
European Honey Buzzard	*Pernis apivorus*	NT	2	
Common Kestrel	*Falco tinnunculus*	NT	1	
Eurasian Hobby	*Falco subbuteo*	NT	2	
Peregrine Falcon	*Falco peregrinus*	NT	2	
Barn Owl	*Tyto alba*	NT	1	
Long-eared Owl	*Asio otus*	NT	2	
Red Kite	*Milvus milvus*	LC	1	
Black Kite	*Milvus migrans*	LC	3	
Northern Goshawk	*Accipiter gentilis*	LC	3	
Eurasian Sparrowhawk	*Accipiter nisus*	LC	3	
Common Buzzard	*Buteo buteo*	LC	3	
Eurasian Pygmy Owl	*Aegolius funereus*	LC	3	
Boreal Owl	*Glaucidium passerinum*	LC	3	
Short-toed Snake Eagle	*Circaëtus gallicus*	-	-	breeding since 2012

[14] BAFU (Ed.) 2011: Liste der National Prioritären Arten. Arten mit nationaler Priorität für die Erhaltung und Förderung, Stand 2010. Bundesamt für Umwelt, Bern. Umwelt-Vollzug Nr. 1103: 132 S.

The **Swiss List of National Priority Species**[15] comprises 3,606 species from 21 different groups of organisms, including 18 species of raptors and owls (Table 3). Conservation priorities have been determined by experts, based on the degree of threat and Switzerland's responsibility for these particular species in an international context. An updated list will be published in 2018 and include a List of National Priority Habitats.[16]

The **Swiss Species Conservation Plan**[17] defines a national strategy for the conservation of native species by establishing the objectives, principles and measures. It provides the basis for the development of measures to implement the Swiss Biodiversity Strategy.

The **Swiss species recovery programme for birds**[18] was established by the Swiss Ornithological Institute and BirdLife Switzerland in 2003, in close cooperation with the Federal Office for the Environment (FOEN). It aims at intensifying specific conservation actions for 50 bird species of national priority (FOEN 2018, in press) - including seven species of raptors and owls: the Bearded Vulture, the Red Kite, the Kestrel, the Barn Owl, the Little Owl, the Eurasian Eagle Owl and the Eurasian Scops Owl (see also Table 3). To date, specific action plans have been developed for six bird species; the SAP for the Little Owl is the first for a bird of prey (Meisser et al. 2016).

Biodiversity in Forests – Targets and Actions[19] aims to eliminate deficits such as the lack of variegated structures and matured forests as well as deadwood. There is still a large number of threatened species and an insufficient number of forest reserves. This enforcement aid substantiates the requirements of the Federal Council and defines the aims of the activities that need to be achieved by 2030.

Environmental Goals for Agriculture[20] analyses and documents the basis for determining the environmental goals for agriculture (Umweltziele Landwirtschaft UZL), their comprehensiveness and the state of progress in achieving them. This document also discusses the expected development of the agreed measures. The goals designate species that can indicate whether the environmental targets in agriculture will be achieved (i.e. UZL species). Among these target species are the following raptors and owls: the Red Kite, the Common Kestrel, the Long-eared Owl, the Eurasian Scops Owl, the Little Owl and the Barn Owl.

2.3.4 International conventions ratified by Switzerland

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, concluded in Washington D.C., USA, 3/3/1973, date of ratification: 9/7/1974, entry into force for Switzerland: 1/7/1975). CITES intends to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

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). The Convention's mission is "the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world."

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[15] BAFU (ed.) 2011: Liste der National Prioritären Arten. Arten mit nationaler Priorität für die Erhaltung und Förderung, Stand 2010. Bundesamt für Umwelt, Bern. Umwelt-Vollzug Nr. 1103: 132 S.

[16] BAFU (ed.) 2019: Liste der National Prioritären Arten und Lebensräume. Arten mit nationaler Priorität für die Erhaltung und Förderung, Stand 2010. Bundesamt für Umwelt, Bern. Umwelt-Vollzug Nr. 1709: 99 S.

[17] OFEV (ed.) 2012: Plan de conservation des espèces en Suisse. Office fédéral de l'environnement OFEV, Berne. 64 p. Download: www.bafu.admin.ch/conservation-especes

[18] http://www.artenfoerderung-voegel.ch; http://www.conservation-oiseaux.ch

[19] BAFU (ed.) 2015: Biodiversität im Wald: Ziele und Massnahmen. Umweltvollzug UV-1503-D. https://www.bafu.admin.ch/bafu/de/home/themen/biodiversitaet/publikationen-studien/publikationen/ziele-und-massnahmen-wald.html

[20] BAFU & BLW (ed.) 2016: Umweltziele Landwirtschaft. https://www.bafu.admin.ch/bafu/de/home/themen/biodiversitaet/publikationen-studien/publikationen/ umweltziele-landwirtschaft-statusbericht-2016.html

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). The Convention intends to promote cooperation between the signatory States in order to conserve wild flora and fauna and their natural habitats and to protect endangered migratory species.

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). The objective of the Bonn Convention is the conservation of migratory species worldwide.

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). The agreement provides for coordinated and concerted action to be taken by the range states throughout the migration system of waterbirds to which it applies.

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). The objectives of the CBD are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.[21]

3. Biological Assessment

The populations of raptors and owls in Switzerland are monitored regularly and most relevant migration and breeding areas and sites are known. The well-established biological assessment reveals population trends, which allows conclusions to be drawn about current threats. However, detailed information is lacking for certain peril topics.

3.1 Monitoring of raptor and owl populations

Programmes in Switzerland use different systematic approaches to survey raptor and owl populations (Table 4). They can be divided into breeding bird surveys and counts during migration.

Ornithological data are gathered and stored at the Swiss Ornithological Institute in Sempach. A Swiss-wide network of experienced bird observers contributes to the breeding bird surveys and the national and regional atlases. In addition, volunteers can provide their observations via the online platform www.ornitho.ch, which has a solid verification system using local and species experts and makes it possible to analyse trends. Regular information is shared between national coordinators and observers through newsletters, the abovementioned online platform, social media and annual meetings.

Table 4: Monitoring and survey programmes for raptors and owls in Switzerland

Breeding raptors and owls		
Swiss-wide surveys		**Species**
	Breeding Bird Atlas. Survey of all Swiss breeding birds in intervals of about 20 years	All (1950s, 1972-76, 1993-1996, 2013-16).
	Annual single species surveys (total population)	Bearded Vulture, Eurasian Scops Owl, Little Owl
Surveys in representative areas		
	Swiss Bird Index; Biodiversity Monitoring	Diurnal common raptors species breeding in Switzerland

[21] www.sib.admin.ch

Breeding raptors and owls		
Regional surveys		
	Population monitoring in selected areas	Different species; done by regional working groups and bird ringers
Migrating raptors and owls		
Systematic surveys		
	Telemetry studies	Red Kite, Bearded Vulture, Golden Eagle
	Adjacent region: Défilé de l' Ecluse (France; with support from the Swiss Ornithological Institute and Swiss ornithologists)	Migrating species (a considerable portion of most raptor species that migrate through Switzerland pass by this site)
Occasional surveys		
	Site surveys (Col de Bretolet, Wasserscheide Gurnigel, Ulmethöchi, Subiger Berg, Schaffhauser Randen etc.)	Migrating species
Winter counts (roosts)		
	Swiss-wide roost counts in November and January each winter	Red Kite, occasionally also for Merlin, Hen Harrier
High quality database of occasional observations from voluntary field observers		
	Ornitho.ch, ID-database of Swiss Ornithological Institute	All raptor and owl species
	Bird ringing centre of the Swiss Ornithological Institute EURING international data base	All data of ringed raptor and owl species

3.2 Inventory of habitats

3.2.1 Important sites for migratory birds

The Swiss Alps are a distinct barrier for most migrating raptor species, especially the soaring birds. Most of the raptors approaching Switzerland in autumn arrive from north-eastern Europe. They are mainly guided by the Pre-Alps and Alps in south-western directions into the central lowland, also known as the Central Plateau, which is additionally bordered by the Jura Mountains to the north. The south-westerly directed chains of the Jura Mountains are a leading line for migrating raptors. The Central Plateau is funnel-shaped with a bottleneck in the south-western part of Switzerland (region of Geneva). Finally, a considerable number of raptors migrating along the Central Plateau in autumn subsequently pass by the Défilé de l'Ecluse in France, which is close to the Swiss border and where raptor migration is documented systematically. Thus, raptors in autumn mainly migrate through the Central Plateau and along the Pre-Alps and the Jura Mountains. Only a small portion of raptors seems to cross the Alpine chain in more southerly directions. However, little is known about their numbers and flyways when they cross the Alps. Species that often show flapping flight, such as the Western Marsh Harrier, the Common Kestrel or the Eurasian Hobby, use alpine valleys for migration to a significant degree (e.g. Val d'Illiez; Thiollay 1966, 1967a, b), as high numbers of these species can be detected during less systematic counts compared to known raptor watch points in the lowlands. Most raptor species do not show concentrations in specific roosting areas during migration and cross the country more or less in a non-

stop flight. Black and Red Kites may congregate at roosts. Large non-breeder colonies of Black Kites once existed and may still exist in protected areas at pre-alpine lakes (e.g. Lake Neuchâtel). In winter, large roosts of Red Kites exist in the lowlands (roosts with more than 100 birds can be found in the following cantons in order of roost magnitude: St. Gallen, Luzern, Thurgau, Fribourg, Zurich, Aargau, Berne, Solothurn, Schaffhausen and Jura). Furthermore, Common Buzzards can concentrate after breeding in agricultural areas in the lowlands as well as during spectacular hard weather movements, but there are no traditional roosting sites.

Little is known about raptor migration in Switzerland in the spring. They likely pass through Switzerland very quickly. Famous regions to observe spring migration are the axis of Hucel F to Mont Pèlerin, the Canton of Ticino, the Jura Mountains and the eastern-most foothills of the Jura Mountains in the Canton of Schaffhausen (Randen).

As explained above, raptor migration in Switzerland occurs more or less on a broad front, especially in the lowlands and adjacent hilly areas. However, migrating raptors concentrate at some ridges, hills, gorges and passes, where they may fly at low altitudes above ground due to the specific topographic characteristics. Accordingly, we identify important areas with high densities of migrating raptors and assess whether they are forced to low flight altitudes due to their topographical and geographical features. At sites where raptors must pass over in low flight altitudes, they face a potential risk caused by significant infrastructural developments such as wind farms, telephone poles or power lines.

The identification of migratory areas for raptor migration is based on recent observation data, published sites of known importance for raptor migration (Maumary et al. 2007) and an evaluation by three raptor experts who assess the altitudes of flight and concentration in view of topographic restrictions in order to measure the potential risk caused by infrastructure developments (Table 5, Figure 3). The non-exhaustive list reflects current knowledge. Further surveys could reveal additional important migratory spots.

Table 5: Important areas with high densities of migrating raptors in Switzerland based on current knowledge. The migrating behaviour of raptors is influenced by topography. Altitude of flight and retention time can act as a measure of susceptibility/threat in respect to infrastructure developments: +++: area with very high susceptibility; ++: area with high susceptibility; +: area with medium susceptibility; ~: area with minor susceptibility.

Area name	Canton	No.	Susceptibility due to migrating behaviour
Col de Bretolet	VS	1	**+++**
Col de Jaman	VD	2	**+++**
Ulmethöchi	BL	3	**+++**
Subigerberg	SO	4	**+++**
Gurnigel/Wasserscheide	BE	5	**++**
Hahnenmoospass	BE	6	**++**
Leimental	SO, BL, (F)	7	**++**
Mont Sagne/La Chaux-de Fonds	NE	8	**++**
Lombachalp	BE	9	**++**
Gurten	BE	10	**++**
Wiechs am Randen	SH, (D)	11	**++**
Monte Ceneri	TI	12	**++**
Upper Blenio valley (passo de la Greina)	TI/GR	13	**++**
Furkapass	VS	14	**++**
Mont Pèlerin	VD	15	**+**

Area name	Canton	No.	Susceptibility due to migrating behaviour
Unterer Hauenstein bis Belchenflue	BL, SO	16	+
Mont Tendre	VD	17	+
Salhöhe	AG	18	+
Ajoie	JU	19	+
Pizzo Leone to Arcegno	TI	20	+
Magadino plain	TI	21	+
Blenio valley (Biasca – Campo Blenio) Greina)	TI	22	+
Mettilimoos/Entlebuch	LU	23	+
Napfberglandschaft	LU, BE	24	+
La Berra	FR	25	+
Klingnauer Stausee	AG	26	~
Wauwiler Ebene	LU	27	~
Rade de Geneve	GE	28	~
Fanel/Chablais de Cudrefin	BE, NE, VD	29	~
Rheinfelden/Giebenach/Füllinsdorf	AG, BL	30	~
Häusernmoos	BE	31	~
Prévérenges VD to Geneva	VD, GE	32	~

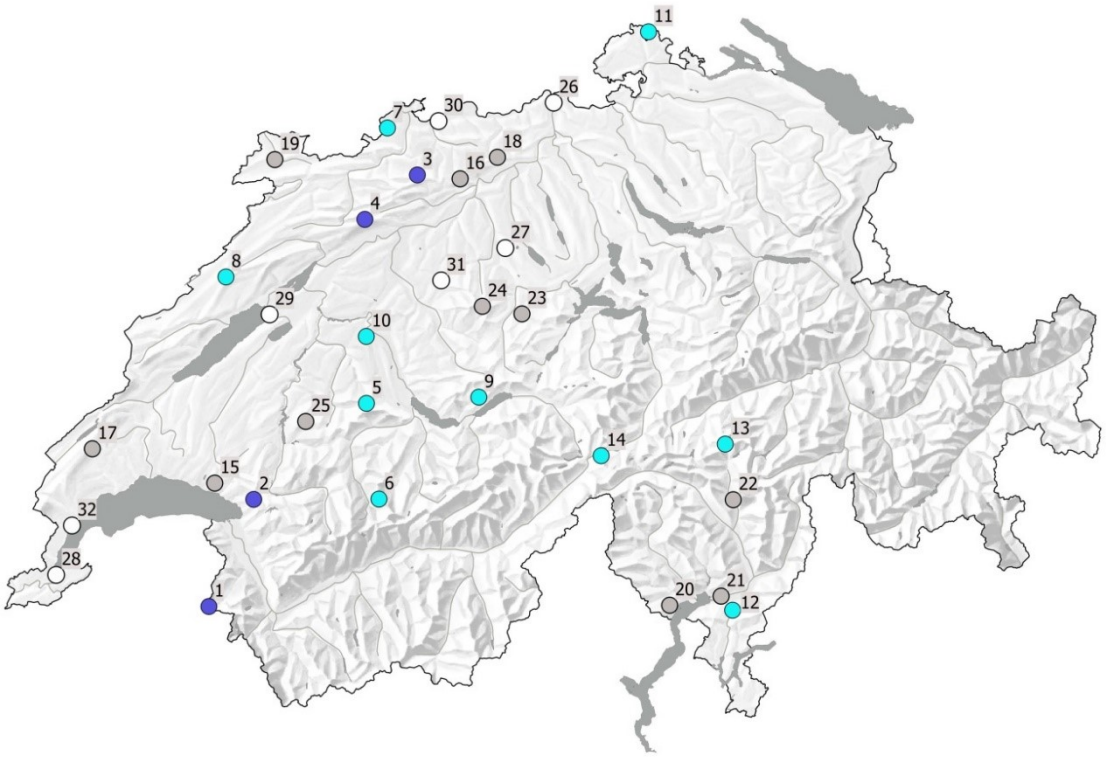

Figure 3: Map showing known important sites for raptor migration in Switzerland. Dark blue: highest susceptibility due to migrating behaviour; blue: high susceptibility, grey: susceptibility probable; white: susceptibility unlikely.

3.2.2 Important sites for breeding birds

Common raptor and owl species use the entire biogeographic regions for breeding. As almost all recent threats in Switzerland occur nationwide or at least in certain biogeographic regions, a nation-wide approach is required to ensure the conservation status of raptors and owls. The habitats of breeding raptors and owls in Switzerland are alpine cliffs, low mountain ranges, woodland (deciduous and coniferous forests), open land (cultivated areas with grassland, arable land, and orchards, for example), settlements and wetlands. Their importance for the different species is listed in Annex I. The dominance of habitats differs greatly between biogeographic regions and the breeding populations of raptor and owl species vary accordingly (Annex I, Table 6). However, important breeding sites and areas can be designated for four rare and threatened raptors and owls with restricted ranges in Switzerland: the Bearded Vulture, the Short-toed Snake Eagle, the Little Owl and the Eurasian Scops Owl. Yet, the distribution of these species can be dynamic depending on current population trends. Therefore, their important breeding sites need to be regularly revised.

Table 6: Important sites for threatened breeding raptor and owl species in Switzerland. Cantons: BL: Basel-Land, GR: Grisons, VS: Valais, JU: Jura, GE: Geneva, TI: Ticino, BE: Berne, FR: Fribourg (Status 2016-2017).

Species	Population size CH (pairs)	Canton	Sites	Number of pairs/ National breeding population (%)
Bearded Vulture	15-17	GR	Side valleys of Upper Engadine	>5 (>33%)
			Swiss National Park	>5 (33%)
		VS	Grand Muveran	1 (7%)
			Gemmi/Leukerbad	1 (7%)
			High mountains close to the border of Italy between Col de Gr. San Bernard and Dufourspitze	2-3 (up to 20%)
Little Owl	120	JU	Ajoie	45 (38%)
		GE	Agricultural plain of the Champagne genevoise	50 (42%)
		TI	Magadino-Plain (Bolle di Magadino to Giubiasco)	15 (13%)
			Mendrisiotto	1-5 (up to 4%)
		BE/FR	Grosses Moos	2-4 (up to 3%)
Eurasian Scops Owl	30-40	VS	Foothills between Sion and Brig at altitudes of 700-900 m (extensive Arrhenatherion and wooded hems)	20-30 (75%)
		TI	Magadino plain (Bolle di Magadino to Giubiasco)	5-10 (25%)
Short-toed Snake Eagle	3-5	VS	Southward exposed slopes between Martigny and Visp	1-2 (50%)
		TI	Central parts of Ticino	1-3 (50%)

4. Threat Assessment

Most common raptor and owl species in Switzerland breed in "normal" landscapes and thus outside of protected areas such as the Swiss National Park, nature reserves or Swiss nature parks. Despite the positive population trends of most raptors and owls in Switzerland, they face a variety of threats, which are listed below.

4.1 Habitat loss and limitation of food resources

In spite of the positive trend among most birds of prey in Switzerland, the current rapid development of settlements and infrastructures puts pressure on the breeding, passage and roosting habitats of raptors and owls. Reduced habitat quality and food limitation due to intensive agriculture in the lowlands and mountainous areas are known to negatively affect the food supply of raptors and owls that feed on insects and small mammals (e.g. Aschwanden et al. 2005, Perrig et al. 2017, Sierro & Arlettaz 2013).

4.1.1 Impacts of habitat loss and associated food limitation

Habitat loss and degradation is a recent major threat to raptors and owls in Switzerland. Suitable habitats could become devaluated, fragmented or destroyed. The rapid development of settlements and industries causes former habitats to be overbuilt, which reduces their quantity. Habitat loss and degradation, in particular, are progressing in cultivated landscapes (loss of arable land, meadows, orchards and hedges, intensive use of grassland and arable fields leading to a strong loss of biodiversity, milling of stones on former extensive stone-rich pastures, etc.) and are serious threats to some species of raptors and owls in Switzerland. Intensive agriculture negatively affects the reproductive success and fitness of species such as the Little Owl (Perrig et al. 2017). The intensive use of agricultural land and forests degrades habitat quality and density of prey organisms. The wide use of pesticides and multiple mowing operations per season considerably reduce the diversity of plants and insects and thus negatively affect food webs. Increasing nitrogen deposition (traffic and agriculture) reduces plant und insect diversity in the remaining extensively used grasslands, as only nitrogen-tolerant species survive. As a consequence, grassland is becoming very dense, fast growing and poor in species diversity and abundance, which also negatively affects associated fauna. Vegetation height and density strongly decrease food accessibility for raptors and owls (Aschwanden et al. 2005).

The trend toward maximising agricultural yields and harvesting earlier in the season leads to protection measures for economic plants, such as covering them with plastic foil. This trend reduces foraging areas for raptors and owls at least seasonally in wide sections of cultivated land.

In remote areas, the rationalisation of agriculture leads to the abandonment of extensively used areas close to the timberline, for example. The subsequent succession of vegetation (forests) causes to a further loss of biodiversity and foraging areas for most raptors species.

The extent of the habitat loss caused by wood cutting is largely unknown to date. Furthermore, knowledge of eyrie trees is limited (e.g. Northern Goshawk).

Species affected (taxonomic order):

Category 1 species:	all
Category 2 species:	all
CMS flagship species:	all
Further species:	all

4.1.2 Food limitation of necrophagous birds

Necrophagous birds like vultures may be regionally subject to food limitation, as the carcasses of perished farm animals need to be removed immediately in Switzerland according to veterinary and sanitary regulations – even in remote areas. Food limitation may especially affect flocks of summering Griffon Vultures in alpine regions or the subalpine areas of Jura. Naturally perished animals should be left in nature whenever there is no threat to the drinking water supply or health issues. With the next revision of the relevant ordinance, the exposure of animal by-products in nature may be prohibited in general and permitted by authorities only in exceptional cases (e.g. to promote reasonable context-specific support for species such as the Griffon Vulture). Yet, constant and predictable feeding sites can be hazardous:

1) They may limit movements and range expansions of carcass-feeding birds (e.g. Bearded Vultures in the Pyrenees, D. Hegglin).

2) They concentrate the birds on known sites which could increase illegal activities.

However, in certain rural areas of Switzerland, nearly 13% of households provide food for Red Kites at least occasionally (Grüebler, pers. comm.). This food source supports their foraging in rather large swaths of the landscape.

Species affected (taxonomic order):

Category 1 species:	Bearded Vulture
Category 2 species:	-
CMS flagship species:	Griffon Vulture, Golden Eagle
Further species:	-

4.2 Disturbances

Indeed, otherwise suitable habitats can be devalued by disturbances that arise from sources such as increasing outdoor activities or woodcutting in the breeding season.

4.2.1 Leisure time and outdoor activities

Outdoor activities are sharply increasing in remote alpine and wooded regions (inside and outside of protected areas). These activities can greatly disturb sensitive species such as the Peregrine Falcon, the Eurasian Eagle Owl and the Golden Eagle. For Peregrine Falcons in northern Italy and southern Switzerland, it has been shown that breeding success and productivity were lower when rock climbers were present (Brambilla et al. 2004). Photography at nest sites has very negative effects on the breeding success of Golden Eagles (Jenny & Schaad, 2015) and potentially Bearded Vultures as well. Disturbances at nest sites can reduce times for the thermoregulation of eggs or freshly hatched chicks in cold weather conditions or reduce the frequency of the food supply and thus the growth of juveniles. In the worst case, broods are abandoned.

The Federal Act on Hunting and Protection of Wild Mammals and Birds stipulates that "the cantons ensure that wild mammals and birds are adequately protected against disturbances" (Article 7 paragraph 4). However, implementation efforts at the regional level are insufficient, as demonstrated by the instances of photographers disturbing Golden Eagles' nests, for example. Furthermore, the "Respect to protect" (Respektiere Deine Grenzen; now followed by: Natur & Freizeit) campaign explains the risks and limits of outdoor activities in relation to wildlife. However, its recommendations are not mandatory.

Species affected (taxonomic order):

Category 1 species:	Bearded Vulture, Red Kite, Pallid Harrier, Red-footed Falcon
Category 2 species:	Black Kite, Hen Harrier, Montague's Harrier, European Honey Buzzard, Kestrel, Eurasian Hobby, Long-eared Owl, Short-eared Owl
CMS-Flagship species:	Griffon Vulture, Osprey, Golden Eagle, Short-toed Snake Eagle, Peregrine Falcon, Northern Goshawk, Barn Owl, Eurasian Eagle Owl, Boreal Owl
Further species:	Western Marsh Harrier, Common Buzzard, Eurasian Sparrowhawk, Tawny Owl

4.2.2 Forestry in the breeding season

The trend in forestry is increasingly to harvest trees all year round. Disturbance by wood harvesting during the breeding season (1 March to 31 August) can reduce the reproductive success of sensitive species (e.g. Northern Goshawk, Eurasian Sparrowhawk, Boreal Owl). The extent of this disturbance during the breeding season is largely unknown to date. Eyrie trees (e.g. Northern Goshawk) and trees with potential as breeding places (e.g. Osprey) need to be better protected and inventoried. Nevertheless, goals and measures to achieve a sound state of biodiversity have been established.[22]

Species affected (taxonomic order):

Category 1 species:	Red Kite
Category 2 species:	Black Kite, European Honey Buzzard, Hobby, Long-eared Owl
CMS flagship species:	Osprey, Short-toed Snake Eagle, Northern Goshawk Boreal Owl
Further species:	Common Buzzard; Eurasian Sparrowhawk, Tawny Owl, Pygmy Owl

4.2.3 Fishery

To date, the fishing activities has not been a relevant stakeholder in raptor conservation. Commercial fishers declared the return of the Osprey as "not problematic for Swiss commercial fishery."[23]

Species affected (taxonomic order):

Category 1 species:	-
Category 2 species:	-
CMS-Flagship species:	-
Further species:	-

[22] Imesch N., Stadler B., Bolliger M. & Schneider O. 2015: Biodiversität im Wald: Ziele und Massnahmen. Vollzugshilfe zur Erhaltung und Förderung der biologischen Vielfalt im Schweizer Wald. Bundesamt für Umwelt, Bern. Umwelt-Vollzug Nr. 1503: 186 S.

[23] http://www.freiburger-nachrichten.ch/nachrichten-see/nicht-alle-freuen-sich-ueber-den-fischadler. Last download: 11 January 2018

4.3 Infrastructural threats

Many raptor species from north-western Europe cross Switzerland during both migration periods in spring and autumn. At specific migratory sites, topographic features can lead to high concentrations of migrating individuals and/or to low flight altitudes – at least during some peak migration days. At such sites, there is a higher potential for conflicts between migratory raptors and infrastructural developments (e.g. power lines, wind farms). Critical power lines (transmission) and wind power stations (production) affect rare and long-lived raptor species (Schaub et al. 2009, Schaub 2012, Korner-Nievergelt et al. 2016). Additionally, road kills play an important role for raptors and owls, and window collisions are especially relevant in the case of the Eurasian Sparrowhawk.

In general, new infrastructure installations and installations that could cause substantial pollution (e.g. power lines and wind power stations) require a detailed Environmental Impact Assessment (EIA). The EIA standard in Switzerland is generally high and in accordance with the CBD guidelines and the CMS Resolution. Furthermore, environmental associations have the right to appeal these EIA-binding projects.

4.3.1 Electrocution

The significant negative effects of electrocution from power lines as well as railway infrastructure on populations of raptors and owls are well known in Switzerland. The dangerous types of medium-voltage power lines for birds have been identified (VSE 2009; BAV Richtlinie 2016).

According to Article 15c (new) of the Electricity Act (Elektrizitätsgesetz, EleG) passed by Parliament on 15 December 2017 and applicable as of 1 January 2019, power lines in the electricity distribution network with a rated voltage of less than 220 kV generally have to be converted into underground cables, to the extent technically and operationally feasible, and if the total costs of an underground cable do not exceed a certain cost factor (maximum 3.0) compared to a technically equivalent distribution variant. Therefore, in the future, most new medium-voltage power lines will be installed as cable lines. However, in some cases, medium-voltage power lines will still be installed as aerial lines. In general, newly built medium-voltage power lines are constructed in such a way as to avoid bird of prey electrocution. However, the adaptation of existing dangerous pylons of medium-voltage power lines, in order to diminish electrocution still stagnates:

1) 25% of the known causes of Eurasian Eagle Owl deaths in the Engadine Valley are from electrocution at medium-voltage power line pylons (Jenny 2013) and 40% at railway infrastructure (Jenny 2017). In Valais, electrocution accounts for 24% of all Eagle Owl fatalities (Schaub et al. 2010, Schaub 2012). This is known to affect population trends negatively.

2) Electrocution is one of the major threats to Red Kites wintering in Spain (Viñuela et al. 1999).

3) Two out of six reintroduced Ospreys in western Switzerland died from electrocution at a dangerous medium-voltage power line pylon in their first year in 2015. One perished in 2016 after flying against a deterrent mounted on a pylon (D. Langenbergue, comm. pers.).

4) Long-eared Owl: “Power lines claim many victims” (Maumary et al. 2007).

5) Golden Eagles died from electrocution at medium-voltage power lines in Ticino (2014, communication from cantonal hunting management TI) and in Valais (2015, communication E. Revaz).

Current national legislation appears to be insufficient when it comes to the adaptation of dangerous power lines. The Ordinance on Power Lines (RS 734.31) does not specify any implementation date to accelerate the adaptation process. Threats and especially measures to diminish the negative effects on raptors, owls and other large bird species are not explicitly specified in most Swiss regulations and guidelines. The guidelines for bird protection at power lines (VSE 2009) stipulates a *minimum* distance of 60 cm between potential seating for birds and conducting parts. The guideline of the Federal Office of Transport (FOT), which was passed in 2016, allows this distance of 60 cm from potential bird seating to conducting parts. Even if a large number of electrocutions can thus be prevented, this measure still

seems insufficient for large species with single wings much longer than 60 cm (Jenny 2017). In Valais, the elimination of electrocution would result in a strong population increase (17% annually) of the Eurasian Eagle Owl (Schaub et al. 2010).

According to the FOEN, the adaptation of existing dangerous medium-voltage pylons is obligatory, but only if required by the local situation. It officially stated that an obligatory measure under existing regulations cannot be accepted as a compensation measure for an environmental threat caused by new infrastructure (BUWAL 200224). Nevertheless, this is often proposed by project executing organisations. The current opinion of the FOEN is that the adaptation of existing dangerous medium-voltage pylons could be considered as a compensation measure for projects that have direct effects on raptor and owl populations. Examples could include new tourism structures, wind farms or new power lines that degrade the territories of the Great Eagle Owl, which is very susceptible to electrocution. Thus, the restoration of dangerous medium-voltage pylons in the same region could be appropriate compensation according to Article 18 of the Nature and Cultural Heritage Act (NCHA).

Species affected (taxonomic order):

Category 1 species:	Bearded Vulture, Red Kite
Category 2 species:	Black Kite, Kestrel, Long-eared Owl
CMS flagship species:	Griffon Vulture, Osprey, Golden Eagle, Short-toed Snake Eagle, Barn Owl, Eurasian Eagle Owl, Barn Owl
Further species:	Common Buzzard, Tawny Owl

4.3.2 Collisions with power lines and other cables

Collisions with power lines and other cables (e.g. earth wires, cable cars) can be a serious threat to raptors and owls, especially for Bearded Vultures, Red Kites, Golden Eagles and Eurasian Eagle Owls, but also for Black Kites, Kestrels, Common and European Honey Buzzards as well as Barn and Long-eared Owls. The significant cumulative mortality caused by power line electrocutions and collisions of raptors and Eurasian Eagle Owls are known to lead to a local and regional decline in some species (for power lines: Schaub et al. 2010, Schaub 2012). Golden Eagles occasionally collide with power lines and die (Haller 1996). Several Bearded Vultures have died from collisions with power lines (Maumary et al. 2007; D. Jenny, pers. comm.), while a Bearded Vulture died in the winter of 2017/2018 after a collision with a cable that was installed to transport hay in very steep alpine areas (Stiftung ProBartgeier, pers.comm.). Yet, other raptor and owl species are also known victims of collisions (Maumary et al. 2007).

Species affected (taxonomic order):

Category 1 species:	Bearded Vulture, Red Kite
Category 2 species:	Black Kite, European Honey Buzzard, Kestrel, Long-eared Owl
CMS flagship species:	Griffon Vulture, Osprey, Golden Eagle, Short-toed Snake Eagle, Peregrine Falcon, Eurasian Hobby, Barn Owl, Eurasian Eagle Owl
Further species:	Common Buzzard, Tawny Owl

[24] BUWAL 2002:

4.3.3 Impact of wind farms

Migratory raptor species breeding in Switzerland may currently be threatened by wind farms in their breeding area, during their active migration and in their wintering areas in south-western Europe and North Africa. This threat to raptors and owls will also increase in Switzerland, where at least 700 wind power stations are planned in the near future.[25]

The significant cumulative mortality caused by raptor and owl collisions with wind farms lead to local and regional declines in some species (Bellebaum et al. 2013, Grünkorn et al. 2016, Korner-Nievergelt et al. 2016). A study modelling the cumulative effects of planned wind parks in the Canton of Vaud and neighbouring regions in France showed that the regional breeding population of Red Kites would be negatively affected (Korner-Nievergelt et al. 2016).

The guideline for land use planning of wind energy projects[26] in Switzerland lists two species whose breeding occurrence may lead to a ban on wind farms during the land use planning process: the Capercaillie and the Bearded Vulture. Currently, the guideline relies on breeding sites regularly used by the Bearded Vulture until 2014 and 5 km of their surrounding area. However, a revision that takes current breeding sites (used after 2014) into account is planned.

The EIA guideline[27] [28] sets the general obligation that EIA-requiring projects must assess the impact on national priority species and threatened species. Most breeding raptors and owls vulnerable to wind energy farms are included among these species, such as the Bearded Vulture, the Red Kite, the Golden Eagle, the Great Eagle Owl and the Peregrine Falcon. However, the guideline does not specifically mention the topic of raptor migration. From a scientific perspective, it would be necessary to investigate the impact of a wind farm project on migrating birds and specifically raptors.

The decision-making process in the cantons is based on balancing interests in wind energy plants with national interests in national priority species of raptors and owls respectively. Thus, the breeding sites of raptor and owl species susceptible to wind power, important sites for migrating soaring birds, and the larger winter roosts of Red Kites will not automatically lead to an exclusion of wind energy infrastructure at critical sites (neither during the planning process nor during the EIA).

Species affected (taxonomic order):

Category 1 species:	all
Category 2 species:	all
CMS flagship species:	all
Further species:	all

4.3.4 Prevention of bird strikes at airports

Measures to prevent bird strikes at airports include habitat management, such as management of green areas at airports, prevention measures and, in very critical situations for safety, the shooting of single individuals of a protected species at airports. These actions can conflict with the aims of raptor and owl conservation, especially in the scope of habitat or species conservation programmes. As the standards

[25] Konzept Windenergie Schweiz 2004: Download: http://www.bfe.admin.ch/themen/ 00490/00500/ index.html?lang=de&dossier_id=05810

[26] Konzept Windenergie 2017: Download: https://www.are.admin.ch/are/de/home/raumentwicklung-und-raumplanung/strategie-und-planung/konzepte-und-sachplaene/konzepte/anhoerung-konzept-windenergie.html

[27] https://www.bafu.admin.ch/bafu/en/home/topics/eia/publications/uvp-handbuch.html

[28] https://www.bafu.admin.ch/bafu/de/home/themen/landschaft/publikationen-studien/publikationen/wiederherstellung-und-ersatz-im-natur-und-landschaftsschutz.html

rise for safety issues (bird strikes) at airports, requests for approvals to shoot single individuals of protected birds of prey may increase in order to deter other conspecifics. However, international experience shows that non-flocking bird species cannot be deterred by shooting (DeFusco et al. 2008; Rey & Liechti 2015).

Hunting and nature conservation legislation entrusts implementation to the cantons, especially as concerns the management of protected areas and species conservation. Yet, as a result of a recent revision of the hunting legislation, the Federal Office for Civil Aviation (FOCA) will assume responsibility for the implementation of safety management at the airfields of airports. It will therefore be responsible for conferring approvals to shoot birds in order to mitigate bird strike risks at airfields. The topic of bird strikes is discussed in the Swiss Wildlife Hazard Committee by federal offices (FOCA; FOEN, Airports, Swiss Air force, Skyguide, Swiss Ornithological Institute und Bird-Life International).

Species affected (taxonomic order):

Category 1 species:	-
Category 2 species:	-
CMS flagship species:	-
Further species:	Common Buzzard

4.3.5 Other infrastructure

Collisions with infrastructures such as buildings with glass fronts or soundproof glass walls claim many birds' lives among the raptors, but primarily the Eurasian Sparrowhawk, which accounts for 10% of known mortality caused by collision with glass surfaces (Maumary et al 2007). Rail and road traffic are an important source of mortality for Common Buzzards, Kestrels, Barn Owls, Eurasian Eagle Owls, Long-eared and Tawny Owls, to name a few (Maumary et al 2007).

Species affected (taxonomic order):

Category 1 species:	Red Kite
Category 2 species:	Black Kite, Kestrel, Long-eared Owl
CMS flagship species:	Eurasian Eagle Owl, Boreal Owl
Further species:	Common Buzzard, Tawny Owl

4.4 Direct persecution

Once direct persecution was halted in Switzerland (for most species in 1926) and in neighbouring states such as Germany (in the 1970s), the densities of many breeding raptors species increased considerably within the next decades. In Switzerland, raptors, owls and their broods are well protected by the Federal Act on Hunting and Protection of Wild Mammals and Birds. Whereas direct persecution only plays a minor role in Switzerland, migrating species may also suffer from poaching and poisoning in the Mediterranean region (e.g. Red Kite[29]).

[29] BirdLife International 2017: *Milvus milvus* (amended version published in 2016) The IUCN Red List of Threatened Species 2017: e.T22695072A110921280. http://dx.doi.org/10.2305/IUCN.UK.2017-1.RLTS. T22695072A 110921280.en. Last Download on 07 July 2017.

4.4.1 Hunting

The legal basis for the protection of raptors and owls in Switzerland does not require revision as regards intentional killing and disturbance, which are strictly forbidden and punished. The use of poison baits is also prohibited. Switzerland has a well-established nation-wide system of controls performed by cantonal game wardens.

The Federal Act on Hunting and Protection of Wild Mammals and Birds is currently being revised. The protection status of birds of prey will not change according to the decision of the Federal Council.

At this time, it is possible to obtain legal exceptions from authorities that allow “damage-causing” individuals of species such as Northern Goshawks to be killed if requesters can prove that considerable economic damage has been caused by the so-called “damage-causing” individuals. The approval process differs from canton to canton, and these birds have not been clearly differentiated in the hunting statistics to date, in terms of shootings of “damage-causing” birds versus shootings of injured birds. However, such approvals are rare. Nowadays, non-lethal measures to reduce potential damage exist and the number of loose poultry has decreased steadily. Thus, considerable damage is rarely inflicted when preventive measures are applied.

Species affected (taxonomic order):

Category 1 species:	-
Category 2 species:	-
CMS flagship species:	Northern Goshawk
Further species:	-

4.4.2 Poaching

Although illegal activities are strictly prosecuted and punished, they do occur. Known sources of intentional illegal killing are:

1) The use of poisoned pigeons by pigeon fanciers. Several cases of poisoned Peregrine Falcons and Northern Goshawks have occurred since around 2009. The birds were poisoned by single living pigeons, on which a neurotoxin had been applied. One female Peregrine gained notoriety after dying close to juveniles in front of a webcam in 2011. After intense investigation, two pigeon fanciers were convicted and received a prison sentence.[30] The successful prosecution of these cases strongly depended on the commendable personal commitment of the investigating officer.

2) In recent decades, sporadic poaching was recorded for the Golden Eagle (between 1970 and 1994, about 16% of recorded dead and injured birds in Grisons had lead shot pellets in their tissue) and the Bearded Vulture (in Switzerland, there was one case of poaching in Valais in 1997). In neighbouring countries, poaching may still be a serious threat to roaming and dispersing Swiss birds, as this was the main cause of death of Bearded Vultures in the Alps at least until the beginning of the 2000s.

It is not known whether intentional disturbances have occurred at roosts and nesting sites. However, unintentional disturbances are increasing steadily (see 4.2 Disturbances). Egg collection is not an important source of disturbance.

Species affected (taxonomic order):

Category 1 species:	Bearded Vulture

[30] http://www.birdlife.ch/de/content/vergiftungen-von-wanderfalken

Category 2 species:	-
CMS flagship species:	Golden Eagle, Northern Goshawk, Peregrine Falcon
Further species:	-

4.5 Unintentional poisoning

Some local populations of raptor and owl species only survived thanks to the DDT ban in the 1970s, the consistent nest site protection of the last remaining breeding pairs (Peregrine Falcon), and the ban on other raptor-toxic pesticides. To reduce the impact of pesticides on the environment, the Federal Office for National Economic Supply (FONES) established an action plan to minimise the risk through the sustainable use of plant protection products.[31]

4.5.1 Lead intoxication of carcass feeding raptors

The accumulation of lead due to the diet of bowel remains and game carcasses shot with lead ammunition results in an intoxication of carcass-feeding raptors. For instance, a high percentage of Golden Eagles are loaded with lead (Jenni et al. 2015; Madry et al. 2015). This is known to cause mortality among Swiss birds. Lead poisoning may be the most significant threat to Bearded Vultures in Europe (Margalida et al. 2008). Despite the fact that lead shot pellets in ungulates are known to be a major threat to carcass-feeding raptors and several cases of intoxications have been reported, lead is currently a widely and nearly exclusively used ammunition by hunters. Therefore, the consequences for humans and the environment need to be addressed consistently with stakeholders.

Species affected (taxonomic order):

Category 1 species:	Bearded Vulture, Red Kite
Category 2 species:	-
CMS flagship species:	Griffon Vulture, Golden Eagle
Further species:	-

4.5.2 Raptor-toxic chemicals

The ban on diclofenac and other NSAIDs as well as deworming chemicals in open land veterinary medicine is not yet enshrined in legislation or the Ordinance on Veterinary Drugs (TAMV 812.212.27). Its widespread use in Asia and Spain leads to significant mortalities in vultures. In Asia, vulture populations have declined significantly and many species are on their way to extinction (Botha et al. 2017). So far, vulture populations in Switzerland are increasing. This can be ensured in the future only by upholding the existing ban on diclofenac and associated chemicals in veterinary medicine.

The unintentional poisoning of raptors and owls by rodents poisoned with pesticides such as bromadiolone in arable fields is well documented (Maumary et al. 2007). The unintentional poisoning of Red Kites, Black Kites and Common Buzzards may also occur when 2nd generation anticoagulant rodenticides are used; their ban needs to be advocated.

[31] Bericht des Bundesrats (06.09.2017): Aktionsplan zur Risikoreduktion und nachhaltigen Anwendung von Pflanzenschutzmitteln

Furthermore, in Switzerland, raptors showing typical symptoms of carbofuran poisoning have been regularly found in the past 30 years. Between 1980 and 1993, 93 raptors were found in Switzerland that all showed typical carbofuran poisoning symptoms (Jenni-Eiermann et al. 1996). The license for carbofuran was withdrawn in 2011 in Switzerland, the selling period ended in May 2012 and the consumption period ended in May 2013. However, remaining stocks of it still seem to be used. During infestations of rodents or chafers, pesticides are widely used that could threaten the birds of prey that feed on contaminated prey organisms. In addition, while the non-lethal impact of toxins and pesticides could cause chronic and sublethal effects that may affect the reproductive success of raptors and owls, knowledge of the chronic and sublethal effects of toxic chemicals remains limited.

Species affected (taxonomic order):

Category 1 species:	Bearded Vulture, Red Kite
Category 2 species:	Black Kite
CMS flagship species:	Griffon Vulture, Golden Eagle, Northern Goshawk, Peregrine Falcon
Further species:	Common Buzzard, Eurasian Sparrowhawk

4.5.3 Exposed poison bait

The use of poison baits is prohibited by the Federal Act on Hunting and Protection of Wild Mammals and Birds. Rare cases of illegal activities (e.g. killing protected wolves) could also affect carcass-feeding raptors. In Switzerland, there is one documented case of two Golden Eagle deaths due to this threat.

Species affected (taxonomic order):

Category 1 species:	Bearded Vulture
Category 2 species:	-
CMS flagship species:	Griffon Vulture, Golden Eagle
Further species:	Common Buzzard

4.6 Climate change

Climate change affects all raptors and owls, even though its effects can be controversial. While some Mediterranean or frost-susceptible species like the Red Kite, the Eurasian Scops Owl, the Little Owl, the Barn Owl and the Short-toed Snake Eagle seem to be affected positively, alpine and montane species like the Bearded Vulture and the Boreal Owl might suffer from climate change. The Boreal Owl, for example, is threatened by predation and competition from the Tawny Owl, which currently seems to be expanding into higher altitudes. The Bearded Vulture and the Golden Eagle will find fewer ungulate carcasses if winter becomes less severe. It is unclear to what extent future habitat changes caused by climate change will affect birds of prey.

Species affected:

Category 1 species:	all
Category 2 species:	all
CMS flagship species:	all
Further species:	all

4.7 Conclusions

Table 7 summarises current knowledge of species-specific threats and includes published literature, the results of the expert workshop and other species expert opinions. Recent major threats in Switzerland are the decline of food availability (intensification of agriculture, pesticides), habitat loss and degradation (infrastructure, forestry), collisions, electrocution, lead ammunition in prey organisms as well as human disturbances at nesting sites of rare species, such as by rock climbers or photographers.

Table 7: Overview of major topics concerning the protection of raptor and owl species regularly occurring in Switzerland. Importance of threats: red: critical; orange: high; yellow: medium; bluish: low; white: not relevant. +: positive effects. Species are listed in taxonomic order.

		Major topics									
Species	**MoU Category, flagship**	Habitat loss (agriculture)	Habitat loss (infrastructure and settlement building)	Decline of food availability (incl. food accessibility	Disturbances from human activities	Wood harvesting in breeding season	Collision (power lines, wind turbines, roads, and rail)	Electrocution	Unintentional poisoning (pesticides, lead)	Direct persecution	Climate change in CH
Bearded Vulture	**1, F**										
Griffon Vulture	**3, F**										
Osprey	**3, F**										
Golden Eagle	**3, F**										
Short-toed Snake	**3, F**										+
Booted Eagle	**3**										
Red Kite	**1**										+
Black Kite	**2**										
Western Marsh Harrier	**3**										
Hen Harrier	**2**										
Montagu's Harrier	**2**										
Pallid Harrier	**1**										
Common Buzzard	**3**										
Europ. Honey-Buzzard	**2**										?
Eurasian Sparrowhawk	**3**						glass				
Northern Goshawk	**3, F**										
Common Kestrel	**2**										
Red-footed Falcon	**1**										
Eurasian Hobby	**2**										
Peregrine Falcon	**3, F**										
Merlin	**3**										
Tawny Owl	**-**										+
Eurasian Eagle Owl	**F**										
Boreal Owl	**3, F**										
Eurasian Pygmy Owl	**-**										?
Long-eared Owl	**2**										
Short-eared Owl	**2**										
Barn Owl	**F**										+
Little Owl	**F**										+
Eurasian Scops Owl	**2, F**										+
Importance of threat											
Affected species (%)		**86.2**	**65.5**	**48.3**	**79.3**	**48.3**	**72.4**	**44.8**	**34.5**	**17.2**	**6.9**

5. Involved Authorities and Interest Groups

A very wide range of authorities and interest groups is involved in raptor and owl conservation, mainly due to the wide range of threats the species face in Switzerland. A list is provided in Table 8.

Table 8: List of authorities and interest groups involved in raptor and owl conservation for the most relevant threats.

	Involved authorities and groups	Major topics						
		Habitat loss and degradation	Decline of food availability	Disturbance from human activities	Collision	Electrocution	Unintentional poisoning (lead, pesticides, etc.)	Direct persecution
Authorities	National authorities	x	x	(x)	x	x	x	
	Cantonal authorities	x	x	x	x	x	x	x
	Veterinarians / health care professionals		x					
	Forest authorities	x		x				
Interest groups	Hunters						x	
	Poachers							x
	Energy suppliers	x			x	x		
	Wind park operators	x		x	x	(x)		
	Agriculturalists	x	x				x	
	Forest enterprises	x		x				
	Poultry farmers							x
	Pigeon fanciers							x
	Outdoor activists (climbers, para-gliders, drone pilots, winter sports etc.)	(x)		x				
	Railway companies				x	x		
	Road maintenance services	x		x	x			
	Safety controllers at airports				x			(x)
	Nature photographers			x				
	Nature conservation organisations	x	x	x	x	x	x	x
	Researchers/ scientists	x	x	x	x		x	

6. Objectives

The overall aim of the Swiss strategic guidelines and priorities for raptor and owl conservation is to maintain, support and strengthen the populations of all raptor and owl species that regularly breed and migrate in Switzerland. Different objectives must be pursued in order to reduce the peril. Mortality rates need to be reduced, breeding, roosting and foraging habitats must be ensured and improved, and further conservation measures should be implemented.

6.1 General objective

The general objective is to maintain national protection of raptors and owls in Switzerland, and especially to support populations of threatened species (Category 1 and 2 species, CMS flagship species, species of national priority and species on the national Red List). The importance and urgency of raptor and owl conservation is assigned to each superordinate topic (Table 9), and the effort and time frame for implementing the activities of each objective is indicated (Table 10).

6.1.1 Impact objectives

To achieve the overall aim of these conservation guidelines, the following impact objectives must be attained:

- Reduce the mortality of raptor and owl species that face notable losses due to human activities or man-made structures by 2022.
- Steadily improve the conservation status of raptor and owl species in Switzerland by 2035 (downlisting in the Red List, increase in the populations of endangered species).
- Prevent any new threats (disturbance, wind energy, pesticides, etc.) from causing negative population trends in breeding raptor and owl species.
- Carry out conservation measures for species with restricted distribution and small populations to create a positive population dynamic.

6.1.2 Implementation

The impact objectives can be attained by implementing these aims:

- Maintain and improve the availability of suitable habitats for nesting, roosting and foraging. Additionally, apply specific measures according to the ecology of the different species, such as improving breeding conditions by providing nest boxes or reducing the risks of disturbance during breeding.
- Monitor and reduce disturbances of raptors and owls caused by human activities (such as climbing, paragliding, photographing at nests, etc.) at critical sites. Existing conflicts between outdoor activities and breeding raptors and owls in rocky cliffs need to be markedly reduced.
- Designate important sites for migrating raptors by 2022 (categories +++ and ++ in Table 5).
- Refurbish dangerous power lines, poles and rail infrastructure that cause electrocution and collision by 2025.[32]
- Coordinate the development of wind energy nationwide to reduce the cumulative effects (collisions, habitat destruction and disturbances). Critical locations for breeding, roosting and migrating raptors and owls need to be inventoried and excluded from infrastructure planning. This process should take into account the population dynamics of raptor species, especially the population increase and dispersal of the Bearded Vulture. Systematic surveys of collision victims need to be carried out at operating wind parks.
- Monitor and reduce mortality caused unintentionally by toxic substances.
- Stop and prosecute illegal activities such as target poisoning.
- Establish a system of monitoring for important environmental threats by 2030.
- Implement a combined conservation programme for all species that require or have a single species action plan by 2025 (Bearded Vulture, Peregrine Falcon, Eurasian Eagle Owl, Eurasian Scops Owl, Barn Owl).
- Provide conservation management guidelines applicable to key stakeholders (e.g. forestry, agriculture, leisure time).
- Establish effective awareness programmes to reduce conflicts between raptors and owls and human populations such as poultry farmers, hunters or individuals who engage in recreational activities.
- Gain the support of relevant stakeholders and lead agencies (agriculture, forestry, power industries, outdoor activity and leisure time associations, NGOs, etc.) and agencies for the necessary raptor and owl conservation measures.

[32] Pilot schemes A4.1 and A8.1 in Federal Office for the Environment (FOEN) (ed.) 2017: Action Plan for the Swiss Biodiversity Strategy. Bern

Table 9: Objectives for raptor and owl conservation in Switzerland, with the importance of each topic as derived from Table 7.

Importance for raptor and owl survival	Objectives	Urgency of activities	Feasi-bility
Objective 1	Ensure suitable habitats for nesting, foraging and roosting		
High	a. Habitat loss	Medium-high	
	b. Disturbance (outdoor activities, etc.)	Medium-high	
Objective 2	Protect important migratory and breeding sites		
Medium	a. Migratory spots	Medium-high	
	b. Breeding sites	Medium-high	
Objective 3	Ensure availability of safe food for necrophagous birds		
Medium	a. Carcasses	Medium	
Objective 4	Reduce mortality caused by infrastructure		
High	a. Electrocution	High	
	b. Collision	Medium-high	
	c. Windfarm	High	
	d. Prevention of bird strikes	Low	
Objective 5	Reduce mortalities caused by chemical substances		
Low-Medium	a. Pesticides	Medium	
	b. NSAID	Medium	
	c. Lead	Medium	
Objective 6	Prevent poaching		
Low	a. Poisoning	Medium	
	b. Persecution	Medium	
Objective 7	Ensure monitoring of populations of breeding and migratory raptors and owls		
Medium-high	a. Species-specific monitoring	Medium	
	b. Environmental threats (e.g. poisoning, collision)	Medium-high	
Objective 8	Ensure conservation programmes for selected species		
Medium	a. Elaborate single species action plans	Medium	
Objective 9	Raise public awareness of raptors and owls		
Medium	a. Develop public awareness programmes	Medium	
Objective 10	Cross-cutting actions to support raptor conservation		
Medium	a. Engage with range states	Medium	
Medium	b. Further research	Medium	

7. Overview of Objectives and Prioritisation of Activities

The planned activities under the Raptors MoU will be implemented under Swiss hunting legislation. The following table describes in detail the measures planned to ensure the long-term protection of birds of prey in Switzerland and improve their population status where necessary. The recommended activities are classified into the following categories: Policy, Action, Education & Awareness, and Research & Monitoring. In addition, their priority is specified and both the relevance of and the respective effort for their implementation is estimated. The table is neither static nor definitive. It is intended for review at regular intervals (every 5 years). The list serves as an instrument for defining ambitious, feasible perennial work plans with concrete resource requirement estimations and set milestones. Furthermore, the responsible lead organisations are named. The **Swiss species recovery programme for birds,**[33] which is jointly managed by the Swiss Ornithological Institute and BirdLife Switzerland, is mandated to coordinate the national activities and propose annual project plans for species support measures to the steering committee, in which the administrations of the FOEN, the cantonal nature conservation conference (KBNL[34]) and the wildlife management conference (KWL/JFK[35]) are also represented. The representatives are jointly responsible for providing the necessary resources to the best of their ability.

Table 10 summarises the relevant activities and their prioritisation for all recommended activities to improve raptor and owl conservation. The table also provides an overview of the national, cantonal and regional stakeholders involved in conservation measures, the priority for each action and the suggested time frame for its implementation.

[33] http://www.artenfoerderung-voegel.ch; http://www.conservation-oiseaux.ch

[34] Konferenz der Beauftragten für Natur- und Landschaftsschutz; http://www.kbnl.ch

[35] Konferenz für Wald, Wildtiere und Landschaft – kantonale Jagdverwaltungen; https://www.kwl-cfp.ch/de/jfk

Table 10: Recommended activities of the Swiss strategic conservation guidelines for raptors and owls. Among the implementation partners, raptor experts and NGOs generally need to be involved; in this table, only specific stakeholders are mentioned.

	Recommended activities	**Category**	**Time frame for implementation**	**Priority**	**Effort**	**Specific stakeholders**	**Authorities**: N: National, C. Cantonal. R: Regional
Objective 1: Ensure suitable habitats for nesting, foraging and roosting							
	Direct habitat loss						
	Promote recognition and conservation of key breeding and roosting sites for raptors (establish sensitive zones or new protected areas)	Policy	Short	High	Medium	Authorities, public	N,C,R
	Continue the Swiss recovery programme for raptors and owls to implement aims	Action	Ongoing	High	Medium	Authorities, farmers	N,C,R
	Integrate knowledge of raptor habitat requirements into management plans for protected areas	Education & Awareness	Ongoing	Medium	Low	Authorities, researchers	N,C,R
	Prevent wood cutting during breeding season; inventory and protect trees with eyries (habitat trees)	Policy	Medium	High	Medium	Authorities, forestry	N,C,R
	Recognise areas where habitats for farmland species are limited; increase habitats and improve habitat quality where appropriate (e.g. nest boxes)	Action	Ongoing	Medium	Medium	Authorities, farmers, public	C,R
	Support sustainable farming practices to improve the food supply for farmland species (e.g. BFF)	Action	Ongoing	Medium	Low	Authorities, public, farmers	N,C,R
	Reduce pesticide use (e.g. 2nd generation anticoagulant rodenticides; insecticides); avoid poisoned rodents in arable fields	Policy	Ongoing	High	Medium	Authorities, farmers	N,C,R
	Increase awareness of activities that devalue or destroy habitats for raptors and owls Integrate raptors in conservation planning and development projects (EIA)	Education & Awareness	Ongoing	Medium	Medium	Authorities, press, public, farmers	N,C,R

	Recommended activities	Category	Time frame for implementation	Priority	Effort	Specific stakeholders	Authorities: N: National, C. Cantonal. R: Regional
	Disturbance (outdoor activities, etc.)						
	Prevent wood harvesting during the breeding season	Policy	Ongoing	High	Low	Authorities, forestry	N,C,R
	Promote the establishment of tranquillity zones around breeding areas to reduce disturbances (e.g. visitor management in wildlife refuges or restricted flying zones for paragliders, drones, etc.)	Education & Awareness	Ongoing	Medium	Medium	Authorities, public	N,C,R
	Define a best practice to temporally avoid disturbances from outdoor activities such as climbing, drone flying, paragliding, etc. at breeding sites; for example, by implementing temporary wildlife zones	Education & Awareness	Short	Medium	Low	Authorities, experts	N,C,R
	Inventory most important breeding sites to protect them by implementing temporary wildlife zones during the breeding season Avoid publishing climbing routes at these sites in national climbing guides Implement awareness campaigns to reduce disturbances of nest sites by photographers and birders.	Education & Awareness	Medium	Medium	Medium	Authorities, experts	N,C,R
	Implement cross-cutting awareness campaigns to increase awareness of the activities that cause disturbances to raptors and owls and how to avoid disturbances	Education & Awareness	Ongoing	Medium	Low	Authorities, NGOs, Police, photographers	N,C,R
Objective 2: Protect important migratory and breeding sites							
	Migratory sites						
	Develop an inventory of important migratory sites to consider for legal protection.	Policy	Medium	High	Medium	Authorities	N,C

	Recommended activities	Category	Time frame for implementation	Priority	Effort	Specific stakeholders	Authorities: N: National, C. Cantonal. R: Regional
	Breeding sites						
	Regularly update key breeding sites for selected Cat. 1 and CMS flagship species	Policy	Short	Medium	Low	Authorities, experts	N,C
	Conduct cross-cutting campaign to inform about important migratory sites	Education & Awareness	Ongoing	Medium	Medium	Authorities, experts, NGOs, press, public	N,C,R
Objective 3: Ensure availability of safe food for necrophagous birds							
	Carcasses and food for necrophagous birds						
	Legislation will be adapted in accordance with EU legislation (remains of cattle and sheep carcasses in alpine regions where possible), VTNP in force by 01.05.2018 (expected)	Policy	Ongoing	High	Medium	Authorities, Veterinary	N,C
	Awareness-raising: Feeding raptors without an authorization is illegal	Education & Awareness	Short	Medium	Medium	Authorities, Veterinary, experts	N,C,R
	Awareness-raising: Promote information about the critical conservation status of carcass-feeding birds	Education & Awareness	Ongoing	High	Medium	Authorities, NGOs, press, public	N,C,R
Objective 4: Reduce mortality caused by infrastructure							
	Electrocution						
	Support the revision of existing policy and legislation to avoid electrocution prevention barriers	Policy	Medium	High	High	Authorities	N
	Inventory dangerous power lines and poles (incl. rail) that threaten raptors and owls susceptible to electrocution	Action	Medium	High	Medium	Authorities, energy suppliers, railways	N,C,R

	Recommended activities	Category	Time frame for implementation	Priority	Effort	Specific stakeholders	Authorities: N: National, C. Cantonal. R: Regional
	Support the full implementation of mitigation measures for dangerous power lines (incl. rail)	Action	Medium	High	High	Authorities, energy suppliers, railways	N,C,R
	Collision at power lines and other cables						
	Support the revision of existing policy and legislation to improve collision prevention (e.g. by marking dangerous infrastructure)	Policy	Short	Medium	Low	Authorities	N
	Inventory dangerous power lines and infrastructure (incl. traffic carriers)	Action	Medium	Medium	Medium	BAFU	N,C
	Promote marking or insulation of dangerous power lines	Action	Short	Medium	Low	Authorities, energy suppliers	N,C,R
	Promote the use of bird-compatible energy technology as set out in the CMS guidelines on energy infrastructure	Education & Awareness	Ongoing	High	Medium	Authorities, energy suppliers	N,C,R
	Windfarms						
	Prevent wind turbines at important migratory, staging and breeding sites	Policy	Ongoing	High	Medium	Authorities, energy suppliers	N,C,R
	Other infrastructure						
	Elaborate mitigation measures to reduce collision by road traffic, at airports etc.	Education & Awareness	Medium	Medium	Medium	Authorities, Federal Roads Office (FEDRO), Federal Office of Civil Aviation (FOCA), Swiss army	C,R

	Recommended activities	Category	Time frame for implementation	Priority	Effort	Specific stakeholders	Authorities: N: National, C. Cantonal. R: Regional
Objective 5: Reduce mortalities caused by chemical substances							
	Pesticides						
	Advocate for a significant reduction in the use of 2nd generation anticoagulant rodenticides in agriculture and permanent baiting of raptors and owls to significantly reduce mortality; engage farmers to remove poisoned rodents	Policy	Ongoing	Medium	Low	Authorities, farmers	N,C,R
	Uphold the ban on carbofuran and similar chemicals	Policy	Ongoing	High	Low	Authorities, farmers	N,C
	Raise awareness of the negative impacts of certain pesticides for raptors and owls; promote safer alternatives	Education & Awareness	Ongoing	Medium	Medium	Authorities, NGOs, farmers	N,C,R
	NSAID						
	Uphold the ban on the use of human drugs in veterinary medicine and promote an explicit ban on NSAIDs in veterinary medicine in legislation	Policy	Ongoing	High	Medium	Authorities, veterinary, farmers	N,C
	Advocate for mandatory safety testing of all veterinary NSAIDs	Education & Awareness	Medium	Medium	Medium	Authorities, veterinary, pharma industry	N,C
	Lead ammunition						
	Eliminate known risks of lead poisoning to carcass-feeding birds, wildlife and humans	Policy	Medium	High	Medium	Authorities, hunters, arms dealers, ammunition industry	
	Improve enforcement of legislation (control, restrict or ban lead ammunition for hunting and promote alternative ammunitions)	Policy	Short	High	Low	Authorities	N,C
	Raise awareness of the negative impacts of lead ammunition on carcass-feeding raptors and environment	Education & Awareness	Medium	Medium	Medium	Authorities, hunters, arms dealers	N,C,R

	Recommended activities	Category	Time frame for implementation	Priority	Effort	Specific stakeholders	Authorities: N: National, C. Cantonal. R: Regional
Objective 6: Prevent poaching							
	Illegal poisoning & persecution						
	Develop strategies to ensure consistent prosecution. Raise awareness among courts of strict punishments for illegal activities; provide awareness training to game wardens and police	Action	Medium	Medium	Medium	Authorities, police	N,C
	Increase public awareness of reporting illegal activities and detecting poisoned birds of prey	Education & Awareness	Ongoing	Medium	Medium	Authorities, hunters, press	N,C,R
Objective 7: Ensure monitoring of populations of breeding and migratory raptors and owls							
	Species specific monitoring						
	Ensure continuation of existing monitoring programmes (breeding bird surveys, migration)	Research & Monitoring	Ongoing	Medium	Medium	Authorities	N,C,R
	Environmental threats						
	Establish programmes to monitor important food resources (e.g. rodents, large insects)	Research & Monitoring	Ongoing	Medium	Medium	Authorities, scientists	N,C
	Establish a monitoring programme on the effects of energy infrastructure on raptor mortality	Action	Medium	Medium	High	Authorities, energy suppliers	N,C,R
	Systematically collect data on the causes of raptor and owl mortality in the national database	Action	Short	Medium		Authorities, energy suppliers, scientists	N,C;R
	Check if existing programmes in monitoring pesticide use/effects cover critical aspects for raptors and owls. If necessary, establish a pesticide monitoring programme that takes raptors into account	Action	Short	High	Medium -High	Authorities, scientists	N,C

	Recommended activities	Category	Time frame for implementation	Priority	Effort	Specific stakeholders	Authorities: N: National, C. Cantonal. R: Regional
Objective 8: Ensure conservation programmes (action plans) for selected species							
	Implement conservation programmes for selected rare and threatened species (Bearded Vulture, Peregrine Falcon, Eurasian Eagle Owl, Eurasian Scops Owl, Barn Owl)	Action	Medium	Medium	Medium -High	Authorities, raptor experts, NGOs	N
Objective 9: Raise public awareness of birds of prey							
	Develop school lessons about raptors and owls to inform children, schools and families	Action	Medium	Medium	High	Authorities, raptor experts	N,C,R
	Conduct an educational campaign to reveal the environmental value of raptors	Education & Awareness	Ongoing	Medium	Medium	Authorities, raptor experts	N,C,R
	Develop advanced and continuing education for experts (foresters / farmers / game keepers etc.)	Education & Awareness	Medium	Medium	Medium	Authorities, raptor experts	N, C, R
Objective 10: Cross-cutting actions and further research to support raptor conservation							
	Engage with range states to uplist all endangered and critically endangered raptors to CMS Appendix I	Action	Ongoing	Medium	Medium	Authorities, raptor experts	N
	Ensure the participation of Switzerland in the Raptor MoU signatory meeting	Education & Awareness	Ongoing	High	Medium	Authorities	N
	Clarify the impact of habitat quality, food availability, environmental dangers and other factors on the population parameters of certain species to improve conservation measures	Action	Ongoing	Medium	Medium	Researchers, raptor experts	N, C

8. Policies, Ordinances and Legislation relevant to Raptor and Owl Conservation

See also Chapter 2.3 for general legislation

8.1 Habitat loss

8.1.1 Relevant legislation in respect of habitat loss and associated food limitation

(1) Federal Act on the Protection of the Environment (1983, SR 814.01)

(2) Convention on Migratory Species (CMS, Bonn Convention, 1995, SR 0.451.46)

(3) Federal Act on Agriculture (1998, SR 910.1)

(4) Federal Act on Forest (1991, SR 921.0)

(5) Federal Act on Spatial Planning (1979, SR 700)

8.1.2 Relevant legislation in respect of feeding opportunities for necrophagous birds

(1) Ordinance on Animal By-products (Verordnung über tierische Nebenprodukte, 2011 SR 1916.441.22) (Art. 2 and 10)

(2) Hunting ordinances of the cantons

8.2 Disturbances

8.2.1 Relevant legislation in respect of leisure time and outdoor activities

(1) Federal Act on Hunting and Protection of Wild Mammals and Birds (1986, SR 922.0)

(2) Federal Act on Spatial Planning (1979, SR 700)

8.2.2 Relevant legislation for forestry in breeding season

(1) Federal Act on Hunting and Protection of Wild Mammals and Birds (1986, SR 922.0)

(2) Federal Act on Forest (1991, SR 921.0)

8.2.3 Relevant fishery legislation

(1) Federal Act on Hunting and Protection of Wild Mammals and Birds (1986, SR 922.0)

(2) Federal Act on Fisheries (1991, SR 923.0)

8.3 Infrastructural threats

8.3.1 Relevant legislation in respect of electrocution

(1) Federal Act on the Protection of the Environment (1983, SR 814.01), Article 10a, Environmental Impact Assessment

(2) Ordinance on the Environmental Impact Assessment (1988, SR 814.011)

(3) Ordinance on Power Lines (RS 734.31 Ordonnance du 30 mars 1994 sur les lignes électriques (OLEI)) (Art. 2 para. 1, para. 2 lit. c and Art. 30)

(4) Guidelines on Electricity Grids and Landscape Protection and the Swiss Landscape Concept

(5) Power lines evaluation system and manual of the Swiss Federal Office of Energy (SFOE) (2013) (Lignes de transport d'électricité: Système d'évaluation et manuel. German, download: http://www.bfe.admin.ch/energie/00588/00589/00644/ index.html?lang=fr&msg-id=48260)

(6) The electricity transmission and landscape conservation guidelines of the Federal Department of Home Affairs from 1980

7) Environmental checklist for railway facilities not requiring an EIA ("Liste de contrôle Environnement pour les installations ferroviaires non soumises à l'EIE") of the Federal Office for the Environment (FOEN)

(8) Bird protection guidelines for contact line systems ("Richtlinie Vogelschutz bei Fahrleitungsanlagen") of the Federal Office of Transport from 2016 [36]

(9) Bird protection from high-voltage open wires with rated voltage of over 1 kV ("Vogelschutz an Starkstrom-Freileitungen mit Nennspannungen über 1 kV") document of the FOEN from 2009

Review of legislation (electrocution):

For new power lines, the **Federal Act on the Protection of the Environment (1983, SR 814.01)** stipulates that the environmental impact of new installations – or the expansion of existing ones – must be assessed before approval. **The Ordinance on the Environmental Impact Assessment (1988, SR 814.011)** stipulates that new constructions and modifications to existing electric power infrastructure and power lines of high voltage (≥ 220kV) require in most cases an Environmental Impact Assessment (EIA) (such as for increasing the voltage from 220kV to 380kV, a major change in alignment, a significant increase in masts, construction and expansion of railway lines, etc.). The construction of new high-voltage lines (≥ 220kV) are subject to strict EIA procedures, which may include compensatory measures for habitats and species, particularly if protected areas and species on Red Lists (Ordinance RS 814.011) are concerned. Medium-voltage power lines in the regional distribution system (1 – 36kV) do not require an Environmental Impact Assessment.

The **Ordinance on Power Lines (RS 734.31)** regulates the construction of new power lines (Art. 2 para. 1) and the improvement of existing power lines when they cause a threat to man or to the environment (para. 2 lit. c). Article 30 paragraph 1provides for both cases: "Where required locally, measures shall be taken such that birds on cross-arms cannot cause shorts in ground or phase-to-phase short circuits." However, the regulation sets no date or obligation for implementation.

For each individual line, a decision must be made on the basis of objective criteria whether the power line should be installed as a transmission line or as an underground cable.

The **"Electricity Transmission and Landscape Conservation"** guidelines of the Federal Department of Home Affairs from 1980 should be taken into account: Important habitats of sensitive species and the closer vicinity of breeding sites of vulnerable bird species as well as nationally important landscapes, species and habitats should be avoided. If it is not possible to circumvent such areas, underground cabling and alternative corridors must be considered as options.

In accordance with the verdict of the Swiss Federal Supreme Court, underground cables are probably the future for new power line constructions (verdict 1C_398/2010 of April 11, 2011). According to the new Electricity Act (Art. 15c), power lines in the electric distribution network with a rated voltage of less than 220 kV generally have to be installed as underground cables, if technically and operationally

[36] https://www.bav.admin.ch/bav/de/home/rechtliches/rechtsgrundlagen-vorschriften/richtlinien/richtlinien-bahn/vogelschutz-bei-fahrleitungsanlagen.html

feasible and if the total costs of an underground cable do not exceed a certain cost factor (maximum 3.0) compared to a technically equivalent distribution variant. This means that most of the new medium-voltage power lines and existing lines requiring remediation will be installed as cable lines in the future. Older types of power lines, however, remain a matter of concern.

Railway infrastructure is a recognised potential risk for bird collisions or electrocutions. The Federal Office for the Environment (FOEN) published an environmental checklist for rail facilities not requiring an EIA ("Liste de contrôle Environnement pour les installations ferroviaires non soumises à l'EIE") which states that standard bird protection measures need to be undertaken.

The **guideline for bird protection at power lines** (VSE et al. 2009) stipulates a minimum distance of 60 cm between potential seating for birds and conducting parts to prevent electrocution. The guideline of the **Federal Office of Transport (FOT)** allows this distance of 60 cm. Even if a good many bird electrocutions can thus be prevented, it seems insufficient for very large species (Jenny 2017).

According to the FOEN, the adaptation of existing dangerous medium-voltage pylons can only be considered a compensation measure for infrastructural projects if raptors are directly threatened.

8.3.2 Relevant legislation in respect of collision at power lines and other cables

(1) Federal Act on the Protection of the Environment (1983, SR 814.01), Article 10a of the Environmental Impact Assessment

(2) Ordinance on the Environmental Impact Assessment (1988, SR 814.011)

(3) Ordinance on Power Lines (RS 734.31 Ordonnance du 30 mars 1994 sur les lignes électriques (OLEI)) (Art. 2 para. 1, para. 2 lit. c and Art. 30)

(4) Guidelines on Electricity Grids and Landscape Protection and the Swiss Landscape Concept

(5) Power lines evaluation system and manual of the Swiss Federal Office of Energy (SFOE) (2013) (Lignes de transport d'électricité:

Système d'évaluation et manuel. German, download:
http://www.bfe.admin.ch/energie/00588/00589/00644/ index.html?lang=fr&msg-id=48260)

(6) The "Electricity Transmission and Landscape Conservation" guidelines of the Federal Department of Home Affairs from 1980

(7) Environmental checklist for railway facilities not requiring an EIA of the Federal Office for the Environment (FOEN) ("Liste de contrôle Environnement pour les installations ferroviaires non soumises à l'EIE")

(8) Bird protection guidelines for contact line systems of the Federal Office of Transport from 2016 ("Richtlinie Vogelschutz bei Fahrleitungsanlagen" [37]

(9) Bird protection from high-voltage open wires with rated voltage of over 1 kV "Vogelschutz an Starkstrom-Freileitungen mit Nennspannungen über 1 kV" (FOEN 2009)

[37] https://www.bav.admin.ch/bav/de/home/rechtliches/rechtsgrundlagen-vorschriften/richtlinien/richtlinien-bahn/vogelschutz-bei-fahrleitungsanlagen.html

8.3.3 Relevant legislation in respect of the impact of wind farms

(1) Federal Act on the Protection of the Environment (1983, SR 814.01), Article 10a of the Environmental Impact Assessment

(2) Convention on Migratory Species (CMS, Bonn Convention, 1995, SR 0.451.46)

(3) Wind power guidelines of the Federal Office for Spatial Development (ARE) from 2017 (Konzept Windenergie. Basis zur Berücksichtigung der Bundesinteressen bei der Planung von Windenergieanlagen. Bern) [38]

(4) EIA handbook from 2009 (UVP Handbuch (2009): Richtlinie des Bundes für die Umweltverträglichkeitsprüfung) (Art. 10b para. 2 of the EPA and Art. 10 para. 1 of the EIAO)

8.3.4 Relevant legislation in respect of bird strike prevention at airports

(1) Federal Act on Hunting and Protection of Wild Mammals and Birds (1986, SR 922.0)

(2) Federal Act on Aviation (1948, SR 748.0)

(3) Ordinance of 23 November 1994 on Aviation Infrastructure (Verordnung über die Infrastruktur der Luftfahrt vom 23. November 1994, SR 748.131.1)

8.3.5 Relevant legislation in respect of other infrastructure

(1) Ordinance on Road Maintenance in Active Service (Verordnung über den Strassenunterhalt im aktiven Dienst, 1986, SR 510.725)

8.4 Direct persecution

8.4.1 Relevant legislation in respect of hunting

(1) Federal Act on Hunting and Protection of Wild Mammals and Birds (1986, SR 922.0)

8.4.2 Relevant legislation in respect of poaching

(1) Federal Act on Hunting and Protection of Wild Mammals and Birds (1986, SR 922.0)

8.5 Unintentional poisoning

8.5.1 Relevant legislation in respect of lead intoxication in carcass-feeding raptors

(1) Federal Act on Hunting and Protection of Wild Mammals and Birds (1986, SR 922.0).

8.5.2 Relevant legislation in respect of raptor toxic chemicals

(1) Ordinance on Hunting and Protection of Wild Mammals and Birds (1988, SR 922.01, Art. 2f)

(2) Ordinance on Veterinary Medicinal Products (Tierarzneimittelverordnung, 2004, SR 812.212.27)

(3) Ordinance on the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Chemicals in International Trade (Verordnung zum Rotterdamer Übereinkommen über das Verfahren der vorherigen Zustimmung nach Inkenntnissetzung für bestimmte Chemikalien im internationalen Handel (PIC-Verordnung, 2004, ChemPICV SR 814.82))

(4) Federal Act on Agriculture (198, SR 910.1)

8.5.3 Relevant legislation in respect of exposed poison bait

(1) Ordinance on Hunting and Protection of Wild Mammals and Birds (1988, SR 922.01, Art. 2f)

[38] https://www.are.admin.ch/are/de/home/raumentwicklung-und-raumplanung/strategie-und-planung/konzepte-und-sachplaene/konzepte/anhoerung-konzept-windenergie.html

9. Implementation and Funding of Activities

As outlined in Swiss hunting legislation, the Confederation and the cantons are primarily responsible for implementing the activities that are selected and prioritised within the framework of these strategic guidelines. However, non-governmental organisations active in Swiss nature conservation also play a decisive role. They have been making an invaluable contribution to national and international bird conservation for more than a century, not only financially, but also by involving civil society in voluntary work such as bird monitoring.

To guide the implementation of activities both strategically and operationally, a coordination structure is required that unites the very different organizations involved in bird conservation. Such a framework already exists with the **Swiss species recovery programme for birds.**[39] It is proposed that the implementation of these strategic guidelines be coordinated by this programme's operational management team. One employee each from the Swiss Ornithological Institute and Birdlife Switzerland would be in charge of preparing and proposing project plans for species support measures. Their tasks would be to break down the recommended activities under each of the 10 objectives (see Chapter 7, Table 10) into an achievable perennial work plan, calculate the financial and human resources required for each planned action and coordinate the concrete actions. In addition, funding will need to be obtained for cross-cutting communication and overarching awareness-raising programmes and the development and management of environmental threat databases (e.g. intentional and unintentional poisoning). Finally, support will be required to further enhance the existing ornithological databases. The Steering Committee of the Swiss species recovery programme for birds, which meets regularly, will make joint decisions on the priorities to be set.

Estimating the cost of implementing the prioritised activities is beyond the scope of these guidelines. A comprehensive budget and fundraising plan needs to be developed for each selected measure. However, as a general principle, budgeting and fundraising for the implementation of activities should primarily be driven by the stakeholders most responsible for those activities ("polluter pays" principle).

The broad spectrum of threats, their political relevance and the need to implement various measures on different spatial and temporal scales with a broad variety of interest groups make it necessary and possible to finance nature conservation in Switzerland through a variety of financing mechanisms. In addition to the national authorities, which provide and maintain much of the funding required to effectively implement the guidelines, cantonal authorities also share responsibility for providing financial and human resources for nature and bird conservation. Since many activities (e.g. monitoring) require the voluntary participation of the civilian population in order to be feasible, the relevant NGOs have an important role to play at both the national and the regional level. The coordination framework of the Swiss species recovery programme for birds is critical in encouraging and recruiting further stakeholders to support the development of projects and proposals on how to source their funding.

Fundraising should look beyond wildlife and environmental associations and actively consider engaging other sectors, such as agriculture, forestry, tourism, sports and energy, which need to integrate bird of prey conservation initiatives.

On a regional or more localised scale, other supporters such as trusts and foundations, and even the private sector, could provide appropriate sources of funding.

[39] http://www.artenfoerderung-voegel.ch; http://www.conservation-oiseaux.ch

List of potential sources of funding:

- Federal Office for the Environment (FOEN)
- Other federal offices (Federal Office for Agriculture (FOAG), Swiss Federal Office of Energy (SFOE), Swiss Federal Nuclear Safety Inspectorate (ENSI)
- Cantons
- Swiss Ornithological Station
- Birdlife Switzerland
- Pro Natura
- WWF Switzerland
- Tourism
- Sports associations
- Hunting associations
- Foundations

10. Further Research

10.1 Monitoring

Our general knowledge of raptor and owl populations in Switzerland is good. However, accurate population estimates for some breeding populations of discreet forest-breeding and especially nocturnal species are lacking (e.g. the Eurasian Sparrowhawk, the Northern Goshawk, the Eurasian Pygmy Owl, the Boreal Owl and the Tawny Owl). Nevertheless, increasing our knowledge of population dynamics while monitoring these species would require disproportionate efforts. To document the effect of activities on forest-breeding species, we would need to study selected populations or screen specific environmental threats (such as by analysing moulting feathers).

Monitoring of breeding populations is coordinated and carried out systematically in a representative range of sites. Nation-wide or at least regional surveys on reproductive success exist for a number of species (e.g. the Bearded Vulture, the Little Owl, the Scops Owl, the Golden Eagle, the Red Kite, the Eurasian Eagle Owl, the Kestrel, the Peregrine Falcon, the Barn Owl, the Long-eared Owl and the Boreal Owl). Thanks to the long-standing efforts of the Swiss Ornithological Institute, coordinated monitoring programmes exist for most raptor and owl populations. However, monitoring programmes for food resources (small mammals, large insects) and environmental threats such as toxic loads are still lacking, though just as necessary.

Diverse monitoring programmes exist for migrating raptors. The major migration site survey in an adjacent region (Défilé de l'Ecluse, France) is supported financially by the Swiss Ornithological Institute, and Swiss ornithologists from the Geneva region help out with the field work. Furthermore, since 2007, an Internet platform (www.ornitho.ch) has been used to collect data on bird occurrences. Hundreds of Swiss birders participate and provide data on raptors and owls, in addition to other species.

10.2 Conservation research

We have only limited knowledge of current bird of prey contamination by environmental pollutants (toxics and pesticides) and their effects on reproduction success. For individual species such as the Little Owl, we know about the impact of habitat quality on reproduction success (Perrig et al. 2017). However, to improve conservation measures, the impact of habitat quality and food availability on certain species' population parameters needs to be clarified.

The effects of climate change on raptors and owls and their habitats seem to be of secondary importance, as Switzerland covers a wide range of altitudes and thus different climatic zones. Nevertheless, some climate-driven changes are known in Switzerland, such as increasing competition

between the Boreal Owl and the Tawny Owl, which puts pressure on the former species. Tawny Owls currently seem to be spreading into higher altitudes due to climatic considerations (Ravussin et al. 2015). Conversely, some species, such as the Short-toed Snake Eagle and the Eurasian Scops Owl, are benefiting from climate warming in Switzerland. Scientific research on the effects of climate change on the birds of prey population would be greatly appreciated; however, it is not crucial for implementing raptor conservation in Switzerland.

Research and monitoring should focus on the most apparent knowledge gaps with respect to Swiss raptor and owl populations, which are summarised in Table 11.

Table 11: The most apparent knowledge gaps with respect to Swiss raptor and owl populations. L: Low; M: Medium; H: High.

Knowledge gaps	Involved species	Importance
Population sizes, trends in forest breeding and some nocturnal species	Northern Goshawk, Eurasian Sparrowhawk, Eurasian Pygmy Owl, Boreal Owl, Tawny Owl	L-M
Population ecology for certain species (productivity, mortality rates, survival rates, genetic structure and fragmentation, dispersal mechanisms, Population Viability Analyses, etc.)	Bearded Vulture, Red Kite, Northern Goshawk, Peregrine Falcon, Eurasian Eagle Owl	M
Habitat use and selection	Bearded Vulture, Golden Eagle, Griffon Vulture, Short-toed Snake Eagle	L
Dispersal, migration and wintering	Long-distance migrants; Kestrel, Hobby, Eurasian Sparrowhawk	M
Impact of threats	all	M
Evaluation of the effectiveness of conservation activities	Species in the Swiss bird conservation programme (“Programm Artenförderung”)	L (existing for some species)
Central database for fatal causalities - including analyses	all	H
Sensitivity of some species to wind power (including nocturnal and forest species)	all	H
Effects of environmental threats (sublethal, chronic)	all	M

10.3 Further support measures

Despite decent legal protection, some species are showing negative population trends or insufficient breeding success on at least a regional scale, which are caused by a variety of different factors (habitat loss, electrocution, disturbances, food limitation). For such threatened species, nation-wide conservation programmes should be launched to coordinate and strengthen actions in the cantons. Management plans for designated conservation areas exist for the Little Owl (Meisser et al. 2016). Conservation projects for the Eurasian Scops Owl are running successfully in the cantons of Valais and Ticino, and its breeding population is increasing again. However, the maintenance and restoration of suitable habitats with high food abundance (mainly Tettigoniidae) seem to be a crucial factor for the population of this species. Core areas need to be protected and restored, where necessary.

Cliff-breeding species like the Peregrine Falcon and the Eurasian Eagle Owl face problems like human disturbances. Potential conflicts are being effectively resolved with climbers and other actors in certain regions. For example, in Valais, the Swiss Ornithological Institute mapped areas where a potential conflict could arise between rock climbers and the breeding sites of selected species and contacted stakeholders to propose spatial and temporal mitigation measures. However, nationally consistent criteria to protect breeding raptors and owls on rocky cliffs are still lacking. Furthermore, collision and electrocution threaten the Eurasian Eagle Owl population at least regionally.

The Barn Owl is a year-round resident of arable land and thus very susceptible to local limitations in food availability or accessibility. Biodiversity support areas and reduced pesticide use could guarantee foraging throughout the year.

At a minimum, protection efforts for Bearded Vultures in the Alps need to be coordinated with neighbouring countries (Austria, France, Germany, Italy and Liechtenstein). Outside of Switzerland, illegal persecution still seems to be a serious problem, at least regionally. EIAs for wind farms should consider all Bearded Vulture pairs, including those breeding in adjacent neighbouring countries. Furthermore, in light of the population's current expansion, the precautionary principle should also be applied to suitable potential habitats.

At present, the rarest breeding raptor species in Switzerland is the Short-toed Snake Eagle. It colonised Switzerland only recently and seems to benefit from climate change and the dry, hot summers. One threat faced by this species is the abandonment of extensive grassland management in remote areas and the subsequent succession of these open meadows to more closed bushy and woody habitats.

10.4 Remedial activities

In Switzerland, with the successful reintroduction of the Bearded Vulture from captive bred birds and the current reintroduction programme for the Osprey, it is not necessary to reintroduce additional bird of prey species. However, support must be guaranteed for on-going projects. To date, wild harvests have not put pressure on any bird of prey populations. Moreover, there are no known diseases that would pose a relevant threat to bird of prey populations in Switzerland. Nevertheless, response procedures should be established to prepare for such an event.

11. Conclusion

Major problems for birds of prey and owls in our country arise from human population pressure on their remaining natural habitats (due to growing settlements and industries, the development of wind energy, intensive agriculture and forestry) and mainly unintentional disturbances from sources such as outdoor activities. Subsequent conservation actions should therefore focus on these effects.

These guidelines present the facts on the recent status, threats and conservation measures that apply to all raptor and owl species regularly occurring in Switzerland. Their overall goal is to maintain and improve the conservation status of raptors and owls. The proposed measures do not focus on one specific species, but are rather concerned with serious general threats to raptors and owls. In Switzerland, the guidelines should be implemented throughout its entire national territory. The international approach of the Raptors MoU guarantees that neighbouring countries will also improve the protection status of raptors and owls, while the international context allows for the comparison of conservation strategies and threats.

For some raptor or owl species, protection or promotion may be achieved with specific measures and relatively little effort (e.g. improving nesting opportunities), whereas other species require a transnational approach to their conservation. Despite Switzerland's small geographical area in Europe, Swiss conservation guidelines make an important contribution to improving the European conservation status of some raptor species such as the Bearded Vulture or the Golden Eagle. Yet, the fate of many migratory

species may heavily depend on the strategies used by other countries along their flyways. Effective raptor conservation is only achievable with a transnational and comprehensive approach.

In Switzerland, raptors and owls are reasonably well protected by law, and our major national threats may only be considered minor priorities in other, less populated countries. Conversely, major conservation topics for some raptors species or owls in other countries may only be marginal threats in Switzerland. Therefore, the threats and measures presented in the Swiss guidelines may not apply to the situations in other countries.

For the conservation of many species, especially the Bearded Vulture and migrants such as the Red Kite, collaborative transboundary measures with adjacent Signatory States are compulsory. Thus, we strongly support the efforts made by the secretary of the MOU to improve international cooperation between conservationists, researchers and authorities. Switzerland is committed to raptor and owl conservation under the Raptors MoU and will participate in the signatory meeting.

In conclusion, these guidelines do not enjoy official status as an enforcement aid. Yet, they should lead to mandatory regulations and targeted activities. Stakeholders need to be involved at early on in the implementation phase.

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13. Annexes

Annex I

Table 1 Status of birds of prey species occurring in Switzerland

Table 2 Status of all raptor and owl species regularly occurring in Switzerland divided up into biogeographic regions

Table 3 List of important habitats for raptor and owl species that regularly occur in Switzerland

Table 4 List of threats having potential or known impact on the population of Category 1, National Priority and Category 2 species

Annex II

Species Account

Annex I

Table 1. Status of birds of prey regularly occurring in Switzerland

National name/ English name	Scientific name	National legal status	National cons. status (regular breeders) 1	National status 2	Breeding population size 2005-12 (min - max) 3	Breeding population size 2013-16 (min - max) 3	Migration numbers (min - max) 4	National trend (regular breeders) 5	Trend period6	Is the species monitored? 7	National or Regional Conservation /Action Plan8
Raptors MoU, Category 1 species (Globally threatened and Near Threatened species according to the latest IUCN Red List)											
Bearded Vulture	*Gypaetus barbatus*	strictly protected	F	RB	5-12 pairs (G)	12-17 (G)	0 (G)	SI	2006-16	Annually	Yes
Red-footed Falcon	*Falco vespertinus*	strictly protected	-	PM	0 (G)	0 (G)	20-1,000 (M) (invasional character)	-	2000-17	Annually	No
Red Kite	*Milvus milvus*	strictly protected	F	RB, PM, WV	1,200-1,500P (M)	2,800-3,500 (M)	10,000-20,000 (Défilé de l' Ecluse: 7,500-10,000)	LI	2005-12 - 2013-16	Annually	No
Pallid Harrier	*Circus macrourus*	strictly protected	-	PM	0 (G)	0 (G)	1-5 (M)	-	2000-17	-	No
National or Regional Priority or 'flagship' species											
Osprey	*Pandion haliaetus*	strictly protected	-	PM, SV	0 (G)	0 (G)	150-200 (M) Défilé de l' Ecluse: 100-150	-	2000-15	Annually	Yes
Griffon Vulture	*Gyps fulvus*	strictly protected	-	SV, V	0 (G)	0 (G)	50-150 (M)	-	2000-17	Annually	No
Golden Eagle	*Aquila chrysaetos*	strictly protected	F	RB	320-340 pairs (G)	350-360 (G)	-	SI	2005-12- 2013-16	Annually	No
Short-toed Snake Eagle	*Circaetus gallicus*	strictly protected	-	OB, V, SV	0-1 pairs (P)	3-5 (M-G)	10-15 (M) Défilé de l' Ecluse: 2-7	SI	2005-12 - 2013-16	Annually	No
Northern Goshawk	*Accipiter gentilis*	strictly protected	F Regional: U	RB	1,400-1,600 pairs (P-M)	1,300-1,700 (P-M)	30-50 (M) Défilé de l' Ecluse: 2-11	SD*	1993-96 2013-16	Annually	No

National name/ English name	Scientific name	National legal status	National cons. status (regular breeders) 1	National status 2	Breeding population size 2005-12 (min - max) 3	Breeding population size 2013-16 (min - max) 3	Migration numbers (min - max) 4	National trend (regular breeders) 5	Trend period6	Is the species monitored? 7	National or Regional Conservation /Action Plan8
Peregrine Falcon	*Falco peregrinus*	strictly protected	F Regional: U	RB	300-400 P (M-G)	260-320 (G)	50 (P)	MD	2005-12-2013-16	Annually	No
Barn Owl	*Tyto alba*	strictly protected	U	RB	1,000-2,500 P (M)	200-1,000 (M)	-	MD	2005-12-2013-16	Annually	Yes
Eurasian Eagle Owl	*Bubo bubo*	strictly protected	F Regional: U	RB	100-140 P (M)	200-230 (G)	-	LI	2005-12-2013-16	Annually	Yes
Boreal Owl	*Aegolius funereus*	strictly protected	F	RB	2,000-3,000 (P)	1,000-3,000 (P)	-	SD-S	2005-12-2013-16	Annually	No
Little Owl	*Athene noctua*	strictly protected	U Regional: F	RB	80-110 (G)	115-150 (G)	-	MI	2005-12-2013-16	Annually	Yes
Raptors MoU, Category 2 species (species considered to have unfavourable conservation status at regional level within a Range State)											
European Honey Bussard	*Pernis apivorus*	strictly protected	F	RB, PM	400-600 P (M)	500-1000 (M)	10,000-15,000 (M) (Défilé de l' Ecluse: 4-10,000)	S-SI*	1993-96-2013-16	Annually	No
Black Kite	*Milvus migrans*	strictly protected	F	RB, PM	1,200 - 1,500 pairs (M)	2,000-3,000 (M)	12,500-20,000 (M) Défilé de l' Ecluse: 7,000-15,000	LI	1993-96-2013-16	Annually	No
Hen Harrier	*Circus cyaneus*	strictly protected	-	WV, PM	0 (G)	0 (G)	40-80 (M) Défilé de l' Ecluse: 30-60	-	1993-96-2013-16	Annually	No
Montagu's Harrier	*Circus pygargus*	strictly protected	-	PM	0 (G)	0 (G)	20-50 (M) Défilé de l' Ecluse: 10-30	-	1993-96-2013-16	Annually	No
Common Kestrel	*Falco tinnunculus*	strictly protected	F	RB, PM, WV	4,000-6,000 pairs (M)	5,000-7,500 (M)	2,000-5,000 (Poor) Défilé de l' Ecluse: 400-1,500	MI	2005-12-2013-16	Annually	Yes
Eurasian Hobby	*Falco subbuteo*	strictly protected	F	RB, PM	400-600 pairs (M)	500-1,000 (M)	1,000-2,000 (P) Défilé de l'	S-SI	1993-96-2013-16	Annually	No

National name/ English name	Scientific name	National legal status	National cons. status (regular breeders) 1	National status 2	Breeding population size 2005-12 (min - max) 3	Breeding population size 2013-16 (min - max) 3	Migration numbers (min - max) 4	National trend (regular breeders) 5	Trend period6	Is the species monitored? 7	National or Regional Conservation /Action Plan8
							Ecluse: 80				
Eurasian Scops Owl	*Otus scops*	strictly protected	U regional: F	RB, V	20-30 pairs (G)	30-40 (G)	? (P)	MI	2005-12-2013-16	Annually	Yes
Long-eared Owl	*Asio otus*	strictly protected	F regional: U	RB, WV	2,500-3,000 (M)	2,000-3,000 (M)	? (P)	S*	1993-96-2013-16	Annually	No
Short-eared Owl	*Asio flammeus*	strictly protected	-	PM, WV	0 (G)	0 (G)	5-15 (M)	-	1990-2017	Annually	No
National common and regularly occurring species (Category 3 and no category)											
Booted Eagle	*Aquila pennata*	strictly protected	-	V	0 (G)	0 (G)	0-3 (M)	-	2000-15	-	No
Western Marsh Harrier	*Circus aeruginosus*	strictly protected	-	PM, SV	0 (G)	0-3 (G)	1,000-2,000(M) Défilé de l' Ecluse: 300-1,000	SI	1993-96-2013-16; 2000-15	Annually	No
Common Buzzard	*Buteo buteo*	strictly protected	F	RB, PM, WV	20,000-25,000 pairs (M)	15,000-20,000 (M)	30,000-75,000 (M) Défilé de l' Ecluse: 14,000-56,000	S*	1993-96-2013-16; 2000-15	Annually	No
Eurasian Sparrowhawk	*Accipiter nisus*	strictly protected	F	RB, PM, WV	3,000-4,000 pairs (P-M)	3,500-6,000 (P-M)	2,000-5,000 (M) Défilé de l' Ecluse: 1,300-2,500	S-SI*	1993-96-2013-16; 2000-15	Annually	No
Merlin	*Falco columbarius*	strictly protected	-	PM, WV	0 (G)	0 (G)	50-100 (M) Défilé de l' Ecluse: 15-79	-	1993-96-2013-16;	Annually	No
Tawny Owl	*Strix aluco*	strictly protected	F	RB	5,000-6,000 pairs (M-P)	6,000-8,000 (M-P)	-	S*	1993-96-2013-16	Annually	No
Eurasian Pygmy Owl	*Glaucidium passerinum*	strictly protected	F	RB	800-1,200 pairs (P)	800-2,000 (P)	-	S-SI*	2005-12-2013-16	Annually	No

[1] National conservation status: F - Favourable, U - Unfavourable

[2] National or Regional status: RB-Regular breeder, OB - Occasional breeder, RNB - Resident non-breeder, WV - Winter visitor, SV - Summer visitor, PM - Passage migrant, V – Vagrant, E - Extinct

[3] Breeding population size: e.g. 2,000-5,000. Specify if pairs or individuals: P – pairs, I – individuals

Please indicate the quality of data as Good (G) = Reliable quantitative data available (e.g. atlas, survey or monitoring data) for the whole period and country, Medium (M) = generally well known, but only poor or incomplete quantitative data available, Poor (P) = Poorly known with no quantitative data available, Unknown (U) = information on quality not available.

[4] Migration numbers: number of individuals. Please indicate the quality of data as Good (G), Medium (M), Poor (P) or Unknown (U).

[5] National or regional breeding population trend in the last 10 years (or three generations). If possible, qualify the trend using the following categories: LD - Large decline (>=30%), MD - Moderate decline (10-29%), SD - Small decline (0-9%), S - Stable (<10% decline and <10% increase), SI - Small increase (0-9%), MI - Moderate increase (10-29%), LI - Large increase (>=30%), U - Unknown (insufficient data). For some species, actual percentage values may not be known. Use of categories should be based on the best available data or expert judgement. *: New methodology led to new population estimates.

[6] Trend period: e.g. 2000-2010

[7] Is the species monitored?: Yes (if yes please specify: Annually - More than once a year – Not annually but regularly - Occasionally)

[8] National or Regional Conservation/Action Plan: Yes (if yes please indicate the year of publication) - No

Table 2: Status of all raptor and owl species regularly occurring in Switzerland separated into biogeographic regions.

	Site ID	CH 1	CH 2a	CH2b	CH3	CH3	CH5	CH6
	Site name (biogeographic regions)	Jura	Western Midlands	Eastern Midlands	Northern Alps	Western Central Alps	Eastern Central Alps	Southern Alps
National name/ English name	Scientific name							
Raptors MoU, Category 1 species (Globally threatened and Near Threatened species according to the latest IUCN Red List)								
Bearded Vulture	*Gypaetus barbatus*	-	-	-	da	br	br	da
Red-footed Falcon	*Falco vespertinus*	mr	mr	mr	mr	mr	mr	mr
Red Kite	*Milvus milvus*	br, mr, sa cs	br, mb sa, ra, cs	br, mr sa, ra, cs	br, mr	br, mr	br, da	da
Pallid Harrier	*Circus macrourus*	mr	mr	mr	-	mr	-	mr
National or Regional priority or 'flagship' species								
Osprey	*Pandion haliaetus*	mr	mr, sa	mr, sa	mr	mr	mr	mr, sa
Griffon Vulture	*Gyps fulvus*	da, mr	mr	mr	sa, da	sa	mr	mr
Golden Eagle	*Aquila chrysaetos*	br	-	-	br	br	br	br
Short-toed Snake Eagle	*Circaetus gallicus*	mr, da	mr	mr	mr	br	da	br
Northern Goshawk	*Accipiter gentilis*	br	br	br	br	br	br	br
Peregrine Falcon	*Falco peregrinus*	br	rare br, sa	rare br, sa	br	br	br	br
Barn Owl	*Tyto alba*	rare br	br	br	rare br	-	-	-
Eurasian Eagle Owl	*Bubo bubo*	br	rare br	rare br	br	br	br	br
Boreal Owl	*Aegolius funereus*	br	-	-	br	br	br	br
Little Owl	*Athene noctua*	br	rare br	rare br	-	rare br	-	br
Raptors MoU, Category 2 species (species considered to have unfavourable conservation status at the regional level within a Range State)								
European Honey Bussard	*Pernis apivorus*	br, mr	br, mb	br, mr	br, mr	br, mr	br, mr	br, mr
Black Kite	*Milvus migrans*	br, mr	br, mr	br, mr	br, mr	br, mr	rare br, mr	br, mr
Hen Harrier	*Circus cyaneus*	mr	mr, sa	mr, sa	mr	mr	mr	mr
Montagu's Harrier	*Circus pygargus*	mr	mr	mr	mr	mr	mr	mr
Common Kestrel	*Falco tinnunculus*	br, mr	br, mr	br, mr	br, mr	br, mr	br, mr	br, mr

	Site ID	CH 1	CH 2a	CH2b	CH3	CH3	CH5	CH6
	Site name (biogeographic regions)	Jura	Western Midlands	Eastern Midlands	Northern Alps	Western Central Alps	Eastern Central Alps	Southern Alps
Eurasian Hobby	*Falco subbuteo*	br, mr	br, mr	br, mr	br, mr	rare br, mr	rare br, mr	br, mr
Eurasian Scops Owl	*Otus scops*	rare br	rare br	rare br	rare br	br	rare br	br
Long-eared Owl	*Asio otus*	br	br, sa	br, sa	br	br	br	br
Short-eared Owl	*Asio flammeus*	mr	nr	nr	-	-	-	-
National common and regularly occurring species (category 3 and no category)								
Booted Eagle	*Aquila pennata*	mr	mr	mr				
Western Marsh Harrier	*Circus aeruginosus*	mr	mr	mr	mr	mr	mr	mr
Common Buzzard	*Buteo buteo*	br, mr	br, mb	br, mr	br, mr	br, mr	br, mr	br, mr
Eurasian Sparrowhawk	*Accipiter nisus*	br, mr	br, mr	br, mr	br, mr	br, mr	br, mr	br, mr
Merlin	*Falco columbarius*	mr	mr, sa	mr, sa	mr	mr	mr	mr
Tawny Owl	*Strix aluco*	br	br	br	br	br	br	br
Eurasian Pygmy Owl	*Glaucidium passerinum*	br	-	rare br	br	br	br	br

[1] For example Important Bird Area (IBA), Ramsar site, Man and Biosphere site (MaB), Special Protection Area (SPA) in the EU, Raptor Watch Global Directory sites (RWGD)

[2] Please select an Area Type and enter it into the Table under the species column:

br – breeding area, mr – migration route, mb – migration bottleneck, sa – staging area (winter, summer), ra – roosting area, cs – congregation site, da – dispersal area for non-territorial individuals

Table 3: List of important habitats for raptor and owl species that regularly occur in Switzerland.

National name/ English name	Scientific name	Important Habitat Types									
		Temperate Forest	Montane Forest	Lowland Grasslands	Arable Land	Wetlands (inland)	Rocky areas	Alpine habitats	Orchards	Settlements	Copses
Category 1 and National or Regional priority (or 'flagship') species											
Bearded Vulture	*Gypaetus barbatus*						C	H			
Red-footed Falcon	*Falco vespertinus*			H	M	M-Low					
Red Kite	*Milvus milvus*	H	Low	H	H	Low			Low	Low	
Pallid Harrier	*Circus macrourus*			M	M	Low					
Griffon Vulture	*Gyps fulvus*						H	H			
Golden Eagle	*Aquila chrysaetos*	Low	H				C	H			
Short-toed Snake Eagle	*Circaetus gallicus*	M	M	M			M	Low			
Peregrine	*Falco peregrinus*			Low	Low	M	C	L		M	
Barn Owl	*Tyto alba*			H	M				M	C (barns)	M
Eurasian Eagle Owl	*Bubo bubo*	Low	Low	M	Low	Low	H	M		L	
Tengmalm's Owl	*Aegolius funereus*	L	H					M			
Little Owl	*Athene noctua*			M	M				H	M (barns)	
Osprey	*Pandion haliaetus*	M				C					
Northern Goshawk	*Accipiter gentilis*	H	H	Low	Low	Low	Low	Low	Low	Low	Low
Category 2 species											
European Honey-buzzard	*Pernis apivorus*	H	Low	M		L					
Black Kite	*Milvus migrans*	H		M	M	H				Low	Low
Hen Harrier	*Circus cyaneus*			M	M	H					
Montagu's Harrier	*Circus pygargus*			M	M	M					
Common Kestrel	*Falco tinnunculus*			H	H		M	H	M	M	Low

National name/ English name	Scientific name	Important Habitat Types									
		Temperate Forest	Montane Forest	Lowland Grasslands	Arable Land	Wetlands (inland)	Rocky areas	Alpine habitats	Orchards	Settlements	Copses
Eurasian Hobby	*Falco subbuteo*	H		Low		H					Low
Eurasian Scops Owl	*Otus scops*	H		H					M	Low	M
Long-eared Owl	*Asio otus*	M	M	M	M	Low		Low		Low	H
Short-eared Owl	*Asio flammeus*			M	M	H					
Category 3 species, no category											
Booted Eagle	*Aquila pennata*	Low		Low			Low				
Western Marsh Harrier	*Circus aeruginosus*			M	M	H					
Common Buzzard	*Buteo buteo*	H	M	H	H	Low	M	Low	M	Low	M
Eurasian Sparrowhawk	*Accipiter nisus*	H	H	Low	Low	Low	Low	Low	Low	Low	Low
Merlin	*Falco columbarius*			M	M	H					
Tawny Owl	*Strix aluco*	H	H	Low	Low	Low	L			Low	Low
Eurasian Pygmy Owl	*Glaucidium passerinum*	L	H					M			

For the detailed IUCN Habitat Classification Scheme (Version 3.0), visit the IUCN website (http://www.iucnredlist.org/technical-documents/classification-schemes/habitats-classification-scheme-ver3). Importance: C – Critical; H – High; M – Medium; Low – Low; L – Local.

Table 4: List of threats[1] exerting known or potential impacts[2] on the populations of Category 1, National or Regional priority (or 'flagship') and Category 2 species

National name/ English name	Types of Threat[1]										
	Hunting and persecution	Electrocu-tion on electric poles	Agriculture (Intensification, abandonment)	Human disturbance (intentional and unintentional)	Pesticides, pollution, lead munitions	Forestry (intensifi-cation)	Climate change (breeders)	Building and infrastructure development	Collision (windfarms, power lines, rail/road)	Loss of nest sites	**Other**
Category 1 and National or Regional priority (or 'flagship') species											
Bearded Vulture	Low	L	Low	M	H		Low	L	M-H		
Red Kite	Low	Low	M	Low	M	Low		Low	M	Low	
Pallid Harrier			M								
Red-footed Falcon			M		M						
Griffon Vulture		M	M	Low	M				M		
Golden Eagle	Low	M	Low	M	H	Low		Low	M		
Short-toed Snake Eagle		M	H	Low		Low	positive	Low	M		
Peregrine	M	Low		M-H	M				Low	Low	Predation
Barn Owl		M	M	M	M		positive	M	M	M	
Eurasian Eagle Owl	L	H	Low	M	Low			Low	H	Low	
Little Owl			H	M	M			M	M	M	Predation
Boreal Owl						M	Low-M	Low	Low	M	
Category 2 species											
Osprey		M	Low	M-H	Low	M-H			Low		
European Honey-buzzard			M	Low	Low	M		Low	Low	Low	
Black Kite		Low	M	Low	Low	Low		Low	Low	Low	
Northern Goshawk	Low			Low	Low	M		Low	Low	Low	
Hen Harrier			M	Low	Low						

National name/ English name	Types of Threat[1]										
	Hunting and persecution	Electrocu-tion on electric poles	Agriculture (Intensification, abandonment)	Human disturbance (intentional and unintentional)	Pesticides, pollution, lead munitions	Forestry (intensifi-cation)	Climate change (breeders)	Building and infrastructure development	Collision (windfarms, power lines, rail/road)	Loss of nest sites	**Other**
Montagu's Harrier			M	Low	Low						
Common Kestrel		Low	M	Low	M			M	M	Low	
Eurasian Hobby			Low	Low	Low	M		Low	Low	Low	
Eurasian Scops Owl			H	Low	M		positive	Low	Low	M	Predation?
Long-eared Owl		Low	M	Low	M	Low		Low	M	Low	Predation?
Short-eared Owl			M	Low	Low						
Category 3 species, no category											
Booted Eagle			Low								
Western Marsh Harrier			M		Low						
Common Buzzard	Low	Low	M	Low	M	Low		Low	M	Low	
Eurasian Sparrowhawk				Low	Low	M		Low	M (glass)	Low	Predation?
Merlin			M		Low						
Tawny Owl			Low	Low	Low	M		Low	Low	Low	
Eurasian Pygmy Owl			Low	Low		M		Low	Low	Low	Predation?

Magnitude of impact specified under Threat Type column: C -Critical: a factor causing or likely to cause very rapid declines and/or extinction; H -High: a factor causing or likely to cause rapid decline leading to depletion; M -Medium: a factor causing or likely to cause relatively slow, but significant, declines; Low -Low: a factor causing or likely to cause fluctuations; L -Local: a factor causing or likely to cause declines in small parts of the population; U -Unknown: a factor that is likely to affect the species but the extent is unknown; N -None: no effects likely; DD -Data deficient: potential affects cannot be evaluated due to lack of knowledge.