CONSERVATION STRATEGY
for the Bohemian-Bavarian-Austrian Lynx population

Project index number and acronym	C1001 3Lynx
Lead partner	Ministry of Environment of the Czech Republic
Project website	https:/www.interreg-central.de/Content.Node/3Lynx.html

3Lynx project partners:

Ministry of the Environment of the Czech Republic

Šumava National park Administration

ALKA Wildlife o.p.s

Nature Conservation Agency of the Czech Republic

Government of Upper Austria

Research Institute of Wildlife Ecology, University of Veterinary Medicine, Vienna

Green Heart of Europe

Bavarian environmental agency

World Wide Fund for Nature Germany

Slovenia Forest Service

Italian Lynx Project

Suggested citation:

Czech Ministry of Environment et.al. (2020). Conservation Strategy for the Bohemian-Bavarian-Austrian Lynx population. Prague. 104 pages.

Front picture: playing kittens in the Bavarian Forest. © Julius Kramer, FokusNatur

Conservation strategy for the Bohemian-Bavarian-Austrian Lynx population - DIRECTORY

Directory

1. Policy Statement

As all three countries (Czech Republic, Germany and Austria) are members of the European union, they are obliged to follow the Flora-Fauna-Habitat directive issued in 1993. For strictly protected species like lynx, the legal demands are to keep or develop the species towards a favourable conservation status. This implies the following indicators: (1) population size (current status, ratio current/favourable pop. size, population trend); (2) distribution (current distribution, ratio current/favourable distribution, trend); (3) habitat (sufficient size, quality, trend); (4) future perspective.

With the document on hand, Czech Republic, Bavaria and Upper Austria present a population level based conservation approach for lynx as European's largest cat species. The three governments stress the importance that lynx should return into the landscape as part of the natural heritage and earnestly pursue the following vision:

"to restore and maintain, in co-existence with people, a viable lynx population within the Bohemian-Bavarian-Austrian border region connected with other metapopulations in Central Europe"

To proceed towards this vision, the three countries focus their joint efforts on the following four major issues:

- Lynx are spread all over suitable habitat within the BBA area,
- Lynx reach sufficient numbers within the BBA area,
- BBA lynx population is connected with other lynx sub-populations to form a functioning metapopulation, and
- Lynx is accepted and respected by humans as an integral part of the natural heritage of Central Europe.

To assess status and trend of the BBA lynx population, standardized and robust monitoring serves as the key prerequisite. Only with a sound and fact-based regular assessment, the implementation of conservation actions can be evaluated. Depending on the results, focus and intensity of conservations actions might shift and/or the conservation strategy needs to be further developped.

2. Summary

The Bohemian-Bavarian-Austrian (BBA) lynx population stretches along the border of the Czech Republic, Eastern Bavaria and Upper and Lower Austria. Extirpated in the 19th century, lynx from Carpathina origin have been reintroduced in the 1970ies and 1980ies. The core area comprises the two nationalparks and landscape protected areas along the borders, however favourable habitat of woodlands stretches far into the lowlands. Main lynx prey is roe deer, to some extent red deer and hare. Depredation on sheep and farmed game is rare. Monitoring data from the last 30 years indicate a restricted distribution, with an increase in numbers and a slight expansion during the past few years.

Monitoring methods improved considerably, heading for a standardized and robust approach on population level. Nowadays, automatic cameras ("camera traps") are set year round in an area of about 13.000 km² to detect lynx presence and ensure individual recognition of animals. Monitoring period is the lynx-year (LJ), dating from 1st of May until the 30th of April of the next year. During the monitoring years 2017-2018 and 2018-2019, the following parameters were assessed: distribution area 9.600 km² / 9.000 km²; number of proven lynx (adults and subadults) 109 / 119; population estimate 98-144 / 99-146; number of reproducing females 32 / 33; number of juveniles 62 / 66; proven mortality 9 / 10; missing adult animals (only LJ 2018-19) 13 animals. Genetic monitoring revealed a high inbreeding effect and calculated an effective population size of only 20.8 individuals. Data from the lynx year 2019-2020 are still analysed.

The overall vision for the BBA population states the following: "to restore and maintain, in co-existence with people, a viable lynx population within the Bohemian-Bavarian-Austrian border region connected with other metapopulations in Central Europe". To proceed towards this vision, the strategy focusses on the following four major topics: (1) Lynx are spread all over all suitable habitat within the BBA area, (2) Lynx reach sufficient numbers within the BBA area, (3) BBA lynx population is connected with other lynx sub-populations to form a functioning metapopulation, and (4) Lynx is accepted and respected by humans as an integral part of the natural heritage of Central Europe.

Moreover, this document translates the vision into practical goals, different objectives and specific targets. Then the strategy defers and lists a wide bunch of related conservations actions, actors and measurable indicators.

To assess strengths, weaknesses, opportunities and threats, a SWOT analyses has been conducted for the BBA lynx population. Internal strengths yield the habitat potential and the central location in Middle Europe, the clear legal framework, the longterm transboundary partnership and a comprehensive knowledge about the lynx population.

Inherent weaknesses comprises the three different countries with distinct histories and various requirements concerning wildlife management and conservation. Within national and regional administration the sectoral approaches dealing with the three trophical levels (plants, heribvores, carnivores) complicate holistic and finetuned solutions, especially for dealing with a top predator like lynx. Because of this complexity, practical goals are often missing and effort to deal with the various stakeholders are discontinuous.

However, the transboundary location of the lynx occurrence offers a excellent opportunity to apply the population level management approach for large carnivores suggested by EU commission. Paired with a long cross border cooperation of experts and administration and a very good knowledge about the species, the lynx case can serve as a best practice example how to develop and implement a population level based conservation and management of a large carnivore in central Europe. These conservation efforts have to deal with some considerable threats, for example the fragmentation of the lynx distribution, habitat deterioration, inbreeding within a small and isolated population, considerable illegal killing and lack of cooperation within and between the three countries.

To lead lynx towards a longterm viable population, two parallel and equally important conservation approaches are needed: (1) to help lynx spread over all suitable habitat within the given BBA area, and (2) to enable regular connectivity of the BBA population to other lynx occurences.

These two overall conservation demands are translated into four practical goals: (1) using the recommened guidelines for large carnivores' population level management, for the BBA population a minimum number of 165 reproducing females within the BBA area is targeted. This key index is to detect by robust monitoring on a yearly basis. (2) within the BBA area, further habitat deterioration and fragementation is to be stopped and counteracted. Moreover, connectivity to other lynx populations is to be secured and documented. (3) To raise and keep acceptance of the species, continuous public relation work is needed based on robust monitoring data. Regular communication and active involvement of key stakeholders is recommended. (4) As illegal killing is the main threat in all three countries, special attention is necessary to address, decrease and finally prevent such actions. Intensive cooperation of all responsible bodies is mandatory.

These four practical goals are divided into specific targets and then further split up into a wide array of precise conservations actions. Responsible authorities, managers, experts and interest groups – according to the respective country, region and specific cirumstances - can choose from these conservation actions which are all in line with the overall vision heading for a favourable conservation status of the BBA lynx population.

The Conservation Strategy for the Bohemian-Bavarian-Austrian Lynx Population is endorsed by the three countries Czech Republic, Bavaria and Upper Austria, by a specific "Memorandum of Understanding". To implement and evaluate the conservation strategy, a transboundary Lynx management board ("LyMBo") is created. This board will assess the yearly status reports, discuss success or failure of applied conservation actions, evaluate and adapt the progress in lynx conservation, and – if needed - further develop the conservation strategy.

3. Introduction

The European Union's Habitats Directive obliges member states to keep or head for a favourable conservation status (FCS) for strictly protected species (European Economic Community 1992). The Eurasian Lynx (*Lynx lynx*) as Europe's largest cat species is listed in Annex II and IV of the Habitat directive. Currently, all lynx occurences and established populations in Western and Central Europe derive from reintroductions. For all of them, the population status is still unfavourable.

The Eurasian Lynx is a species with high spatial demands. In Central Europe, the big conservation challenge is how to integrate a population large enough for a FCS into a cultural landscape, which is largely converted, influenced and occupied by human development. One recommendation by EU commission is to work on population level-based management (Linnell et al. 2008), therefore addressing not only the national level, but - in case of transboundary occurrences - work on the biological relevant unit which means the population level.

Within the 3Lynx Project, eleven partners from five countries (Czech Republic, Germany, Austria, Italy and Slovenia) worked from 2017 to 2020 on harmonization of lynx monitoring and exchanged regional and national experience on conservation efforts regarding population level management. Main emphasis has been put on the development of a conservation strategy for the Bohemian-Bavarian-Austrian (BBA) lynx population (see Fig. 1, chapter 5.2.), which has been established by reintroductions in the 1970s and 1980s (for details, refer to chapter 5.1.2). The population stretches along the largely forested highlands between Czech Republic, Germany and Austria. Transboundary conservation effort has been established in the 1990ies, focusing on information exchange, species' basic ecology and standardized monitoring.

The BBA Lynx Conservation Strategy addresses the political and technical administrative bodies, stakeholder groups and the interested public on regional, national and international level. The conservation strategy document offers relevant background and basics, starting points and a variety of implementation measures.

The document at hand has been endorsed by the respective responsible political and administrative units. Stated vision, goals and possible implementation measures are set here to be incorporated into conservation and management schemes/action plans on international, national and regional level.

On the one hand, the document set a clear framework of internationally binding conservation obligations; on the other hand, it provides freedom to choose from a large variety of conservation actions to head for and ensure the long-term survival of the BBA lynx population as a transboundary and inherent natural heritage within Central Europe.

4. Vision

The overall vision for the BBA lynx population is stated as this:

“to restore and maintain, in co-existence with people, a viable lynx population within the Bohemian-Bavarian-Austrian border region connected with other metapopulations in Central Europe”

To proceed towards this vision, we need to work on the following four major topics:

1) Lynx are spread all over all suitable habitat within the BBA area,
2) Lynx reach sufficient numbers within the BBA area,
3) BBA lynx population is connected with other lynx sub-populations to form a functioning metapopulation, and
4) Lynx is accepted and respected by humans as an integral part of the natural heritage of Central Europe.

This Conservation strategy for the BBA lynx population translates the vision into practical goals, different objectives and specific targets. Then the strategy defers and lists related conservations actions, actors and measurable indicators.

The overall vision implies two major working fields:

a) to improve the species’ situation by increasing lynx numbers and spatial coverage within the BBA area and secure (occasional exchange) with other lynx populations (e.g. Carpathian, Alpine);

b) to raise and keep societal acceptance for the large cat. Of course, main tools to use are information, communication and participation. However law enforcement to address cases of illegal killings are as much important to guide lynx towards a favourable conservation status.

Addressing conservation of the BBA lynx population, it is definitely possible to achieve the required distribution of lynx within the given habitat, and reaching population numbers that reflect FCS for the BBA, together with the (re-)establishment of connections to other lynx occurences within the next decades!

5. Status Assessment

5.1. Species Information

5.1.1. Taxonomic information

The Eurasian lynx (*Lynx Lynx* L. 1758) belongs to the family of Felidae, order Carnivora. It is the largest felid in Eurasia and the third largest predator in Europe after brown bear and wolf. There are three other lynx species: the bobcat (*Lynx rufus*) and Canada lynx (*Lynx canadensis*) from North America, and the Iberian lynx (*Lynx pardinus*), which is restricted to Spain and Portugal.

In its Eurasian range currently nine subspecies are differentiated: *L. l. lynx* (nordic lynx population: Scandinavia, Baltic countries, Western Russia), *L. l. carpathicus* (Carpathian mountains), *L. l. martinoi* (Balkan), *L. l. dinniki* (Caucasus), *L. l. isabellinus* (Turkestan), *L. l. wardi* (Altai), *L. l. kozlovi* (Baikal), *L. l. wrangeli* (Sibiria), *L. l. stroganovi* (Amur). In the Northern and Eastern range the body size of lynx subspecies tends to be bigger and heavier than in the further Western and Southern range (Breitenmoser & Breitenmoser-Würsten 2008).

Morphological characteristics include long legs and large feet, a round head with a short neck, a flared facial ruff, triangular ears with black tufts, and a short black-tipped tail. Sexual dimorphism is pronounced in lynx with males being larger than females. Body mass of adults ranges between 12-20 kg in females and 18-28 kg (35 kg) in males. Shoulder height is about 50-65 cm (Breitenmoser & Breitenmoser-Würsten 2008).

The general color of the pelt is greyish with reddish to yellowish tint along the back and the flanks of the body, but whitish at the belly. There are four major coat patterns: large spots, small spots, rosettes, and unspotted (Werdelin & Olsson 1997, Thüler 2002). As the coat pattern is individually distinct, good (camera-trap) pictures allow the identification of an individual.

5.1.2. Historical range

In historical times, the Eurasian lynx existed throughout Europe with the exception of the Iberian Peninsula, most islands (like Ireland, Sicily), non-forested coastal regions, and the North-west of Northern Europe. As a consequence of human activities (deforestation – conversion of forested areas into cultural landscapes, expansion of agricultural activities and increase of human population, followed by a decline of wild ungulates and direct persecution), the lynx disappeared until 1800 from most of its European range, at first in the South, and later in the North of Europe. Until 1900, all western European populations went extinct. In Europe the lynx survived only in the Fennoscandia, Baltic (in connection to Russia), Carpathian and Balkan Mountains (Greece, Macedonia, Albania) (Chapron et al. 2014). In the Bohemian-Bavarian-Austrian region the last records are from 1846 (Bavaria) and from 1905 (Bohemia).

Re-introduction programs in several countries in Central and Western Europe helped the species to recover (Chapron et al. 2014). The Bohemian-Bavarian-Austrian (BBA) lynx population stems from two re-introductions: 5-7 lynx in 1970s in the Bavarian Forest and 17 animals (6 females, 11 males) from 1982-1989 in the Bohemian Forest (Červený & Bufka 1996, Volfová & Toman 2018). It is not known, if reintroduced lynx, released in the 1970s within the Bavarian Forest, survived until the reintroduction of lynx in the 1980s in the Bohemian Forest on the Czech side.

5.1.3. Ecology

5.1.3.1. Reproduction and mortality

Mating takes place from February to mid-April, depending on climatic factors. Males follow the females to check their reproductive status. Lynx have induced ovulation. After approx. 70 days of gestation, birth takes place, usually in late May or beginning of June. Litter size varies from 1-5, but most often 2-3 kittens are born. Kittens follow their mother until the next mating season. At the age of 10 months (range 8-11months), a family group dissolves and the kittens become independent (Schmidt et al. 1998, Zimmermann et al. 2005, Breitenmoser & Breitenmoser-Würsten 2008).

Females are usually sexually mature at the age of two years, whereas males usually mate for the first time when they are three years old. Both sexes are able to reproduce at a younger age, but this is rare (Kvam 1990). A female reproduction at one year of age was documented recently in BBA population (Engleder et al. 2019).

The age of female first reproduction differs individually and also among populations. In Scandinavia, the proportion of 1.5-year-old females that ovulated was generally lower in the northernmost areas (Nilsen et al. 2010), thus indicating a slower life cycle in more extreme northern environments. Also, the proportion of young females (i.e. 2 years old) that actually gave birth and produced a litter varied markedly between study populations; it was highest in the southernmost population, lowest in the northernmost, with other populations showing intermediate values (Nilsen et al. 2012). This geographical variation in the breeding proportion may be caused by differences in feeding conditions and growth rates between areas (Nilsen et al. 2012), a theory supported by the findings that body size and body mass of lynx in southern Sweden were related to roe deer availability during the first year of life (Yom-Tov et al. 2010).

Males usually mate for the first time when they are two or three years old, probably depending on the physical condition and spatio-social context (Breitenmoser & Breitenmoser-Würsten 2008). In nature, lynx were reported to live up to 17 years (Breitenmoser et al. 2000).

The lynx has no natural enemies. Lynx can suffer from various parasites and diseases, such as rabies, sarcoptic mange or parvovirus. The mortality among juvenile and subadult lynx is about 70-75%. (Breitenmoser et al. 2000, Poledníková et. al 2015). The main mortality factors are human-induced such as traffic accidents and illegal killing; in countries where hunting is allowed (e.g. Scandinavia) also hunting is a relevant factor.

5.1.3.2. Demography and population dynamics

Lynx are solitary living animals, except for females with the offspring of the year. Lynx density is regulated by prey density and is limited through social interactions (such as territorial marking) among lynx. Reported lynx densities ranged from 1,9-3.2 (adult) individuals per 100 km^2 in Poland; 0,94-2,1 individuals per 100 km^2 in Switzerland; or 0,35 – 1,9 per 100 km^2 in the Bohemian-Bavarian-Austrian lynx population (Wölfl et al. 2009, Wölfl & Schwaiger 2010b, Wölfl & Schwaiger 2012, Weingarth et al. 2012).

5.1.3.3. Diet and food ecology

The Eurasian lynx preys mainly upon smaller ungulate species, such as roe deer, chamois or reindeer. Depredation on domestic ungulates (sheep, goats) or farmed deer occurs locally but is rare. The spectrum of prey species ranges from small rodents, lagomorphs (3-6%), birds, young of wild boar (up to 3%) and red deer (mainly fawns and yearlings; 3-28%) (Jedrzejewski et al. 1993, Okarma et al. 1997, Gervasi et al. 2013, Belotti et al. 2015). Lynx consumption rate averages 1-2,5 kg of meat per day, a family group consumes 4-7 kg of meat per day (Okarma et al. 1997, Breitenmoser & Breitenmoser-Würsten 2008).

The impact of lynx on prey populations is widely discussed. Lynx do not eradicate their prey, but in marginal habitat or in specific situations, the predation impact can be considerable. The effect of large predators is relatively weak in highly productive environments and in regions with mild climate, but increased markedly in regions with low vegetation productivity and harsh winters (Melis et al. 2009).

On average, 3-9% of a local ungulate community is consumed. However, the predation impact on a roe deer population was estimated to be 36-39% in Switzerland or 25% in Poland (Okarma et al. 1997, Breitenmoser & Breitenmoser-Würsten 2008).

In the Bohemian-Bavarian region with social organized adult males, females with their offspring, and temporarily present subadults the impact ranged between 0.52 and 1.17 roe deer / km^2 / year. Adult males consumed 0.11 roe deer / km^2 / year, adult females 0.41 roe deer, subadult females 0.45 and lynx family groups 0.61 roe deer / km^2 /year (Belotti et al. 2015).

The influence of lynx predation on a local ungulate community depends on habitat structure, density of the prey community, age and sex structure of the ungulate population, number and social structure of the lynx population, other causes of ungulate mortality and abiotic factors. Furthermore, the impact of predation can considerably change over time, making the predator-prey-system very dynamic.

Lynx can show a considerable numerical and functional response to changes in prey abundance and availability (Breitenmoser & Breitenmoser-Würsten 2008). Consequently, lynx predation is an important factor shaping density, distribution and behaviour of the main prey species. A reduction in prey abundance or availability can on the other hand quickly lead to a reduced lynx abundance and threaten a local population as lynx depend mostly on one or two staple prey (Breitenmoser et al. 2006).

Livestock depredation by lynx is much less problematic compared with other large predators. In most European countries, lynx are not regarded as a major problem to livestock husbandry. Where depredation by lynx occurs, compensation schemes have been implemented to mitigate the conflict with livestock breeders. The examination of the killed livestock by a trained person is part of special approval systems within many European countries.

5.1.3.4. Habitat and land tenure system

The lynx inhabits forested areas in most of its range. However it can also be found in open and sparsely wooded regions or treeless environments (tundra). The lynx lives in all types of forest: deciduous, mixed, and coniferous forests. Today, the lynx is restricted to large remaining large forest complexes in Europe.

Land tenure system

Both males and females occupy individual territories (home ranges), which they mark with gland secretions and urine. Males share their home ranges with one or two, rarely more females. Usually home ranges of males overlap at the edges to a certain extent, whereas home ranges of neighbouring females overlap only slightly if ever. Few cases were observed of mothers having totally overlapping home ranges with their sub-adult female offspring (Breitenmoser & Breitenmoser-Würsten 2008).

Home range sizes vary depending on habitat type, composition of prey community and density of prey. Estimates of lynx home ranges based on telemetry studies revealed sizes of 80-370 km^2 for females and 150-615 km^2 for males in forested highlands (Schmidt et al. 1997, Breitenmoser et al. 2000, Breitenmoser & Breitenmoser-Würsten 2008, Belotti et al. 2015, Bufka, unpubl. data). Females occupy very small home ranges while nursing kittens (late spring to summer). They extend their home ranges gradually until winter. Distances travelled by lynx within their home range per night range from 1-45 km. They depend on age, sex, social status, prey density, hunting success, etc. The highest movement rates are observed during the mating season. The activity pattern is determined by sunrise and sunset, lynx are mainly active at dusk and at night, and usually rest during daytime, except for the mating season when lynx are active also during daytime.

5.2. Distribution of the Bohemian-Bavarian-Austrian lynx population

The monitoring system established in the border region of Germany, Austria and Czech Republic is up to now the most comprehensive and large-scaled monitoring approach in Central Europe: in the years 2013-2015 and 2017-2019 the monitored area covered 7600 and 13000 km^2, respectively. The same monitoring standards are applied in all three countries. This made the data comparable and produced a valuable and robust data set.

The Bohemian-Bavarian-Austrian (BBA) lynx population stretches along the Czech-German and Austrian border region. The area of occurrence was assessed in the scope of two transboundary projects co-financed by EU Interreg programmes: TransLynx from 2013-2015 and 3Lynx from 2017-2020 (Tab. 1, Fig. 1, see also Wölfl et al. 2015a, Wölfl et al. 2015b, Minarikova et al. 2019, Wölfl et al. 2020).

Tab. 1 Lynx distribution given by the number of occupied grid cells (10x10 km). Results were gained in two two-year monitoring projects (Translynx 2013-2015 and 3Lynx 2017-2019) on population-level.

Monitoring Year	Period	Monitored area (km^2)	Number of occupied grid cells (10x10 km)	Distribution (km^2)
2013	1.5.2013-30.4.2014	7600	51	5100 km^2
2014	1.5.2014-30.4.2015	7600	55	5500 km^2
2017	1.5.2017-30.4.2018	13000	96	9600 km^2
2018	1.5.2018-30.4.2019	13000	90	9000 km^2

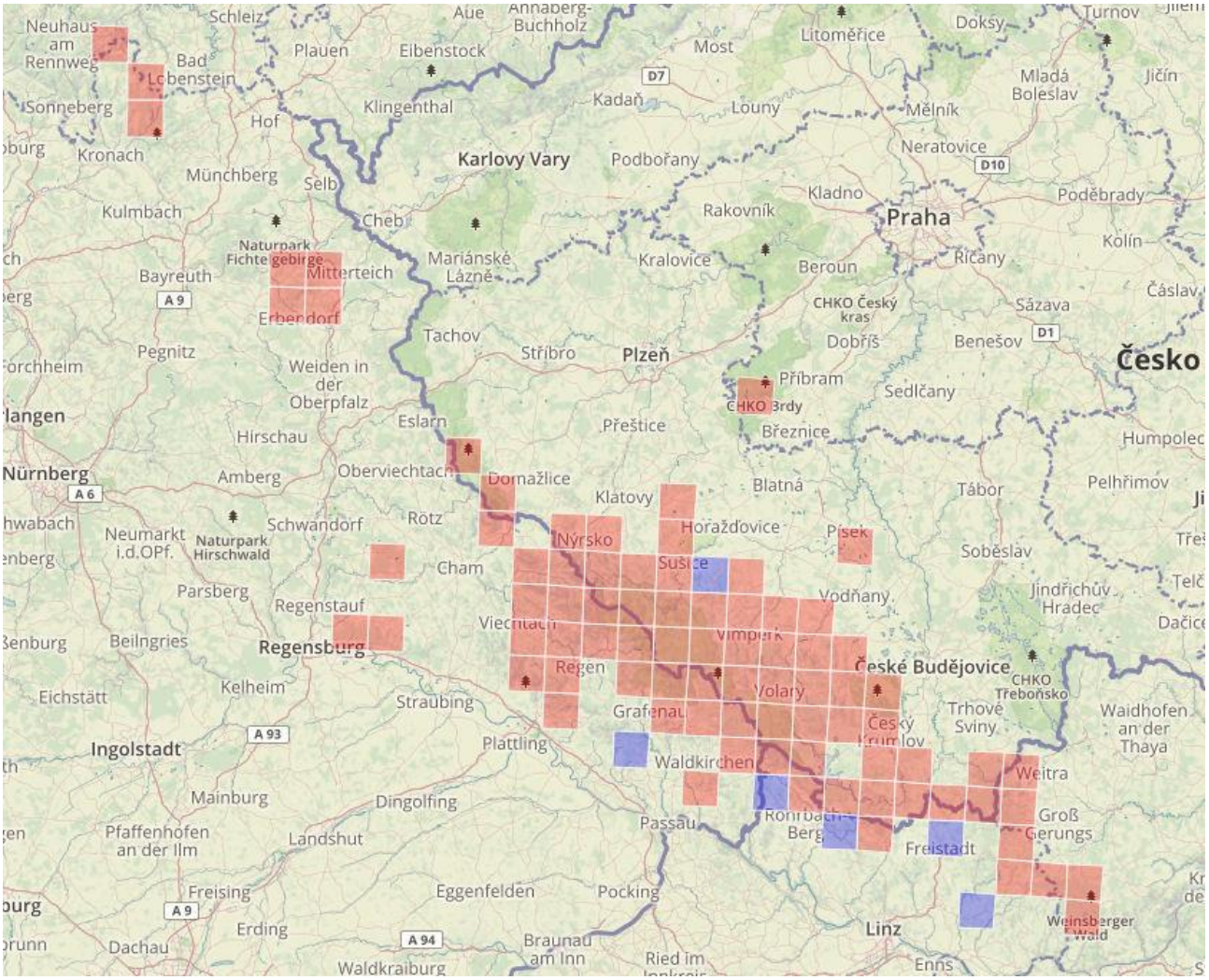

Fig. 1 Distribution map of BBA lynx population of lynx year 2018 (1.5.2018-30.4.2019). Grid cells where lynx occurrence was proved (C1) are marked in red; grid cells where lynx signs have been found and were confirmed (C2) are marked in blue.

5.3. Population information

The population information below was assessed in the scope of two transboundary projects, co-financed by EU Interreg programmes: TransLynx from 2013-2015 and 3Lynx from 2017-2020 (Wölfl et al. 2015a, Wölfl et al. 2015b, Mináriková et al. 2019, Wölfl et al. 2020).

5.3.1. Lynx families

Tab. 2 Distribution and population size of BBA lynx population in 2013-2015 and 2017-2019.

Monitoring Year	Period	Number of reproducing females with juveniles (lynx families)	Number of juveniles
2013	1.5.2013-30.4.2014	15-18	23
2014	1.5.2014-30.4.2015	15-16	24
2017	1.5.2017-30.4.2018	32	62
2018	1.5.2018-30.4.2019	33	66

5.3.2. Lynx mortality

Tab. 3 Registered population losses in BBA lynx population in 2013-2015 and 2017-2019

Monitoring Year	Period	Number of dead lynxes	Cause of death
2013	1.5.2013-30.4.2014	6	Car accident (2), illegal killing (4)
2014	1.5.2014-30.4.2015	4	Car accident (2), natural (2)
2017	1.5.2017-30.4.2018	9	Car accident (6), orphaned lynx (3)
2018	1.5.2018-30.4.2019	10	Car accident (4), illegal killing (2), orphaned lynx (2), natural (1), unclear (1)

5.3.3. Population size

Tab. 4 Distribution and population size of BBA lynx population in 2013-2015 and 2017-2019.

Monitoring Year	Period	Distribution (km^2)	Number of proven lynx (adults and subadults)	Population estimate (adults and subadults)
2013	1.5.2013-30.4.2014	5100 km^2	63	63-86
2014	1.5.2014-30.4.2015	5500 km^2	59	59-83
2017	1.5.2017-30.4.2018	9600 km^2	109	98-144
2018	1.5.2018-30.4.2019	9000 km^2	119	99-146

5.4. Present status of the Bohemian-Bavarian-Austrian lynx population

The Bohemian-Bavarian-Austrian (BBA) lynx population lives along the border region of Germany, Czech Republic and Austria. The area of permanent and sporadic lynx presence ranged from 5100 to 9600 km^2 in the years 2013-2019 (Wölfl et al. 2015a, Wölfl et al. 2015b, Mináriková et al. 2019, Wölfl et al. 2020). The last assessment of lynx year 2018 (LY18, period 1.5.2018 – 30.4.2019) confirmed lynx presence on 9000 km^2 and a number of 119 independent (subadult and adult) lynx of which 33 (18%) are reproducing females. The estimation of the theoretical population size is stable with 97-143 independent lynx in LY17 and 99-146 independent lynx in LY18 (Mináriková et al. 2019, Wölfl et al. 2020).

The change from LY13/14 to LY17/18 in range and numbers is most likely due to an increase of monitoring effort, i.e. the size of the monitored area (increased from 7600 km^2 to 13000 km^2), especially in Austria and Czech Republic. A genuine but minor expansion took place in Bavaria where the monitoring effort has been kept almost the same over the years and some areas without past lynx presence now are inhabited by lynx and even by reproducing females.

The last transboundary assessment of lynx numbers and distribution was in the 1990s (1996-1998, range with regular occurrence and reproduction: 8100 – 8700 km^2; Wölfl et al. 2001). Despite the data base in the 1990s was much worse than today and unfortunately is hard to compare with current assessments, the rough comparison suggests that the lynx population more or less stagnated in numbers and range during the last 25 years.

The assumed reasons for this long-term stagnation are both human-induced: illegal killing and (increasingly also) road mortality. The analysis of LY17 and LY18 revealed a high percentage of unknown mortality among the adult lynx. 22% of adult lynx disappeared from LY17 to LY18. Together with known causes of mortality (road mortality, confirmed illegal killing, orphaned juveniles) this percentage of losses in the population increased to 28 %. Taking into account also the loss among the subadult lynx (51% including known and unknown mortality), these high losses can explain the only marginal increase in population size (Wölfl et al. 2020).

The Bohemian-Bavarian-Austrian (BBA) lynx population is still a small population and according to the IUCN Red List assessment a critically endangered population (CR(D) under citerion D, i.e. total population size smaller than 250 mature individuals; see also Kaczensky et al. 2013a).

Future conservation efforts have to focus on reducing illegal killing as the main threat to the BBA lynx population and should further investigate the negative demographic and genetic effects illegal killing poses for the BBA lynx population. Moreover, losses by traffic accidents should be addressed by defragmentation measures in lynx habitat and possible migration corridors.

5.4.1. Genetic monitoring and genetic health

Conservation genetics is currently an essential part of the research and protection of large carnivores. Obtained data are used not only to confirm their presence, but also to identify individuals, to evaluate family relationships, to monitor spatial activity, to estimate population density and to assess genetic variability of the populations. The Bohemian-Bavarian-Austrian (BBA) population origins from reintroductions (see 4.1.2) and therefore faces difficulties within genetic health: Reintroduced populations. Reintroduced populations, which were established from a few individuals (sometimes even relatives), are significantly threatened by the loss of genetic variability due to stochastic genetic drift and inbreeding. Inbreeding depression can significantly reduce fitness and the viability of the population and, in extreme case, lead to the population extinction. During the 3Lynx project we performed intensive genetic sampling within the distribution range of the BBA population and collected 300 genetic samples of lynx. These samples were used for first reliable assessment of genetic health of the BBA population (the level of genetic diversity and inbreeding).

The complete genotype profiles were obtained for 143 samples and in these samples we identified 76 individuals. The genetic variability of the studied BBA population was the lowest (HE = 0.427 with the use of 20 loci, HE = 0.400 for 15 loci) among all populations included in the comparison (native Carpathian, Baltic, Scandinavian and reintroduced Harz population). The average number of alleles per locus was lower than 3 and the effective number of alleles was only 1.9 alleles per locus. The estimated values are lower than the values estimated on the comparable sample size in the Dinaric lynx population when first signs of inbreeding depression were already observed (Sindičić et al. 2013). The estimated value of the effective population size (Ne = 20.8 individuals) in the BBA population was below the short-term inbreeding avoidance threshold of 50 individuals (Frankham et al. 2014).

High individual inbreeding coefficient was found for third of all sampled individuals as a consequence of mating between closely related animals. This can lead to deleterious effects of inbreeding (inbreeding depression) and can endanger viability of the population. Therefore, it is necessary to further monitor the population from the point of view of its health and genetic status. The risk of inbreeding depression can be evaluated as high.

For successful survival of the population it is necessary to preserve the landscape connectivity within the whole distribution range. Ideally to re-connect BBA population with its source Carpathian population or with other lynx populations in the surroundings, e.g. the Alpine one. Other focus has to be the reduction of the human-induced lynx mortality rate. Therefore, a further monitoring of the population is needed aiming at studying inbreeding in detail using genetic markers of the next generation – SNPs (single-nucleotide polymorphisms) and to evaluate the possible harmful effect of inbreeding depression on individual and population fitness.

Analysis of population origin showed that one individual originated in the Harz population (lately identified as lynx “Ivan”). The sample of this individual was found in straight-line distance 80 km northwest from the nearest lynx sample belonging to the BBA population. Thus, we can presume that individuals from the expanding Harz population can in future mix with the BBA population. So far, the mixing of these two populations was not detected on the base of genetic analyses (no hybrid individuals were identified). The value of fixation index of population differentiation between Harz and BBA population was substantial (FST = 0.406) and these populations are genetically the most differentiated from all included in this study. Admixture between genetically differentiated populations can lead to the outbreeding depression and to the decline in fitness as a consequence of mixing different ecological or physiological adaptations and their loss.

In this case no different adaptations exist. The admixture between Harz and BBA population could lead to the increase of genetic variability of BBA as well as Harz population and enhance their population viability, but the outcome of a genetic exchange between both populations is unknown. Therefore, it is necessary to closely monitor and evaluate the effect of potential admixture of both populations.

6. Situation Analysis

6.1. Legal Status, responsibilities and policy

6.1.1. International Treaties and Recommendations

For the conservation of the Eurasian lynx, many treaties and recommendations are relevant in Europe and worldwide:

Convention on the conservation of European wildlife and natural habitats (Bern Convention, Council of Europe, 1979): "The aims of this Convention are to conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the co-operation of several States and to promote such co-operation" (Article 1). *Lynx lynx* is listed in Appendix III (protected fauna species). "Each contracting party shall take appropriate and necessary legislative and administrative measures to ensure the protection of the wild fauna species specified in Appendix III. Any exploitation of wild fauna specified in this Appendix shall be regulated in order to keep the populations out of danger" (Article 7).

Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (EU Habitat Directive, 1992): "The aim of this Directive shall be to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty applies (Article 2.1). Measures taken pursuant to this Directive shall be designed to maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest (Article 2.2). Member States shall undertake surveillance of the conservation status of the natural habitats and species (Article 11)." *Lynx lynx* is listed in Annex II (Animal and plant species of Community interest whose conservation requires the designation of special areas of conservation) and in Annex IV (Animal and plant species of Community interest in need of strict protection). Eurasian lynx is however not considered a priority species. "Member States shall take the requisite measures to establish a system of strict protection for the species listed in Annex IV in their natural range, prohibiting (for instance) all forms of deliberate capture and killing, and disturbance of the species" (Article 12.1). The incidental capture and killing of animal species in Annex IV has to be monitored (Article 12.4).

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1973)

Lynx lynx is listed under Appendix II, which contains species that a) are not necessarily threatened with extinction but may become so if trade is not controlled, and b) look so similar to endangered species (listed under Appendix I) that they are difficult to distinguish.

Convention on the Conservation of Migratory Species of Wild Animals (CMS; Bonn Convention, 1979)

Originally named the Convention on the Conservation of Migratory Species of Wild Animals (CMS). This international treaty aims to conserve terrestrial, avian and marine species which are known to undertake migratory journey as part of their natural history.

IUCN Red List

Listed under the subcategory “Least Concerned” within the category “Lower Risk”, which includes taxa that do not qualify for the categories “Critically Endangered”, “Endangered” or “Vulnerable”. The subcategory “Least Concerned” lists species not qualifying for the one of the other two subcategories “Conservation Dependent” or “Near Threatened”.

Recommendation No. 204 (2019) of the Standing Committee, adopted on 6 December 2019, on the Conservation of the Eurasian lynx (*Lynx lynx)* in Continental Europe

The Standing Committee of the Convention on the Conservation of European Wildlife and Natural Habitats, acting under Article 14 of the Convention,

- Having regard to the aims of the convention to conserve wild fauna and its natural habitats;
- Considering that the European lynx *(Lynx lynx)* is a fundamental part of the European natural heritage;
- Conscious that international co-operation by all relevant Parties is necessary for the long-term preservation and management of the small and isolated populations in Continental Europe, also considering other populations which have an unfavorable conservation status;
- Recalling that one of the aims of the convention is to conserve wild fauna and its habitats, especially those species whose conservation requires the co-operation of several states, and to promote such co-operation;
- Stressing the need to advance to a more coordinated management of the small and isolated populations of lynx in the whole of its range in Continental Europe;
- Desirous to avoid a further loss of biological diversity in Europe and wishing to promote co-existence of viable populations of lynx in Europe with sustained development of its rural areas and noting that lynx conservation is compatible with other human activities such as livestock raising and hunting;
- Recalling Recommendation No. 115 (2005) on the conservation and management of transboundary populations of large carnivores and Recommendation No. 137 (2008**)** on population level management of large carnivores’ populations;
- Convinced that illegal killing of lynx and other illegal activities affecting the species should be actively eradicated using preventive measures and law enforcement;

Taking note of the Conclusions of the expert workshop on lynx conservation in Bonn, Germany, 16-19 June 2019, recommends that relevant Contracting Parties to the Convention:

1. Strengthen conservation of endangered native populations of lynx, such as the Balkan Lynx listed in Appendix II of the Convention;
2. Monitor and improve genetic diversity of all reintroduced populations aiming to avoid the threat of inbreeding depression;
3. Monitor and manage transboundary populations of lynx following the principles and guidelines endorsed in the Standing Committee Recommendation No.137 (2008) on population level management of large carnivore populations; develop in particular a common conservation strategy for the native Carpathian population;
4. Improve as necessary connectivity of different lynx subpopulations, based on genetic and population data; use, as appropriate, restoration of corridors, green bridges, mitigation of human-induced mortality, habitat improvement, and, where necessary, translocations; in that context promote knowledge of migration of lynx between populations, improving information on the movement of individuals and monitoring their genetic status;

5. Monitor genetics of all small and isolated lynx populations in Europe; the monitoring needs to include tracking of genetic diversity and inbreeding over time, assessing effective population size and detecting genetic flow between neighbouring populations;
6. Develop a system for assessing and exchanging animals to facilitate an assisted metapopulation management; for that purpose, facilitate the establishment of a permanent lynx genetics working group which could develop a detailed protocol for genetic monitoring and conservation aiming to reduce the inbreeding of wild populations and guide genetic management of metapopulations;
7. When restocking populations of reintroduced populations, use preferably genetic stock from the same source as the original population, or, where appropriate, properly managed specimens from the European Association of Zoos and Aquaria (EAZA) Carpathian lynx European Studbook (ESB), following the IUCN *Guidelines for Reintroductions and Other Conservation Translocations* (IUCN/SSC 2013); make sure when animals are taken from free-ranging populations that removal of individuals will not be detrimental to the source population;
8. Develop specific protocols for (1) breeding, husbandry, training and assessment of zoo-born lynx designated to be released, and (2) for the husbandry and testing of orphaned lynx to be released. These protocols must be jointly developed by lynx experts, the EAZA Felid TAG and ESB, and relevant IUCN SSC institutions (e.g. Cat Specialist Group, Reintroduction Specialist Group, and LCIE);
9. Support, as appropriate, the creation of a permanent Eurasian lynx Working Group, e.g. affiliated with IUCN SSC specialist groups such as the Cat Specialist Group and the LCIE; this group could be charged with (1) drafting detailed protocols for capturing, treating/examining and transporting Eurasian lynx; (2) developing and maintaining practical protocols for lynx conservation and management as outlined under the recommendations above; (3) engaging with other experts to develop concepts for a wider outreach and communication in order to reach the institution and interest groups mentioned above, but also the general public.

6.1.2. National legislation

This chapter describes – on national level - the legal status of lynx, restrictions to the status and lists the authorities in charge for lynx conservation and management.

6.1.2.1. Austria

Legal status: Mainly subject to the district's hunting laws, but year-round closed season.

Management interventions: Special permits to shoot a lynx to be issued by the district authorities on request, so far never used.

Authority in charge: Hunting and nature conservation authorities of the provinces.

6.1.2.2. Germany

Legal status: Subject to the nature conservation law (specially and strictly protected species); subject to the hunting law as well, but year-round closed season.

Authority in charge: Nature conservation authorities of the federal states, but the respective hunting authorities also have a responsibility (esp. in terms of management actions).

6.1.2.3. Czech Republic

Legal status: Subject to the nature conservation law (strictly protected species); subject to the hunting law as well, but year-round closed season.

Authority in charge: Nature conservation authorities on state as well as regional level.

6.1.3. Policy and species conservation

Policy, legislation and conservation measures should refer to the main goal to secure the viability of any population and consider the present status of the local lynx populations. A framework of international treaties and national laws should advocate these long-term goals, and national or local action plans should provide guidelines to monitor and maintain the local population and to administer conflicts.

- Countries sharing lynx populations secure cross-border management.
- The lynx is protected by law. Hunting is only allowed if it does not threaten the long-term survival of the population, and if the harvest is in accordance with the goals formulated in the action plan.
- Law enforcement is intensified in areas where illegal killing is an important threat for the population.

6.2. Interest Groups / Stakeholders

- Forestry sector - Bodies governed by public law
- Hunting sector – private persons + Hunting associations (NGOs)
- Lifestock owners
- Nature conservation (NGOs)
- Tourism
- Regional public Authorities
- Higher education and research groups
- Private organizations
- Private landowners

In the case of the Eurasian lynx, the key stakeholders are hunters, foresters and nature conservationists. Efforts already have been made and still need to continue to ensure and broaden the acceptance for the species. A regular information exchange and additionally the participation of the key stakeholders in monitoring and analysis of the data is one very important way to proceed. The communication should be focussed on regularly personal contact (min. twice a year) to create sustainable mutual trust.

Especially when using the participation or citizens science approach, it is crucial for responsible authorities to stick to international standards. Data gathering and analyses need to follow strict procedures, openly discussed and finally interpreted and published by the responsible governmental bodies.

6.3. Conflicts and public awareness

6.3.1. Conflicts with human interests

The main sources of conflicts with human interests are the depredation (lynx killing livestock) and the competition of the predator for game with the hunters. The general principles to reduce the conflicts from depredation are
(1) to prevent depredation,
(2) to compensate livestock owners for the losses, and
(3) to eventually remove/kill nuisance lynx.

Conflicts with hunters could be reduced by
(1) participation in lynx monitoring according to international standards under the roof of responsible authorities
(2) adapted management of the main prey ungulate species and
(3) eventually – in a later stage – a careful harvest of the lynx population.

6.3.2. Public awareness and public involvement

- Information campaigns should be launched in order to teach the broad public about all aspects of lynx conservation and management.
- Detailed educational programmes should be initiated for specific interest groups such as hunters or livestock owners.
- Local people should be integrated into the planning and implementation of lynx action plans. Establishing boards incorporating all local interest groups could do this.
- Local people (e.g. represented through management boards) should permanently be involved into decisions concerning lynx management and conservation.

6.4. Current activities in conservation, management and research

6.4.1. Austria

In Austria the federal states ("Bundesländer) are responsible for nature conservation. Regarding the BBA population the federal states of Upper Austria (Oberösterreich) and Lower Austria (Niederösterreich) are concerned. There is no lynx management plan for Austria.

Until 2019 all issues regarding large predators were discussed within the so called "KOST" (federal coordinating office for brown bear, lynx and wolf). Since 2019 the newly established "Austrian Center Wolf, Lynx, Bear" in Raumberg-Gumpenstein, Styria, has taken over these agendas. The members of this institution are mainly consisting of agricultural authorities of the federal states and the Ministry of the Environment ("Federal Ministry for Sustainability and Tourism - BMNT").

There exists a commitee, the *Luchsarbeitskreis* (LUKA) for the needs and concerns of the lynx population in the National Park Kalkalpen region (alpine region). So far, no such committee/ working group exits for the BBA population.

6.4.2. Germany

In Bavaria, the Bavarian Conservation Agency contracted a technical concept for lynx monitoring, conservation and management (Wölfl M. 2005). This concept served as the technical background for drafting out the Bavarian Lynx management plan, which was discussed, developed and finalized by the Bavarian Large Carnivores Working Group (StMUV 2008). Since then, various regional and transboundary projects focused on establishing a robust monitoring with camera traps, getting data on lynx spatial use and predator-prey relationships, implementing damage compensation system and prevention techniques. In 2016, some nature conservation and hunting NGOs asked for an update of the lynx management plan, but the process has not yet started.

In 2009, the Federal Agency for Nature Conservation (Bundesamt für Naturschutz, BfN) issued monitoring guidelines for large carnivores (Kaczensky et. al. 2009; updated version Reinhardt et. al. 2015). These guidelines, based on the so-called SCALP-criteria (Molinari-Jobin et al. 2012), give detailed instructions for monitoring wolf, lynx and bear and assessing the various parameters which are needed to fulfill the regular FFH-reporting within the European Union. People from the federal states being responsible for the lynx monitoring meet on yearly base to gather and discuss the lynx situation in Germany. In 2020, the BfN contracted the development of a technical framework for lynx conservation ("Rahmenkonzept Luchs"). Procedures, contents and possible conservation actions are currently discussed with experts and representatives from the federal states.

6.4.3. Czech Republic

In Bavaria, the Bavarian Conservation Agency contracted a technical concept for lynx monitoring, conservation and management (Wölfl M. 2005). This concept served as the technical background for drafting out the Bavarian Lynx management plan which was discussed, developed and finalized by the Bavarian Large Carnivores Working Group (StMUV 2008). Since then, various regional and transboundary projects focused on establishing a robust monitoring with camera traps, getting data on lynx spatial use and predator-prey relationships, implementing damage compensation system and prevention techniques. In 2016, some nature conservation and hunting NGOs asked for an update of the lynx management plan, but the process has not yet started.

In 2009, the Federal Agency for Nature Conservation (Bundesamt für Naturschutz, BfN) issued monitoring guidelines for large carnivores (Kaczensky et. al. 2009; updated version Reinhardt et. al. 2015). These guidelines, based on the so-called SCALP-criteria (Molinari-Jobin et al. 2012), give detailed instructions for monitoring wolf, lynx and bear and assessing the various parameters which are needed to fulfil the regular FFH-reporting within the European Union. People from the federal states being responsible for the lynx monitoring meet on yearly base to gather and discuss the lynx situation in Germany. In 2020, the BfN contracted the development of a technical framework for lynx conservation ("Rahmenkonzept Luchs"). Procedures, contents and possible conservation actions are currently discussed with experts and representatives from the federal states.

7. SWOT Analysis

To analyse the conservation needs of the BBA lynx population, we used the so-called SWOT analysis, a formal instrument for strategic rational planning on business or project level (e.g. Mintzberg 1994). During this process, inner organizational strengths (S) and weaknesses (W) as well as outside factors concerning opportunities (O) and threats (T) are specified in order to identify internal and external factors that prove favourable and/or unfavourable to achieve certain goals and objectives.

For carving out the lynx conservation strategy on population level, “internal factors” were defined as addressing mainly authority and administration level whereas “external factors” are associated especially with sociocultural and environmental variables, which are located or formed outside the main responsible bodies.

Conservation goals, objectives and specific actions were derived from all four perspectives

- to continue and improve work on internal strengths
- address and lessen internal weaknesses
- specify and better use external opportunities
- name external threats clearly and lessen/counteract/overrule their negative impacts

7.1. Internal Strengths

Apart from a clear legal obligation long-term existing cooperation between the three countries concerning lynx topics has been a very valuable prerequisite to head for a transboundary conservation strategy on population level. During the past 30 years on regional, national and international level, a good knowledge about status of the species and related societal issues has been built up. Therefore, key conservation aspects could be readily deduced from the long-lasting effort in monitoring and management approaches.

7.1.1. Habitat potential and location in Central Europe

The BBA area has a unique history. In a critical period of time, the core area of Šumava mountains on the Czech side has been closed to human activities and interventions. Paired with relatively sparse settlements along the countries’ borders, a large forested and remote area remained until today to host lynx and enables regular reproduction of the species. Two national parks and landscape protected areas guarantee long term protection there.

Moreover, the location of BBA area basically has potential for connectivity to other European lynx populations. Especially along the mostly forested border areas regular exchange of single animals seems to be possible to enable sporadic genetic exchange to counteract inbreeding.

7.1.2. Establishment of the reintroduced population

The BBA population was reintroduced from Slovakian animals. There were 17 animals released in the Czech side during 1982 – 1989 and 5 – 8 animals in the Bavarian side in the seventies (Volfová and Toman 2018). Because of this long period of time, there is a lower founder effect than in other reintroduced populations. It still represents a potential problem but it is not so big as in other regions (e. g. Dinaric population; Skrbinšek, pers. communication).

7.1.3. Specific legal obligation

The European Union's Habitats Directive obliges member states to maintain or restore species of wild fauna at a favourable population status (European Economic Community 1992). The Eurasian lynx (*Lynx lynx*) is listed in Annex II and IV of the Habitat Directive. Therefore core areas of lynx habitat must be designated as sites of Community importance (SCIs) and included in the Natura 2000 network. Strict protection regime across the entire natural range within the EU, both within and outside Natura 2000 sites, must be ensured. This provides a strong legislative conservation framework that is mandatory for the EU member states.

According to the Directive, conservation status of the species is seen as 'favourable' when:

a) population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats; and

b) the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and

c) there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

To be able to assess the status and trends of the species, the member states have to implement a robust monitoring. Moreover, besides implementation of strict protection regime by all member states, active conservation actions must be adopted to restore the species' FCS if necessary. The EU Commission has contracted the Large Carnivore Initiative for Europe (LCIE) to translate the concept of FCS into Large Carnivores conservation. The result has been a strong vote for transboundary management and conservation approaches on population level (Linnell et al. 2008).

There are strong national legislatives regarding lynx protection and punishments for illegal killing a strictly protected species. In the Czech Republic, Act no 114/92 Sb. On the conservation of nature and landscape has a variety of tools how to protect species and their habitat and it´s regularly used. According to Criminal law act, the punishment for illegal killing and trade with animal products from protected species ranges from fines to imprisonments up to 8 years.

7.1.4. Long term partnership on regional, national and transboundary level

Within and across borders, information exchange and common lynx work has a long history. In the beginning, most of the cooperation has been allocated to monitoring and research efforts. However, during the development and implementation of transboundary projects, joint responsibility for lynx conservation has been recognized by authorities and administrations. So for more than two decades, national, regional and local administrations have dealt with lynx issues together in the BBA area.

In the last 10 years, the transboundary partnership and cooperation focused on pairing GO,NGO and academic level within each country to address lynx monitoring and management (e.g." TransLynx" and "3Lynx" projects). The linkage of scientific experts, interest groups and administrative key players with a lot of commitment and experience, gained in common projects, has been proved as a crucial step towards carving out the common BBA lynx conservation strategy.

There has been a strong involvement of key players of GO and academic level for long time that has built trust, expert credit and informal cooperation. This has been a key stone for further cooperation in lynx conservation in regional as well as international dimension. For a long lasting partnership, regular and transparent communication with other stakeholder groups is crucial.

7.1.5. Extensive and robust knowledge about lynx

Data and knowledge about the BBA Lynx population are extensive and robust. Due to the long-term experiences in lynx monitoring the status of the species is pretty well known on fine and large scale (refer to Chapters 5.2, 5.3, 5.4). The BBA population is indeed one of the best studied and known European lynx populations. These monitoring results serve as a crucial backbone for any conservation strategy and management approaches and their evaluation. They substantially contribute to the essential foundation to define and implement a conservation strategy on population level.

Moreover, research projects, regular information exchange and technically based public relation work contributed to the broad picture. This knowledge drawn during the last decades gave a deep insight into biological and sociological mechanisms concerning lynx conservation and of course are used to create the given conservation strategy at hand.

7.2. Internal Weaknesses

Of course, transboundary approaches need to overcome the heterogeneity, which three different countries bring along. Within the respective administrations, dealing on three trophic levels with top predators returning to the landscape, is a new and challenging situation.

7.2.1. Three different countries

Transboundary conservation requires the consideration of national differences. These could be caused by cultural, historical and socioeconomic factors. Another major consideration refers to the organization of state administration and the responsibilities concerning wildlife management. For implementing the BBA conservation strategy, all different administrative levels (national, regional, local) must certainly be considered.

For the Czech Republic, the initial situation within the state is probably one of the easiest of the three participating countries, due to a centralist government system. There is only one legislative binding framework, which means that the implementation of wildlife management in different Czech regions is subject to the same rules. On the other hand, there are big differences in the historical development of land ownership within the other two countries, Austria and Germany, which makes the synchronisation of new wildlife management approaches much more difficult. In the Czech Republic, there will be one management plan for lynx, which deals with the BBA as well as the Carpathian population. The management plan is being prepared by the Ministry of Environment and Nature Conservation Agency and has to be yet negotiated with other ministries before final approval. This process of finalisation and negotiation of the whole plan might be very complicated and long lasting. The management plan is obligatory only for nature conservation administration which is fully responsible for its implementation. It is not obligatory for hunters or landowners, whose participation in the implementation is welcome, but not claimable. On the other hand, strict and unanimous legal protection regime for lynx in the Czech Republic sets clear rules in lynx management for all stakeholders to follow.

Germany is a country with 16 federal states. Existing conservation and hunting laws provide the given framework on national level, however for the detailed legal formulation and implementation of wildlife management the federal states are responsible. They can – to a certain extent - specify and refine national law. Therefore, lynx conservation and management is bound to the federal states and mostly concernes the regional level.

In order to follow a common transnational conservation approach, these differences must be recognized and adequately considered. Therefore, the conservation strategy on lynx population level is meant to serve as common transboundary “umbrella”, which accommodates the (even ready existing) national,

regional or even local conservation approaches. The strategy is designed to give “freedom within frames”, which refer to legal and conservation related obligations and opportunities.

7.2.2. Sectoral dealing with three different trophical levels

Common to all three countries is the sectoral dealing with the different trophic levels of the ecological pyramid. The return or presence of large predators (“carnivores”) might influence the next trophic level, the ungulates (“herbivores”). As a consequence, even the basic layer “plants” can be affected.

The “plant level” is usually dealt with by the agriculture and forestry department. “Large herbivores” are managed usually by the hunting and forestry department, partly with quite contradicting objectives. Lynx, as one of the returning “large carnivores”, formally often belongs to the “game animal” legislation but – when it comes to conservation issues – to the conservation sector as well.

Communication and/or cooperation between the different sectors dealing with wildlife management is not guaranted. However, with the return/presence of large predators the needs for different administrative units to discuss and elaborate the complex issue in favour of a solution that is profitable from the viewpoint of all involved units becomes more and more obvious.

7.2.3. Complex topic – no easy solutions

The lynx conservation and management are very complex topics where interdisciplinary scientific approaches and cooperation of various sectors is mandatory to develop suitable tools and implement appropriate measures.

Strongly linked with the sectoral approaches within the administration (see chapter 7.2.2) is the complexity of dealing with three different trophic levels. With the new situation, that large carnivores are again being present in the cultural landscape of Central Europe, responsible authorities/bodies and key actors have to think and discuss about possible/necessary adaptions of former use and management approaches at plant and herbivore level.

Therefore, the discussion about the lynx and its conservation often reflects the struggle between hunting (herbivores) and forestry (tree regrowth) interests. With the main issue of the debate, the impact of roe deer browsing on forest regrowth/natural rejuvenation. And – as roe deer is the main prey species of the lynx – the role of the lynx can be seen on the one hand as an appreciated help for controlling the roe deer population, and on the other hand lynx’ predation can be perceived as the last straw that breaks the camel’s (in this case the roe deer’s) neck.

If the lynx returns into the biological system, its possible influence on distribution and population numbers of prey animals has to be taken seriously into account and must be discussed. But a fact based and solution-oriented discussion is difficult, with the reliability of hunting statistics often to be questioned and proof of illegal killing of lynx clearly showing, that the law is regularly breached within all three countries.

One promising way to move forward in these difficult discussions is to rely on the best and most robust population database available whenever possible. This foundation should be comprised of sound data on lynx, roe deer and forest regrowth. Efforts to achieve better and measurable indicators to collect robust data should come from all parties and departments, best with jointly developed methods, within a given timetable, with specific local focus and within specially designed pilot projects.

7.2.4. Low priority, discontinous participation, lacking practical goals

As stated in chapter 6.1., legislation is addressing lynx as a strictly protected species. But due to the complexity of the issue, the willingness and commitment in governmental structures is sometimes limited. But dealing with the topic would need intensive discussions with other departments. Furthermore, openly

and publicly addressing illegal killing of a protected species is often even unwanted in our socio-political environment, especially if you address an obvious lack of law enforcement. In general, environmental trespasses have a low priority within investigation units, and this includes the illegal killings of strictly protected species as well.

Building and maintaining trust between key actors is a crucial principle for lynx conservation work. This is not possible without continuous political and financial support. The majority of lynx work is currently done within different, temporally limited projects. Within these periods, intensive communication within and between different stakeholder groups and key persons is definitely leading to a better mutual understanding and even a trustful cooperation. However, these key elements in wildlife management can not be maintained without continuous efforts on every side. Without this longterm commitment, mutual trust is likely to erode again and even can lead to dissolving of expert teams.

Documents dealing with the complex issues of large carnivore conservation often have a low enforceability and just reach consensus on a very rough scale. One shortcoming is a lack of translation of legal obligations into practical goals. Of course, these flaws apply to this document at hand as well. However, by translating the concept of favourable conservation status into numerically and spatially explicit requirements this approach is a step forward. It is now up to the level of implementation and evaluation to steer into this direction.

7.3. External Opportunities

The cross-border region of the Bohemian Forest Ecosystem serves as a “Best practice” example to implement the EU recommendation of a population level management of large carnivores into reality. The programmatic of the Central Europe Programme (INTERREG B) referring to the sustainable use of natural resources as a natural heritage perfectly suits this approach perfectly. The Eurasian lynx is among European large carnivores probably the least controversial species in terms of real conflicts with the demands of people. Thus, conservation actions and management approaches can be readily achieved which can also serve as a good basis to build management and action plans for other large carnivores like the wolf.

7.3.1. Perfect pilot region

The transboundary area of lynx occurrence along the borders between Czech Republic, Germany and Austria provides a perfect pilot region for cross-border conservation and management approaches. The trilateral lynx occurrence should be considered and managed on population level.

The approach is a best practice example for the development and implementation of large carnivores´ management on population level approach as recommended by the EU commission. The BBA conservation strategy serves as a common roof for national, regional and local actions, so that countries can use their “freedom within frames”.

Collected data about lynx occurrence and population numbers are robust and the lynx population seems still vital with some dozens of reproductive events every year. The pilot region is well defined by geographic features. Even if the area of the Bohemian Forest Ecosystem is not large enough to host a population in favourable conservation status, there are possibilities of functioning linkages to other lynx populations to counteract genetic depression in the long-term period.

7.3.2. Perfect species

The Eurasian Lynx as the European largest cat is a very charismatic species. Furthermore, humans are not really afraid of it and the depredation risk on livestock is very low. For these reasons, the implementation

of management and conservation approaches for lynx can be considered as the easiest among the European large carnivore species.

Consequently, administration, society and politics could use the “lynx case” as a good opportunity to learn and train how to deal with large carnivore conservation by addressing the three trophic levels, their mutual interactions and finally outbalancing possible effects on them. Therefore, our society can learn to cope with the presence of a large carnivore and the associated, often contradicting/conflicting demands based on different human interests.

7.3.3. Setting standards

With this transboundary conservation strategy, its spatially explicit stepwise implementation and continuous evaluation by administrative bodies with a high level of participatory elements, the three countries can set standards in approaching and working on complex issues in nature, especially large carnivore conservation.

The creation of the transboundary “Lynx Management Board” (LyMBo) (see chapter 11) and its role in guiding the discussion and implementation of largescale lynx conservation could serve as a model example for the next decades.

7.3.4. Stakeholder involvement

Lynx monitoring and conservation actions provide excellent opportunity to build communication bridges with other stakeholders, e. g. hunters and foresters, which can lead to their direct involvement in both activities and open doors for other conservation topics. Regular cooperation can build trust and willingness to solve conflict issues.

7.3.5. Educational potential

Within the last decades a lot of robust monitoring and research has been done within the BBA lynx population put together by scientists, conservationists, hunters and foresters. It has a potential to be used for education of public as well as further generations of stakeholders involved in lynx issues. Research results can be part of academic curriculum at forestry, hunting, zoology and ecology education in different universities.

7.4. External Threats

The increasing fragmentation on small and large scale threatens lynx habitat and possible migrating corridors with the BBA lynx population being still small and isolated. As the occurrence descended only from a few founder animals, the population faces a high risk of inbreeding, and consequently extinction in the long term as well. Illegal killing is still a major threat in all three countries, which could even intensify when neglecting possible/necessary adaptions in favour of herbivore management.

Within the human society, the trend towards self-profiling of individuals mainly peering on short term publicity and status prevents building of trust and long-term cooperation among relevant stakeholders.

The return of the wolf to the Bohemian Forest Ecosystem is another challenge for lynx conservation, as the discussion about the management of the wolf is accompanied by much more emotionality and controversy.

7.4.1. Fragmentation of lynx distribution

The fragmentation of lynx distribution implies two levels – the first is the fragmentation of lynx occurences and lacking genetic exchange between these different populations, and the second one is the continuous degradation of habitats. Both topics are very complex clearly calling for interdisciplinary approaches.

7.4.2. Fragmentation of lynx occurences

Transport, industrial and urban infrastructures represent barriers that significantly limit free movement of animals in the landscape. Habitats offering favourable conditions for lynx each day become more fragmented, creating isolated areas with insufficient connection to the surrounding environment. This process, called landscape fragmentation and fragmentation of populations, is one of the most significant negative impacts of human activities on the living nature (Miko & Hošek, 2009).

Lynx is a species with large-spatial requirements (see chapter 5.1.3.4). Lynx is able to adapt to some extent, but especially females are sensitive to disturbance. They need safe retreating sites for raising kittens and habitats which offer sufficient food supply.

Due to diverse ecological requirements of lynx and due to variable natural and social conditions in particular areas, finding solutions or proposing certain protection measures poses a very complex challenge. The number of anthropogenic barriers has been increasing extremely fast over the past few decades. As a result, fragmentation of the landscape is nowadays perceived as a crucial issue. The open landscape, a mixture of natural and semi-natural habitats, supposed to act as a connecting element between lynx occurences, is now losing its capacities. In many cases, this is an irreversible process making the securing and protection of the existing linear connections a key task in species conservation. Therefore, ecological networks are getting more and more important with their basic attribute of suitable habitats and desired continuity. The level of implementation of ecological networks and other measures to counteract the effect of population fragmentation again varies strongly among the BBA countries, with Czech Republic taking a lead in this area. However, regardless of the concerned country, it always requires excellent cooperation and communication of various state sectors like land use planning authorities, nature conservation authorities, transport, forestry and other sectors on national, regional and local levels. This makes the defragmentation topic a very challenging issue.

Negative examples are:

- building of infrastructure (highways, railroads), especially without fauna passages or without Environmental Impact assessment (EIA) on state or transboundary level
- higher traffic intensity, even on smaller roads
- continuous urbanisation and conversion of natural habitat into cultural landscapes affecting existing and potential wildlife corridors
- intensive large-scale agriculture leading to even less coverage of the already open landscapes in many areas, which are becoming completely unsuitable for migratory movement

7.4.3. Habitat deterioration and loss on small scale

The slow but perpetuous degradation of lynx habitat basically regarded as good, is often difficult to detect, as the local (negative) influence is difficult to identify and measure. For the competent authorities it is difficult to evaluate the cumulative effects of such small disturbances. In fact, lynx is considered as an adaptable species, however, it has some threshold limits of tolerance which can be easily overreached by cumulative amount of human activities. Thus, the overall increase of disturbances could lead to real negative impact, especially on reproductive sites.

Examples of such negative activities are:

- Increasing opining of forest area, e.g. due to bark beetle control
- Increased wilderness tourism and recreational hobbies in prime lynx habitat, especially functioning as lynx resting/reproduction sites (e.g. geocaching)
- Local road improvements, of local roads leading to higher traffic volumes and faster driving
- Steady urban sprawl and encroachment leading to scattered settlements and subsequent habitat fragmentation

7.5. Inbreeding

The BBA population has been founded by only a few animals (5 - 7 in Bavaria in 1970 - 1973, and 17 in Czechia 1982 - 1989; see chapter 5.1.2, Volfova & Toman 2018). Nowadays still being small and isolated, the population faces a high risk of inbreeding.

A high level of inbreeding could lead to:

- loss of genetic variability
- less fecundity
- higher susceptibility to diseases

The situation within the BBA population has been analysed during the 3Lynx project, first results indicate a low number of the effective population and a strong degreee of inbreeding (see chapter 5.4.1.).

7.6. Diseases

Within the last 30 years, lynx that died from diseases are rare within the BBA area. Looking at other populations, diseases like sarcoptic mange, caused by an ectoparasite (documented in the Harz and Carpathian populations) could play a role (e.g. Wölfl S. et al., in press). In Naliboki Forest, NW Belarus, a strong yearly decline in lynx population, along with the observation of ill animals and a lack of reproduction was recorded in 2019 (Sidorovich 2019). The symptoms recorded in ill animals were: weight loss, abnormal appearance or inflammation of the eye (conjunctivitis), frequent urination, urination outside of usual marking point. The cause of this decline however remains unknown.

Incidences of Feline Leukemia Virus (FeLV) are known from *Lynx pardinus* and *Lynx rufus (Meli 2010)*, but clinical symptoms and deadly outcomes are so far not documented in *Lynx lynx* .Feline immunodeficiency virus (FIV) classically infects felid species with highly divergent species-specific FIVs. Recent studies have detected an FIV strain infecting *Lynx rufus* in California and Florida (Meli 2010).

7.7. Human-Induced mortality

Apart from negative impacts on lynx habitat, human-induced mortality is clearly the main threat to the BBA lynx population.

7.7.1. Illegal killing

First of all, the term “illegal killing” has to be clearly distinguished from the term “poaching”. “Illegal killing” refers to the killing of a protected species which is not allowed to be hunted at all or having year-round protection, whereas “poaching” refers to the killing of a game species, but without having the licence to do so (e.g. hunting in the neighbouring hunting ground or by taking possession of a game species killed in a traffic accident).

During an assembled workshop by 3Lynx project partners, illegal killing has been assessed as the most important threat to lynx conservation. Extensive population modelling comes to this conclusion as well (Heurich et al. 2018).

During the last decade, various cases of illegally killed lynx have been documented within the BBA population (see status review, chapter 5.4). Data from extensive camera trapping show a high degree of “turnover” of resident lynx in certain areas. Most of them are never recorded again, despite BBA area is nearly completely covered by lynx monitoring scheme. The then vacant territories are occupied more or less shortly afterwards by subadults or other mature animals. This “unnatural high turnover of resident animals” is a strong indicator that illegal killings take place regularly and have a high impact on the BBA lynx population.

Lynx illegal killing, which has always been a major threat to the lynx population survival in all three countries, is also an interdisciplinary issue. In the BBA area, the issue has been was investigated by the sociological tools revealing that the reasons for illegal killing vary from gaining of attractive trophy to reduction of a major roe deer predator to hate. Variety of reasons leads to a diversity in the types of poachers. The main motivation for the illegal killing also varies among countries and in time, e.g. based on recent study, in the Czech Republic, the motivation is shifting from competition for hunting roe deer more to lynx trophy hunting).

The activities to reduce illegal killing in the three countries must include sociological research conducted in order to better understand the motives and characters of perpetrators, economic motivation for lynx acceptance, improvement of procedures of investigation and prosecution of lynx illegal killing and better communication and cooperation with key stakeholders, mainly hunters and foresters. This means the problem itself can only be solved using the knowledge from the fields of sociology, economy, hunting, forestry, biology, crime science and a number of other scientific fields in cooperation of various state sectors.

7.7.2. Traffic mortality

The collisions caused by traffic (mostly road, sometimes railroad) are the second most important cause of lynx mortality. Improvement of road infrastructure including minor roads generally leads to higher traffic volumes and increased vehicle speed. This leads to higher traffic mortality as well as deterioration of habitat mentioned above (see chapter 7.4.2).

7.7.3. Captive lynx and escapes/illegal releases

Captive lynx individuals with long-term experience with humans mostly show atypical behaviour such as reduced shyness when replaced in the wild again. The problem is that they often cannot hunt (or only to

limited extent), which increases the risk of regularly approaching human settlements and killing domestic animals (e.g. sheep, dogs).

In the Czech Republic, there are regularly registered cases where a captive-bred lynx escapes into the wild (so far the last case was in 2019, the lynx has been moving in the wild for more than half a year and its recapture has failed).

There is also not sufficient control of lynx breeders, bred individuals and so far there is also no genetic database enabling the identification of each individual and his offspring.

7.8. Lack of cooperation

7.8.1. Sectoral perspectives

As stated in chapters 3 and 4, the return or presence of a large predator is a complex issue and demands a holistic management approach. Triggered by the increasing presence of large carnivores, a holistic management approach within and outside administrations has to be relearned . Of course, among all affected and involved stakeholder groups this needs an open and fact-based discussion and argumentation.

7.8.2. Loudness instead of arguments – raising self-interest

In general, voices uttering self-interests are raising in Europe. Approaches to find common ground and to work hard for compromises get rarer, loud voices often have a quicker and higher impact than sound arguments. This should definitely be kept in mind working with lynx conservation.

The return of the wolf will probably increase this tendency: the debate about wolves might override constructive approaches/willingness for compromises by (intended) political uproar, addressing pure emotions and clearly going for extremes.

Large carnivores are “sexy species” which easily get high attention by media, and people who deal with these issues are therefore exposed to public interest. Therefore, some of these people may tend to develop a clear personal interest instead of pursuing long-term conservation guidelines. This behaviour often contradicts with the most important aims of trust building and fair negotiations.

7.9. Management of prey species (wild ungulates)

As the issue of predation is crucial when talking about large carnivores, the management of prey species deserves a separate subchapter. In most cases throughout Europe when large carnivores return the possible impact on the herbivores level is taken into consideration very lately or not at all.

Lynx food requirements are well studied in several lynx populations, but reliable data about real numbers of wild ungulates are usually not available. Therefore, direct impacts of carnivores on prey species and of prey species on forest regrowth cannot be precisely estimated. Because of the lack of reliable data, discussions between hunters and foresters about game densities and their impact on forest regrowth are often stuck. Subsequently, people hesitate to put the return of large predators on top of the already difficult dispute. In consequence of this neglection, lynx often serves as a scapegoat for hunting-forestry controversy about appropriate ungulate and forest management.

7.10. Discontinuous financing of information, communication and participation work

Three aspects are most relevant for success or fail of public relation work: intensity, continuity and coordination. However, national resources for these communication activities are limited and so far they

have not been seen as a priority for state nature conservation. Therefore, public relation work often relies on international, EU funded projects, which however, by mere definition, have a beginning and an end. Therefore, the intensity of public relation work could be allocated only to certain periods but continuity in a decent but comprehensive manner is definitely still lacking. There is also an issue of personal continuity in communication with stakeholders due to unstable financing.

7.10.1. Information, education and communication

General knowledge about basic lynx ecology, hunting behaviour, habitat and status is low because a wide part of the public is not interested. There are enough information sources but there is a lack of platforms to share more complicated topics and issues. People are used to quick and superficial communication and they are not willing to dedicate longer time to study and understand the topic. This is a general issue of these days.

Journalists are interested in special outstanding events and often not-fact-based news are published. General mass media are not a suitable channel to communicate with some target groups, e.g. hunters and foresters. In their case, face-to-face communication and discussion are crucial and enable to overcome “traditional” knowledge and opinions.

7.10.2. Participation

In general, participation means an active involvement, this can be ensured by active support in monitoring activities, attendance of information or communication talks, often within the respective stakeholder group. In general, these activities support and lead to a good cooperation and confidence and trust building.

However, since the method of using automatic camera traps yield a definite recognition of individuals, lynx monitoring is good and robust enough to reveal in some areas an unnatural high turnover of resident animals, a strong indicator of illegal killing (see chapter 7.7.1.).

In spite of being a wonderful instrument for detecting wildlife together, the results indicate circumstantial evidence of illegal killing. Therefore, tendencies within the hunting community exist to carry out their own lynx monitoring. However, as good pictures allow individual recognition – no matter who set up the camera trap – results should be similar, if not fakes or lynx pictures attributed to false locations will show up more often. Therefore, it will be crucial keeping up common standards (e.g. checking the location of camera traps) while implementing robust lynx monitoring.

8. From Vision to Conservation Actions

This chapter extensively describes the various conservation actions derived from the four practical goals. Split up into different objectives and respective targets, the conservations actions are listed and linked to various actors, a specific time line and measurable indicators. This procedure translating conservation goals into practical actions is based on a classical Logical Framework Approach (LFA, see e.g. IUCN Cat Specialist Group 2015). All conservation actions are summed up in a table ready at hand for responsible administrations, experts, interest groups and broad public (see chapter 9).

8.1. Overall Vision

The overall vision for the BBA lynx population reads as follows: **"To restore and maintain, in co-existence with people, a viable lynx population within the Greater Bohemian Ecosystem connected with other metapopulations in Central Europe"**

This implies two main parallel approaches, one focusing on the large cat itself, the other on the human dimension and related aspects like possible conflicts and acceptance.

- The long-term survival of lynx within the BBA population is secured
- The species "Lynx" is respected as an integral part of the native fauna and the natural heritage of Central Europe

8.2. Practical Goals

We split up the overall vision into four practical goals, several respective objectives and specific targets.

GOAL I: Lynx returns to and stays in a Favourable Conservation Status

- Objective I.1.: BBA Lynx population is in a favourable conservation status
    - Target I.1.1.: Reach minimum population size (165 family groups)
    - Target I.1.2.: Assess genetic status
    - Target I.1.3.: Secure genetic and physical health
    - Target I.1.4.: Assess population status and dynamics
    - Target I.1.5.: Ensure steady enlargement of distribution into suitable habitat within BBA area
    - Target I.1.6.: Improve methods and help with specific research
- Objective I.1.: Robust and efficient monitoring on population level
    - Target I.2.1.: Implement and continue standardized demographic monitoring
    - Target I.2.2.: Regularly analyse and present results
    - Target I.2.3.: Provide sufficient resources

GOAL II: Sustain and enhance landscape permeability for lynx

- Objective II.1.: Maintain and restore habitat structure, function and connectivity within BBA area
  - Target II.1.1.: Stop/counteract small scale deterioration/encroachment of prime lynx habitat
  - Target II.1.2.: Reduce traffic mortality (related to population size and expansion)
  - Target II.1.3.: Protect lynx habitats and corridors in spatial planning
- Objective II.2.: Secure and improve connectivity to other lynx populations
  - Target II.2.1.: Analyse and define key areas and possible corridors to other (meta)populations
  - Target II.2.2.: Secure and improve sufficient connectivity within the given corridors
  - Target II.2.3.: Assisted exchange of single individuals to prevent/counteract inbreeding

GOAL III: Keep and raise acceptance for the lynx

- Objective III.1.: Raise awareness and knowledge about lynx and create broad communication capacities
  - Target III.1.1.: Provide regularly fact based information to broad public
  - Target III.1.2.: Provide target-specific information
  - Target III.1.3.: Ensure regular communication
  - Target III.1.4.: Implement education and training
- Objective III.2.: Build up mutual trust through participation and integration
  - Target III.2.1.: Engage local people into the standardized lynx monitoring
  - Target III.2.2.: Sustain and enhance the network of cooperating people
  - Target III.2.3.: Establish regional round tables/consultative groups
  - Target III.2.4.: Prepare and adopt guidelines for monitoring of main prey species
- Objective III.3.: Address, prevent and mitigate possible conflicts
  - Target III.3.1.: Deal with conspicuous animals
  - Target III.3.2.: Secure sustainable compensation system for livestock depredation
  - Target III.3.3.: Provide damage prevention solutions
  - Target III.3.4.: Apply integral ungulate and forest management in lynx conservation
- Objective III.4.: Promote economic benefits from coexisting with large carnivores and generate incentives around lynx presence
  - Target III.4.1.: Introduce lynx as a flagship species for sustainable land use/ecotourism
  - Target III.4.2.: Reward monitoring contributions
  - Target III.4.3.: Consider lynx presence into hunting policy

GOAL IV: Prevent illegal killing and other illegal actions

- Objective IV.1.: Decrease/prevent illegal killing
    - Target IV.1.1.: Implement robust monitoring to transparently document turnover rates of resident animals
    - Target IV.1.2.: Create and increase awareness within investigation and justice units
    - Target IV.1.3.: Improve and secure professional investigation methods and procedures
    - Target IV.1.4.: Provide sufficient capacities and ensure severe penalties
    - Target IV.1.5.: Train and establish volunteer and professional rangers
    - Target IV.1.6.: Raise political and public awareness towards illegal killing
- Objective IV.2.: Detect/prevent illegal releases
    - Target IV.2.1.: Get overview about lynx kept in enclosures
    - Target IV.2.2.: Regular check of lynx stock in captivity
    - Target IV.2.3.: Detect illegal releases

The work on different objectives and targets sometimes leads to the same specific conservation action. If so, this action is placed in detail where it is mostly needed, and otherwise just shortly stated with a link to the comprehensive description.

The given conservation actions could include tasks which are already fulfilled or on its way to be implemented. These actions are integrated on the one hand to raise motivation proceeding on the given path, on the other hand to easier detect setbacks and neglections.

8.3. Prerequisites and demands

For the implementation of the BBA lynx conservation strategy main responsibility lie at the government and administrative level – hand in hand with experts, key stakeholders and interest group. These bodies should foster round tables to facilitate exchange of information, constructive dialogue and further development of objectives and participatory approaches.

Essential backbone to evaluate the given conservation strategy is the implementation of a robust monitoring to document and assess the lynx population, esp. given reproductive units, distribution and population trend.

The strategy enumerates a comprehensive numbers of conservations actions that countries/regions can choose of. Which actions are needed in specific contexts and surroundings is to define and select by the contracted parties. The first listing and prioritizing should be done best during the preparation of the first meeting of the Lynx Management Board (LyMBo) based on the lynx monitoring report 2019/20, available beginning of 2021.

8.4. Goals, objectives, targets and conservation actions

Goal I: Lynx returns and stays in a favourable conservation status

Translating the vision's part of longterm survival into practical goals we used the concept of the favourable conservation status (FCS, European Economic Community 1992). Generally speaking, the **lynx should return to and stay in a FCS.** All conservation actions are meant to foster and secure the long term survival of the species within the BBA area.

Objective I.1. BBA population is in a Favourable Conservation Status

Target I.1.1. Reach Minimum Population Size (165 family groups / 85 mature males)

The crucial issue for "reaching sufficient numbers" is the translation of the legal obligation for FCS into practical goals. One pragmatic approach is to refer to the criterion D (population size) of the IUCN Red List category "near threatened" and use the translation into numbers given in the "Guidelines for population level management plans of Large Carnivores in Europe". The numbers amount - for an isolated lynx population - to 1,000 mature animals (category "near threatened"), or to 250 mature animals for an occurrence being connected to other populations (category "vulnerable").

For lynx, 1,000 mature animals – calculating one animal/100km² - would mean a spatial demand of approximately 100,000 km². The BBA area is not large enough to correspond to these numbers, so the logical consequence is to pursue two parallel approaches: hosting at least 250 mature lynx and securing genetic exchange between neighbouring sub-populations creating metapopulations of a minimal size of 1000 adult animals (see chapters 6.1.1, 8.1, 9).

As the 250 mature animals are defined as the absolute minimum numbers for reaching FCS, we propose to count only actually reproducing animals to be well above this critical bottom line. Taking lynx social organization into account (on average one male covers the home ranges of two females), the minimum of 250 mature animals consist of 165 reproducing females and 85 reproducing males. To reach 250 animals taking part in reproduction we therefore propose to strive for **at least 165 reproducing females** and **85 males** within the BBA population.

Key monitoring unit is the **„lynx family group"**. These family groups should be distributed according to proportion of available suitable lynx habitat in the Czech Republic, Germany and Austria, respectively.

Conservation Action I.1.1.a Robust monitoring to detect family groups, number of mature/independent animals and recorded kittens

Actors: responsible authorities/administration

Timeline: every year (2020-2025)

Indicator: yearly assessment report

[see Target I.2.1.]

Conservation Action I.1.1.b Establish facility/rescue station for motherless/orphaned/injured lynx on population level

Actors: responsible administration

Timeline: 2021

Indicator: facility built and in use

During the last decades, a fair number of lynx kittens and subadults were found alone and helpless within the BBA area. Mostly these helpless animals approached single houses or small villages looking for easy food because obviously they could not survive in the wild. We call these animals “motherless” because there could be various reasons behind this phenomenon:

- Mother is dead (illegal killing, traffic accident, other causes)
- Mother is severely injured so she cannot care for the kitten(s) anymore
- Family group was severely disturbed and split up (e.g. logging or hunting activities)
- injury or sickness of the kitten/subadult/adult so the animal is no longer able to care for itself

Within the BBA area there is no apt facility or rescue station to care for theses animals. Nature protection law demands care and rerelease of these animals when they can care for themselves and are fit for the wild again. Experiences show that even kittens found alone very early could survive in the wild after a period of captivity of 10 months or more. However, care should be applied under special circumstances, e.g. far from public visitors and with trained personal. Such a facility to care for these motherless animals with the clear goal to release them again into the wild is urgently needed.

The capacity of the facility should be set according to number of orphans and injured lynx yearly recorded in the BBA area. The facility should be able to accept animals from all three BBA countries which implies establishing of working bureaucratic procedures and permits.

Conservation Action I.1.1.c Establish procedures and common protocols so rescue facility can be used by all three countries

Actors: responsible administration

Timeline: 2021

Indicator: facility built and in use

To use the rescue facility best and efficient within the BBA countries area procedures and protocols have to be prepared in advance to facilitate the (transboundary) transport of the given animals.

Conservation Action I.1.1.d Establish common protocols for capture, care and release of these animals

Actors: responsible administration

Timeline: 2021

Indicator: protocols are trilaterally implemented

To reach and guarantee comparable international standards protocols have to be prepared for capture, care and release of these animals. Moreover, evaluation of this conservation action should document whereabouts and fate of the given animal.

Conservation Action I.1.1.e Care and release of motherless/orphaned/injured animals

Actors: responsible administration; contracted parties/experts

Timeline: if suitable/necessary

Indicator: number of cared for and released animals

Any action should be consider the genetic status and consequences, well documented and reported during the yearly meeting of the LyMBo.

Conservation Action I.1.1.f Replacement of illegally killed animals with genetically apt animals in suitable areas in cooperation with/including stakeholders

Actors: responsible administration; contracted parties/experts

Timeline: if suitable/necessary

Indicator: number of replaced animals

If illegal killing of a lynx is documented the loss should be compensated by the release of a genetically and gender suitable animal. The reasoning behind is that criminals should not have success in diminishing a strictly protected species. Related costs of the action should be paid by the causer if known and convicted.

Conservation Action I.1.1.g Translocation of animals to foster given distribution patches/create new stepping stones

Actors: responsible administration; contracted parties/experts

Timeline: if suitable/necessary

Indicator: number of translocated animals, increase of permanently occupied lynx range

In certain cases, a translocation of animals from one place to another might have direct positive effect on small distribution patches or potential stepping stones. Especially the translocation of subadult females could have remarkable effects because usually these young females tend to stay near her mother's territory and try to establish their home range nearby (see chapter 5.1.3.4). So their tendency of long distance dispersal is low. On the contrary, young males tend to roam far greater distances during their dispersal so they could reach once in while lone young females translocated to suitable stepping stones eventually forming a new reproducing unit.

Of course, any translocation has to be well prepared in terms of information and intense communication with the relevant regional stakeholders. Permission for such an action must be issued by the responsible authorities.

Conservation Action I.1.1.h Reinforcement of given distribution patches/stepping stones

Actors: responsible administration; contracted parties/experts

Timeline: if suitable/necessary

Indicator: stabilization of permanently occupied lynx range

Translocations could serve to reinforce existing distribution patches as well. For translocations, strong attention should be paid to the age and status of given animals. Tendencies for the so-called "homing in", the behaviour to try to get back to the original habitat, are much stronger the elder the animal is and when dealing with residents (animals having established their own territory). In males, dispersal tendencies and this "homing in" are generally stronger.

Conservation Action I.1.1.i Reintroductions ("new animals in new areas")

Actors: responsible administration; contracted parties/experts

Timeline: if suitable/necessary

Indicator: lynx range expansion

Of course, any reintroduction has to be well prepared in terms of information and intense communication with the relevant regional stakeholders. Experiences so far indicate that success of such actions is strongly

linked with a intense communication process to head for common responsibility among various stakeholder groups paired with cross sectoral administrative support.

Target I.1.2. Assess genetic status

For the long-term survival of the BBA population genetic health is crucial. Being founded with only a few animals inbreeding can be a heavy burden. Therefore, a regular assessment of the genetic status is necessary.

Conservation Action I.1.2.a Common protocols for collection, storing and analysing of genetic samples

Actors: responsible administration; contracted parties/experts; genetic labs

Timeline: 2022

Indicator: Common protocols on population level

For collecting, storing and analysing genetic samples common protocols are recommended to optimize results and comparability across the whole population.

Conservation Action I.1.2.b Regular assessment of genetic status

Actors: responsible administration; contracted parties/experts

Timeline: every 5 years

Indicator: Collection of sufficient samples to guarantee successful and comparable analysis of about half of the given population size to assess inbreeding coefficient/heterogenity.

Results of the genetic analyses are summed up in the assessment report every 5 years paired with a set of recommendations to proceed towards a satisfactory genetic status.

Target I.1.3. Secure genetic and physical health

Depending on the results of the genetic analyses and detected examples of physical health problems actions to counteract negative effects are to be taken. For the BBA population the phylogenetic trait has been defined to be “Carpathian line” (Council of Europe 2019). Therefore for any active measure the given animal(s) should correspond to this phylogenetic trait.

Conservation Action I.1.3.a Monitor health of the population

Actors: responsible administration; contracted parties/experts

Timeline: in every given case

Indicator: number of individuals

The BBA population should be closely monitored for anomalies esp. inbreeding-related, infections and other health issues. Preferably noninvasive methods such as scat collection, autopsy of dead individuals should be used. Common protocol prepared by veterinarians should be applied in order to monitor population health status.

Conservation Action I.1.3.b Care and release of motherless/orphaned/injured animals

Actors: responsible administration; contracted parties/experts

Timeline: if suitable/necessary

Indicator: number of cared for and successfully released animals

Refer to *Conservation Action I.2.1.e*

Conservation Action I.1.3.c Sporadic exchange of animals between areas or populations (e.g. motherless animals)

Actors: responsible administration; contracted parties/experts

Timeline: if suitable/necessary

Indicator: number of exchanged animals

One promising tool for enhancing genetic health could be the exchange of specific animals between countries and/or populations. For example, the care and release of motherless animals implies capture, transport and more or less time in captivity anyway, so an exchange of these animals can be prepared and organized by responsible bodies in time. However, it is mandatory to consider the phylogenetic Carpathian trait.

Conservation Action I.1.3.d Replacement of illegally killed animals with genetically suitable animals

Actors: responsible administration; contracted parties/experts

Timeline: if illegal killing happens

Indicator: number of replaced animals

Refer to *Conservation Action I.2.1.f*

Conservation Action I.1.3.e *Common protocols for examinations of animals (alive or dead)*

Actors: responsible administration; contracted parties/experts

Timeline: 2021

Indicator: Protocols for capture and findings of dead animals (pathology, forensics)

To guarantee standard procedures when capturing lynx or examining lynx found dead common protocols should be used to ensure comparability of analyses across the BBA population.

Conservation Action I.1.3.f *Analyse known mortality from the protocols in the yearly status report*

Actors: responsible administration; contracted parties/experts

Timeline: every year

Indicator: cases and results are integrated into the yearly assessment report

All cases of captured animals and lynx found dead are documented using common standards and the results integrated into the yearly status report.

Conservation Action I.1.3.g *Remove/replace problematic animals*

Actors: responsible administration; contracted parties/experts

Timeline: in every given case

Indicator: number of discussed and performed cases

To remove/replace problematic animals a profound and sound documentation and reasoning of the given case is mandatory. Problems could arise from genetic origin, life history (e.g. escape from captivity, illegal release), health problems or certain behavior. The documentation of the given case should be cross-sectoral within the responsible bodies and communicated to the relevant (regional) stakeholders. Common standards should be developed and applied in all BBA countries.

Target I.1.4. Assess population status/dynamics

To describe vitality of the lynx population to know the key parameters of population ecology (natality, mortality, emigration and immigration) is crucial.

Conservation Action I.1.4.a Assess population parameters (natality, mortality, emigration, immigration) on population level per lynx year

Actors: responsible administration; contracted parties/experts

Timeline: every year

Indicator: status report contains population parameters

Target I.1.5. Ensure steady enlargement of the distribution into suitable habitat within BBA area

For reaching FCS lynx has to increase its range within the BBA area continuously. So monitoring the edge of the known distribution to detect natural expansion is necessary. If no expansion is seen active conservation measures (see Target I.2.1.) should be applied to support range increase.

Conservation Action I.1.5.a Monitor distribution along population edges to detect natural expansion

Actors: responsible administration; contracted parties/experts

Timeline: every year

Indicator: documentation of expansion of lynx distribution (grid cells with C1 data, with focus on new family groups)

Conservation Action I.1.5.b Apply active measures to support or create new distribution patches/ stepping stones

Actors: responsible administration; contracted parties/experts

Timeline: every year

Indicator: expansion of lynx range/new distribution patches (grid cells with C1 data, with focus on new family groups)

For implementation of active conservation measures see extensively Target I.2.1

Target I.1.6. Improve methods and help with specific research

Regularly assessing the status of the BBA lynx population is not an easy task. In various field,s improvement of methods and new tools could foster an efficient and robust work within the area of monitoring, population assessment and the implementation of conservation actions.

Conservation Action I.1.6.a Develop identification tool for coat patterns

Actors: experts

Timeline: 2021-2022

Indicator: Identification tool is available

To compare lynx pictures for individual identification within and between countries is a tremendous task. The larger the population will be (which is the overall vision!) the more work will it be. So tools to facilitate the identification are needed. During 3Lynx project first steps were taken and should yield useful application tools within the next months.

Conservation Action I.1.6.b Conduct further analysis to improve population viability assessment

Actors: experts

Timeline: 2020-2025

Indicator: Methods and data base improved

To further asses, refine and evaluate the given argumentation for FCS further analyses (population viability analysis, occupancy and habitat model) will be designed within and after the 3Lynx project. To support these analyses countries sharing BBA lynx population will focus on improving the database in respect to population structure and dynamics.

Conservation Action I.1.6.c Improve genetic analysis with focus on individual kinship and pedigrees

Actors: experts

Timeline: 2020-2025

Indicator: Robust genetic pedigrees available, comprehensive evaluation of possible inbreeding effects

Within the 3Lynx project a large set of samples has been analysed to address the genetic status of the BBA lynx population. These analyses should be further developed with focus on individual kinship and pedigrees. Moreover, a comprehensive evaluation of possible inbreeding effects is needed within the next 5 years.

Conservation Action I.1.6.d Analyse and improve dispersal data

Actors: experts

Timeline: 2020-2025

Indicator: given data analysed

To understand dispersal mechanisms of subadult lynx is crucial to evaluate possible natural expansion of lynx. Therefore, existing data on dispersal and known life histories should be analysed, distinct patterns worked out, missing aspects described and recommendations for further studies derived.

Conservation Action I.1.6.e Organize and/or prepare input to (scientific) conferences, symposiums and workshops

Actors: responsible administrations; experts

Timeline: every year, attached to the expert group meeting preparing the LyMBo

Indicator: take turns between the three countries

To keep the scientific and methodological information exchange alive, scientific conferences, symposiums and workshops should be organized within the BBA area. The event could be attached to the prepatory expert meeting for the LyMBo group, countries could take turns in organizing the workshops.

Objective I.2. Robust and efficient monitoring on population level

The crucial backbone for evaluating the conservation strategy is to establish and secure a robust, standardized, robust and efficient monitoring. This lynx monitoring has to focus on methods ensuring individual recognition of animals. Otherwise, discussions about conservations issues will not be objective. Main responsibility to finance, implement, secure and evaluate the lynx monitoring lies within the national/regional authorities.

Target I.2.1. Implement and continue standardized demographic monitoring

Conservation Action I.2.1.a Focus on use of camera traps with individual recognition of lynx

Actors: responsible administration

Timeline: every year

Indicator: number of implemented camera traps across the BBA population area

From the long-term monitoring experience the use of automatic cameras is best for individual recognition of lynx. As soon as lynx start getting territorial photo traps are “catching” the animal within weeks or a few months. To document status of the animal (sex, territoriality, reproducing) a fair distribution of cameras is necessary. However, numbers of cameras trapping sites per spatial unit can vary, e.g. to document presence/absence 2-4 camera trapping sites per 100 km^2 are mostly sufficient, while to prove reproduction however 4-6 camera trapping sites might be necessary. Of course, number of cameras are strongly dependent on quality of trap locations (e.g. mere travel routes or scent marking places).

Applied camera trapping should focus on detecting reproducing females (as main indicator of FCS and strategy Target I.1.1.: Reach minimum population size - 165 family groups), life histories (e.g. distinct coat patterns of kittens to get to know their whereabouts and fate in the next monitoring years) and turnover rates of resident animals. To achieve these goals the extent of monitored area and continuity of lynx monitoring are crucial. For spatial planning of camera trap distribution, EEA reference grid (10 x 10 km) will be used.

Target I.2.2. Regularly analyse and present results

Conservation Action I.2.2.a Stepwise analyses of data on regional, national and population level

Actors: responsible administration, contracted experts/parties

Timeline: every year

Indicator: data analyses, preparation of assessment report (based on lynx year)

Data gathered across the BBA area should be put together, analysed and summed up in a yearly monitoring report, based on the data of the so-called lynx year (01.05. until 30.04. of the next year). This period comprises the biologically meaningful cycle of reproduction (birth of kittens until dispersal of youngsters).

Conservation Action I.2.2.b Assess population status on a yearly interval ("Lynx year")

Actors: responsible administration, contracted experts/parties

Timeline: every year

Indicator: assessment report issued in October

BBA population workshop will take place in November and sum up all available camera trapping data in order to compare lynx individuals recorded in the three countries and assess the minimum number of independent lynx recorded in the given lynx year in the BBA area. Results will be summarized in the BBA lynx status report by the end of January of the following year. This report will be baseline for the international lynx management board ("LyMBo", see chapter 11).

Conservation Action I.2.2.c Yearly evaluation of assessment report

Actors: LyMBo representatives

Timeline: meeting in November

Indicator: minutes, protocols of meeting

During the meeting of the BBA Lynx management board the status report will be discussed and evaluated.

Conservation Action I.2.2.d Assess population trend

Actors: LyMBo representatives

Timeline: meeting in February

Indicator: 3 years assessment report prepared

The evaluation implies the assessment of the population trend, based on the past three monitoring years. Main indicator will be the number of reproducing females.

Target I.2.3. Provide sufficient resources

Conservation Action I.2.3.a Provide resources for monitoring implementation, data handling and analyses

Actors: responsible authorities/administration

Timeline: every year

Indicator: yearly status report

Monitoring of an elusive species with these high spatial demands needs financial resources and manpower. Responsible bodies should provide enough funding to guarantee long-term implementation of monitoring to derive – based on robust data - meaningful conservation and management measures.

GOAL II: Sustain and enhance landscape permeability for lynx

Apart from reaching sufficient numbers lynx needs suitable and reachable habitat. This is true for three scales: the quality and permeability on a small scale within a lynx territory itself, e.g. the quietness of possible resting and reproduction sites. The medium scale is the permeability and connectivity within the BBA area so lynx can disperse and settle into all suitable habitat there. The third scale concerns the linkage of the BBA area to other lynx metapopulations, most important the autochthonous Carpathian population.

Objective II.1. Maintain and restore habitat structure, function and connectivity within BBA area

To maintain and restore habitat structure, function and connectivity within BBA area, necessary conservation targets are

- to secure and improve lynx habitat on a small habitat specific scale (e.g. key reproductive sites and ample prey base);
- to secure and improve connectivity within BBA area (e.g. permeability of roads or highways, mountain valleys which are very often continuously built up by settlements with less and less possibilities for animal movements).

Target II.1.1. Stop/counteract small scale deterioration/encroachment of prime lynx habitat

Small scale deterioration of lynx habitat is often barely noticed. Common understanding is that one more forest road here, one more hiking path or climbing route there is not relevant for a species with these high spatial demands. However all these small-scale activities add up and finally pose such disturbances that possible reproduction sites are not used any more or resting sites decrease under a critical level. Therefore, in lynx conservation spatial planning should definitely have these disturbing and additive effects in mind.

Conservation Action II.1.1.a Provide lynx data for spatial planning

Actors: responsible administrations; contracted parties/experts

Timeline: every year

Indicator: Data layer (GIS shape) available according to monitoring report

Robust lynx data are necessary to give spatial planning the base for efficient protection of lynx habitats and evaluation of possible impact of planned infrastructure and/or other activities (EIA, SEA).

Conservation Action II.1.1.b Ensure that spatial planning processes prevent habitat loss and maintain or increase lynx habitat connectivity

Actors: responsible administrations, contracted parties/experts

Timeline: every year

Indicator: stable or better fragmentation index

Regular input about key factors of lynx habitat requirements and possible threats should take place in spatial planning processes. Common goal would be the further prevention of habitat loss and (re)gaining better connectivity.

Conservation Action II.1.1.c (Fully or temporally) protect key reproduction and/or resting sites (e.g. from logging, leisure activities, hunting)

Actors: responsible administrations

Timeline: if suitable/necessary

Indicator: area increasing (km^2), e.g. protected forest/wildlife reserves, number of contracts with private landowners

To ensure undisturbed reproduction and/or resting sites, given areas could be fully or temporally protected. This could be done by designation of new small-scale protected areas and/or by special agreements/contracts with the respective landowners.

Conservation Action II.1.1.d Direct tourism and leisure activities (e.g. hiking, snow shoe walking, geo caching) on certain routes („stay on trail"-philosophy)

Actors: responsible administrations

Timeline: if suitable/necessary

Indicator: Length of mandatory/recommended use of trails (km)

Tourism and leisure activities should consider the habitat demands of lynx as well. Therefore, an intelligent pooling and guidance of activities, paired with comprehensible information should be worked out in specific regions/areas to enhance human sensibility.

Conservation Action II.1.1.e Conserve/regenerate prime lynx (and roe deer) habitat outside the forest („shrublands")

Actors: responsible administrations

Timeline: if suitable/necessary

Indicator: suitable area increasing (km^2)

In some regions of the BBA area extensive shrubland outside the forest serves as a prime roe deer and lynx habitat, even with documented reproduction. Special programs could help to conserve and even increase this type of habitat.

Target II.1.2. Reduce traffic mortality (related to population size and expansion)

Road mortality is one of the main causes of mortality in lynx, stongly linked to traffic density and driving speed. Improvement of roads usually exactly enhances these two factors, leading to a definite higher risk of wildlife casualties.

Conservation Action II.1.2.a Define critical crossing locations on fine-scale within BBA area

Actors: responsible administrations; contracted parties/experts

Timeline: from 2021 onwards

Indicator: regularly updated maps of critical crossings within BBA area (locations, numbers)

Within prime lynx habitat certain road passages are more prone to vehicle-wildlife accidents than others. One important task for spatial planning is to analyse and define these critical crossings on a small scale.

Conservation Action II.1.2.b Improve crossing possibilities

Actors: responsible administrations

Timeline: 2021-2025

Indicator: Number of improved crossing possibilities (green bridges, underpasses)

Having defined the most critical crossings adequate measures to reduce collision risk should be developed and implemented. These measures could be wildlife warning systems linked to automatic speed limits, the improvement of existing underpasses/bridges or the construction of new underpasses or green bridges.

Conservation Action II.1.2.c Install traffic signs and/or wildlife detection systems at specific critical locations

Actors: responsible administrations

Timeline: 2021-2025

Indicator: Percentage of marked critical crossings in relation to total critical crossings identified

To increase drivers' awareness special traffic signs could be installed to inform about high risk of lynx/wildlife crossings. In addition, wildlife detection systems, which are able to detect the presence of wildlife and warn drivers with light signals, could be used (at least at suitable places).

Conservation Action II.1.2.d Create specific information campaign for wildlife crossings with lynx as a possible flagship species

Actors: responsible administrations; contracted parties/experts

Timeline: 2021

Indicator: Implementation of information campaign

To address the vehicle-wildlife dilemma a regional/national information campaign could be started, using lynx as possible and attractive flagship species.

Target II.1.3. Consider lynx presence and expansion in spatial planning

To conserve and improve landscape permeability for a wide roaming species like lynx the habitat requirements and movement patters should find their way into the spatial planning processes on all levels (fine scale to large scale).

Conservation Action II.1.3.a Implement environmental impact assessment (EIA) for planned infrastructure in lynx habitat and corridors

Actors: responsible administrations

Timeline: in every given case

Indicator: Lynx habitat demands are integrated in EIA

According to current EU and national legislatives, environmental impact assessments have to be conducted when infrastructure is planned in lynx habitats and possible migrating corridors, based on explicit data and/or expert's estimations.

Conservation Action II.1.3.b Conduct transnational EIA for big projects influencing the whole lynx population, e.g. infrastructure projects

Actors: responsible administration, considering all affected countries (e.g. CZ, AT, DE, SK, PL …)

Timeline: in every given case

Indicator: lynx habitat demands are integrated in EIA

According to current EU and national legislatives, if large infrastructure projects concern the whole lynx population and/or important migration routes transnational EIA should be conducted considering the overall impact on the given metapopulation concept. In cases that the EIA is not performed, create international pressure to ensure the fulfillment of the law.

Objective II.2. Secure and improve connectivity to other lynx populations for regular exchange

One important demand to reach FCS for the BBA lynx population is to connect the BBA lynx population with other lynx subpopulations to form a functioning metapopulation. Concerning connectivity and habitat around the BBA area, conservation steps are

- secure and improve sufficient connectivity to other lynx populations (Carpathian, Alpine or Harz mountains). For reaching connectivity with neighbouring lynx populations, especially the Carpathian population, the so-called "CELTIC" concept (Conservation of the Eurasian Lynx – Management and International Cooperation; Wölfl et al. 2001) or the most recently developed maps of core-areas, stepping stones and corridors for the BBA area (Romportl 2015) could serve as a guideline;
- maintain and restore suitable habitat in these possible migrating corridors.

Target II.2.1. Analyse, define and ensure protection of key areas and possible corridors to other (meta)populations

To establish a long term natural exchange of individuals between metapopulations key areas and possible dispersal corridors needs to be defined, secured and – where necessary – improved.

Conservation Action II.2.1.a Create/assess/improve regional or national concepts on wildlife corridors

Actors: responsible administrations; contracted parties/experts

Timeline: 2020-2021

Indicator: Concepts available

In all three BBA countries some sort of national, regional or local concepts for wildlife corridors exist. These concepts should be completed and updated and protection for these areas should be ensured in practice.

Conservation Action II.2.1.b Implement environmental impact assessment (EIA) for planned infrastructure in lynx habitat and corridors

Actors: responsible administrations

Timeline: in every given case

Indicator: Lynx habitat demands integrated in EIA

For details see Target II.1.3.

Conservation Action II.2.1.c Merge regional and national wildlife corridor concepts on population level, using the CELTIC-concept

Actors: responsible administrations; contracted parties/experts

Timeline: 2021-2022

Indicator: GIS map layer with gradual habitat and corridor quality

The so called "CELTIC-concept" implies a linkage of the BBA lynx population to the autochthonous Carpathian population. Still being a very rough approach a further development using the regional and national concepts for wildlife corridors is necessary.

Conservation Action II.2.1.d Conduct transnational EIA for big projects influencing the whole lynx population, e.g. infrastructure projects

Actors: responsible administration, considering all affected countries (e.g. CZ, AT, DE, SK, PL …)

Timeline: in every given case

Indicator: Lynx habitat demands integrated in EIA

For details see Target II.1.3.

Conservation Action II.2.1.e Improve existing approaches by habitat and corridor modelling

Actors: responsible administrations; contracted parties/experts

Timeline: if necessary

Indicator: GIS map layer with gradual habitat and corridor quality

For details see *Conservation Action II.2.1.c*

Target II.2.2. Secure and improve sufficient connectivity within the given corridors

When existing and possible corridors are analysed and defined the next tasks will be securing and improving these habitats. This implies providing lynx data layers, the improvement of permeability of given infrastructure/barriers and a robust monitoring for evaluating these conservation actions.

Conservation Action II.2.2.a Provide lynx data for spatial planning

Actors: responsible administrations; contracted parties/experts

Timeline: 2022

Indicator: GIS map layer with lynx data

For details see *Conservation Action II.1.1.a*

Conservation Action II.2.2.b Improve and/or build fauna passages with linkage to the adjacent backcountry/existing corridors at the most problematic crossings

Actors: responsible administrations; contracted parties/experts

Timeline: 2020-2025

Indicator: Number of improved/new fauna passages

For details see *Conservation Action II.1.2.b*

Conservation Action II.2.2.c Monitor wildlife crossings on fauna passages

Actors: responsible administrations; contracted parties/experts

Timeline: when appropriate

Indicator: data on wildlife (lynx) detected at fauna passage

To evaluate implemented measures a robust monitoring of traversing wildlife should be applied, e.g. using camera traps.

Target II.2.3. Assisted exchange of single individuals to prevent/counteract inbreeding

If corridor analyses and improvements do not yield any or insufficient natural exchange of animals a so called assisted exchange of single animals should be applied in the meantime to prevent/counteract inbreeding in due time.

Conservation Action II.2.3.a Build one rescue facility for motherless/injured lynx within the BBA area

Actors: responsible administrations

Timeline: 2020-2021

Indicator: Rescue facility built

For details refer to *Conservation Action I.2.1.b*

Conservation Action II.2.3.b Agreement between BBA countries for easy use of the crossborder facility

Actors: responsible administrations

Timeline: 2021

Indicator: Agreement signed

For details refer to *Conservation Action I.2.1.c*

Conservation Action II.2.3.c Agreement between countries hosting animals of Carpathian origin for exchange of animals

Actors: responsible administrations

Timeline: 2021

Indicator: Agreement signed

To consider the phylogenetic traits on lynx exchange of animals with the BBA population should consider only animals from Carpathian origin.

Conservation Action II.2.3.d Exchange of individuals between lynx populations hosting animals of Carpathian origin

Actors: responsible administrations; contracted parties/experts

Timeline: if suitable/necessary

Indicator: number of exchanged animals

For details refer to *Conservation Action I.2.3.c*

Goal III: To keep and raise acceptance

For lynx being respected as an integral part of natural heritage, we need to maintain and raise acceptance among local people living in the BBA area. Apart from providing fact based, transparent and timely information, establishing adequate ways of communication to build trust between the various stakeholders is crucial. If such a constructive and trustful environment is created, possible conflicts can be reasonably discussed and possible solutions developed, by jointly finding a compromise or even generating win-win situations.

Objective III.1. Raise awareness and knowledge about lynx and create broad communication capacities

Target III.1.1. Provide fact-based information to broad public on a regular basis

Fact based and regular information is one important prerequisite for information, communication and participation. With the method of automatic camera traps being used extensively specific and reliable data about lynx presence and numbers is available. Sharing the results can serve as a robust base for further discussions.

Conservation Action III.1.1.a Online presentation of up-to-date information

Actors: responsible administrations; contracted parties/experts

Timeline: after each lynx year

Indicator: Presentation of key results from population based assessment report

Using the results of the yearly assessment report of the respective lynx year a comprehensive overview about the BBA lynx population can be presented in given online tools like websites and social media.

Conservation Action III.1.1.b Prepare and offer presentations on regional level

Actors: responsible administrations; contracted parties/experts

Timeline: at least once a year

Indicator: Number of presentations on regional level

Presentations about the recent assessment should be put together and be presented at local/regional level.

Conservation Action III.1.1.c Put together information for multipliers working with the public and for journalists

Actors: responsible administrations; contracted parties/experts

Timeline: each year

Indicator: summarized information package available

Presentations, training manuals or other means of communication can be prepared for multipliers within the various interest groups taking into account the principle of the “best messenger for the message”.

Target III.1.2. Provide target group specific information

Apart from the basic results about status and trend of the BBA lynx population, target group specific information and concepts should be created and further developed. This implies the incorporation of the lynx into the respective background, hopes and concerns of the respective interest group.

Conservation Action III.1.2.a Online target group specific newsletters

Actors: contracted parties/experts

Timeline: twice a year (winter/summer)

Indicator: Summer issue: monitoring results; Winter issue: related topics

Regularly providing target specific information could be ensured by a periodic newsletter presenting the recent lynx assessment and related issues.

Conservation Action III.1.2.b Provide target-group specific information events

Actors: responsible administration; contracted parties/experts; NGOs, in cooperation with interest group representatives concerned e.g. hunting associations

Timeline: continuously

Indicator: Number of events conducted

Events or meetings from interest groups concerned should be used to offer information about lynx e.g. at a meeting of a local hunting association, meeting of a forest department or regional administration.

Target III.1.3. Ensure regular communication

Providing fact-based information is the basic requirement for cooperation in lynx conservation and management. Within this process, monitoring results are discussed, argued and interpreted. This mutual process is crucial for a long-term establishment of a constructive and engaging dialogue among the people concerned.

Conservation Action III.1.3.a Organize regional symposium to present and discuss lynx issues

Actors: contracted parties/experts

Timeline: continuously when possible/needed

Indicator: symposium with written output and agreed goals/procedures

To discuss recent development of the BBA population a symposium or workshop should be organized on a regular basis. Responsible administration and/or interest groups can take turns - even across the three countries. The goal is to discuss conservation measures and challenges and identify areas of collaboration.

Conservation Action III.1.3.b Perform regular transboundary stakeholder visits

Actors: GOs, NGOs, experts

Timeline: continuously when possible/needed

Indicator: number of events

Jointly experiencing and reflecting upon different approaches in lynx conservation and management presents a very good and long-lasting way to establish mutual understanding and trust. These “stakeholder visits”, usually organized with 10-30 participants with various backgrounds and interests are meant to

bring together people across the BBA-Area and provide the potential of establishing long-term relationships between the participants.

Conservation Action III.1.3.c Celebrate the International lynx day by organizing public events, meetings and conservations actions

Actors: NGOs GOs, NGOs, experts

Timeline: each year on 11th of June

Indicator: number of events

During the 3Lynx project, the "International lynx day" has been established and set on 11th of June where events should commonly address the lynx conservation on a transnational scale in Central Europe. Therefore, this date or week could be used as a reminder and implementation of lynx conservation actions.

Target III.1.4. Implement education and training

Apart from general information to a broader public, target specific training and education can help raise awareness and create acceptance among specific target audiences.

Conservation Action III.1.4.a Develop and promote educational lectures for pupils and students

Actors: GOs, NGOs, experts

Timeline: 2021

Indicator: Lectures are developed and conducted

Specific training schemes present lynx ecology and conservation.

Conservation Action III.1.4.b Integrate lynx and related issues into the official curriculum for hunters and foresters education

Actors: GOs, NGOs, experts

Timeline: 2021-2022

Indicator: Lynx topic is integrated in the official curriculae and trainings are conducted

In the various educational process (apprenticeship, school, training courses) lynx ecology and related issues should be a common and mandatory part.

Objective III.2. Build up mutual trust through integration and participation

Creating and maintaining mutual trust is a long-term and continuous process. Based on a transparent information and communication based on robust data integration and participation of stakeholders in the conservation of lynx can yield a long term and trustful cooperation.

Target III.2.1. Engage local people in standardized lynx monitoring

Monitoring methods like using camera traps and/or implementing regular tracking surveys are excellent possibilities to engage stakeholders into the gathering of data. Being able to participate in monitoring gives people the opportunity to learn about the challenges of obtaining and interpreting data and can give them the feeling of being part of a bigger effort. Sharing one piece of puzzle to and being part of the whole picture deepens existing bonds considerably.

Conservation Action III.2.1.a Involve local interest groups (hunters, foresters, nature conservationists) in lynx (and game) monitoring using camera traps and tracking surveys

Actors: responsible administration; contracted parties/experts

Timeline: continuously

Indicator: Number of people integrated in lynx monitoring

Integration of local people into the monitoring of lynx and possibly its prey species tending camera trap locations or helping in tracking surveys is a very promising approach because working on common ground usually leads to more mutual respect and trust. However, usage of obtained data, data flow and feedback must be clearly designed to prevent data loss or even data misuse.

Conservation Action III.2.1.b Apply and adapt the developed standardized methods for data collection/analysis done by contracted parties/volunteers

Actors: responsible administration; contracted parties/experts

Timeline: 2020

Indicator: standardized protocols are prepared and being used

The more players and people take active part in monitoring efforts the greater is the need for standardized methods and procedures. Therefore, clear and easily understandable protocols are crucial to guide people through their work.

Target III.2.2. Sustain and enhance the network of cooperating people

People from various interest groups helping and being integrated into lynx conservation actions can make the difference Long term commitment of responsible bodies to regularly facilitate information exchange and further education among the members of the network is crucial to keep people motivated, engaged and informed.

Conservation Action III.2.2.a Regular information and discussion meetings about monitoring results and possible improvements

Actors: responsible administration; contracted parties/experts; NGOs

Timeline: every year

Indicator: number of meetings

Regular presentation of the monitoring results, mutual information exchange and discussion about possible/necessary improvements are important to give back the personal dedication and to form a long term and trustful relationship. These meetings should focus on regional aspects – however a meeting of all networkers once a year or every second year could help improving the bonds between all networkers.

Conservation Action III.2.2.b Develop an incentive system for documenting lynx presence

Actors: NGOs

Timeline: 2021

Indicator: suitable incentive system installed

The idea behind an incentive system is to shift the perception of lynx presence away from being a burden towards a positive and even precious issue. Various approaches around the world pursue this conservation action for a wide array of large mammals – for Europe these ideas are still pretty rare. One promising approach might be the progressive rewarding of lynx pictured by phototraps.

Target III.2.3. Establish regional round tables/consultative groups

To create and regularly use regional round tables is an apt form to built up mutual trust. Regular information exchange and face-to-face communication could lead to a form of cooperation which even can cope with controversical issues. In the long run, these groups could even develop to an essential consultive element in the management process.

Conservation Action III.2.3.a Invite key players to form a regional consultative group

Actors: responsible administration; contracted parties/experts; NGOs

Timeline: 2021-2022

Indicator: regular meetings at least twice a year

Members of such groups should be carefully selected taking into account personal background and attachment to the respective interest group. Of course, a certain balance of attitudes is needed to cover the whole range of lynx conservation issues.

Conservation Action III.2.3.b Use moderated meetings for fact based information exchange and discussion

Actors: responsible administration; contracted parties/experts; NGOs

Timeline: continuously

Indicator: regular meetings at least twice a year

Installing a neutral moderator in such groups from the very beginning can speed up the process of open discussion and mutual respect considerably. Tasks of such facilitators are to clearly define the role of the group, the given legal frames and to come to a common agreement of working procedures.

Target III.2.4. Prepare and adopt guidelines for monitoring main prey species

As several prey species form the prerequisite for the presence of lynx and other large predators, reliable information on different prey species needs to be obtained. Robust and reliable methods to assess e.g. roe deer densities serve as the basis for discussions about possible impact of lynx on its prey and further ungulate management.

Conservation Action III.2.4.a Develop standardized methods for collecting and handling/analysis of prey species data

Actors: responsible administration; contracted parties/experts; NGOs

Timeline: 2021-2022

Indicator: standardized protocols and procedures

To assess ungulate numbers standardized methods should be implemented by responsible bodies, best in cooperation with relevant stakeholders.

Conservation Action III.2.4.b Conduct regular assessment of main prey species

Actors: responsible administration; contracted parties/experts; NGOs

Timeline: regular assessment, best on a yearly base

Indicator: data on ungulates are available

The yearly assessment report of the BBA lynx population should contain a summary or link about current ungulate monitoring, possible pilot studies and best practice examples.

Objective III.3. Address, prevent and mitigate possible conflicts

Possible conflicts with lynx should be transparently addressed, wherever possible prevented and mitigation measures implemented. Most conflicts result from conspicuous behaviour of single animals, depredation on livestock and due to the results of predator-prey relationship.

Target III.3.1. Dealing with conspicuous animals

Conspicuous behavior of individual lynx could be related to the presence of lynx close to or within settlements, bold behavior towards humans or predating exhaustively on livestock.

Conservation Action III.3.1.a Develop intervention protocols

Actors: responsible administration; contracted parties/experts

Timeline: 2021

Indicator: Criteria are set and protocols available

A protocol including detailed description and definitions of conspicuous lynx behaviour and respective intervention measures are developed for the BBA population

Conservation Action III.3.1.b Provide standardized procedures for dealing with orphaned/motherless/ injured animals on population level

Actors: responsible administration; contracted parties/experts

Timeline: 2021

Indicator: Procedures are implemented

Procedures for dealing with orphaned/motherless/injured animals are defined in all three countries and are implemented in the national/regional action plans. [Refer to *Conservation action I.1.1.c*]

Target III.3.2. Secure sustainable compensation system for livestock and farmed deer predation

Compared to other large carnivores' species, lynx depredation on livestock is rare. However, governmental compensation schemes should be available for livestock owners and deer farmers. Efficient

procedures for the assessment of damage and the payment of compensation should be established, regularly evaluated and improved if necessary.

Conservation Action III.3.2.a Provide general and sustainable governmental compensation system

Actors: responsible administration

Timeline: 2020

Indicator: Compensation systems installed

A close cooperation of responsible administration of nature protection and agriculture is recommended to develop compensation schemes.

Conservation Action III.3.2.b Maintain and improve procedures to investigate, thoroughly document and compensate possible predation on livestock and farmed deer

Actors: responsible administration

Timeline: 2021

Indicator: Procedures implemented and running smoothly

When establishing such a compensation system it is important on the one hand to assess financial livestock values and secure funding. On the other hand procedures for assessment of possible damage should be clear, transparent and efficient, having results available within a relatively short time. Compensation payments should be transferred in due time as well.

Target III.3.3. Improve damage prevention

Lynx predation on livestock and farmed deer is rare and often comprises of a single attack per location. However, in some cases individual lynx repeatedly kill livestock, e.g. within deer enclosures or certain pastures with specific habitat conditions (e.g. strong interlink of forest, shrub area and extensive pastures).

Conservation Action III.3.3.a Provide tools like electric fencing/livestock guarding dogs to sheep breeders

Actors: responsible administration; contracted parties

Timeline: when appropriate

Indicator: implemented prevention measures

In these rare occasions, electric fencing and/or livestock guardian dogs should be provided to the sheep farm concerned.

Conservation Action III.3.3.b Electric upgrade for game enclosures

Actors: responsible administration; contracted parties

Timeline: when appropriate

Indicator: implemented prevention measures

If an enclosure of farmed deer is repeatedly attacked, electric fencing is an appropriate measures to prevent further damages. In this context, compensation payments need to be linked to mandatory implementation of prevention measures when new deer enclosures are planned.

Conservation Action III.3.3.c Provide advice and training on damage prevention techniques

Actors: responsible administration; contracted parties

Timeline: 2020

Indicator: mechanisms are secured

To secure the correct implementation and maintenance of damage prevention measures, advice and training needs to be provided to the farmers intending to install fences or keep livestock guardian dogs.

Conservation Action III.3.3.d Implement better control of wildlife breeders

Actors: responsible administration

Timeline: 2025

Indicator: mechanisms are secured

To ensure control of existing wildlife enclosures/farms and limit the creation of new ones in order to minimalize potential sources of conflicts and prevent the rising of new barriers in the landscape.

Target III.3.4. Apply integral ungulate and forest management in lynx conservation

The return of a large predator also concerns wildlife and forest management practices. Therefore, an intensive dialogue with all relevant stakeholders and the different administration bodies is important. Robust data sets and cooperative approaches can help to find adequate integral management approaches in the different environmental and societal conditions. However, this could be a long-term process, which needs close cooperation of several state administration sectors and even changes in national hunting and forestry laws.

Conservation Action III.3.4.a Form regional working groups on game management in the presence of large predators

Actors: responsible administration, experts, stakeholder groups

Timeline: 2021-2022

Indicator: working group installed

A specially designed and composed working group should gather relevant issues, discuss possible conflicts and concerns, find approaches and initiate pilot studies to test and refine appropriate measures.

Conservation Action III.3.4.b Implement standardized methods for ungulate monitoring and common data handling/analysis procedures

Actors: responsible administration, experts, universities, stakeholder groups

Timeline: 2025

Indicator: Ungulate monitoring procedures implemented

One of these measures should be to ensure that all interest groups use the same standardized methods for the monitoring of ungulates, esp. roe deer, to improve database on the herbivores' level.

Conservation Action III.3.4.c Implement standardized methods for assessing forest regeneration

Actors: responsible administration, experts, universities, stakeholder groups

Timeline: 2025-2030

Indicator: Standardized methods to assess forest regrowth applied

The same should be true for the vegetation and forest regrowth level – to implement and improve standardized procedures to assess forest regrowth and possible effects of browsers.

Conservation Action III.3.4.d Design and implement pilot studies to address integral approaches concerning lynx, roe deer and forest regeneration

Actors: responsible administration, experts, stakeholder groups

Timeline: from 2021 on

Indicator: Pilot studies launched

Pilot studies to address all three trophic levels and evaluating their inter- and intraspecific relationship should be commonly developed and implemented to find efficient and reliable standard procedures as an important base for further discussions and improvements.

Objective III.4. Promote economic benefits from coexisting with large carnivores and generate incentives around lynx presence

The presence of lynx is still pretty rare in Central Europe and its importance should be highlighted. The presence of European's largest wild cat could be used to generate incentives e.g. for promotion of eco-friendly tourism or specific labelling of our cultural landscape.

Target III.4.1. Introduce lynx as a flagship species for sustainable land use/ ecotourism („Land of the large cat")

Area with permanent presence of lynx could be labelled as "Land of the large cat", serving as an outstanding factor e.g. for ecotourism.

Conservation Action III.4.1.a Select and implement model projects where local people use lynx presence to form outstanding reputation/ generate income (lynx room, excursions, farming/hunting on lynx territory)

Actors: responsible administration, experts, stakeholder groups

Timeline: from 2021 on

Indicator: Number of model win-win projects launched

Advertising the permanent presence of lynx could yield outstanding reputation and generate special income. GOs and NGOs paired with expert advice should support such initiatives.

Target III.4.2. Reward monitoring contributions

Monitoring contributions, e.g. by participatory approaches implementing the camera trapping, could be specially acknowledged or even rewarded.

Conservation Action III.4.2.a Progressive reward/payments for lynx pictures (e.g. family group, new animal, known animal, yearly documentation - the longer the more)

Actors: NGOs

Timeline: from 2021 on

Indicator: Payments in € linked to monitoring contribution

NGOs could implement a system of pay for lynx monitoring contributions, e.g. focusing on the key unit of documentation of family groups. If so, some sort of check and/or revision needs to be installed to prevent misuse and cheating.

Target III.4.3. Consider lynx presence into ungulate hunting policy

Scientific studies indicate that lynx could have impact on main prey ungulates under certain circumstances. Therefore, prerequisites and scenarios should be discussed and defined to possibly adjust hunting bags accordingly.

Conservation Action III.4.3.a more flexibility in fulfilling hunting bags if lynx reproduction is proven and forest regeneration is satisfying

Actors: responsible administrations, experts; stakeholder groups

Timeline: from 2021 on

Indicator: Numbers of hunting grounds using this flexibility

One approach would be to allow more flexibility in hunting bags when preconditions like satisfying forest regrowth and proved lynx reproduction are met.

Goal IV "Prevent illegal killing and other illegal actions"

The main threat for lynx in the BBA population is illegal killing. Apart from "positive" measures to raise acceptance (see Goal III), a powerful and efficient law enforcement is definitely needed to deter or prosecute any criminal actions.

Objective IV.1. Decrease/prevent illegal killings

In all three countries of the current BBA lynx distribution illegal killing is seen as the main threat on the path towards a favourable conservation status. Responsible authorities have to clearly state that killing a strictly protected species is anything else than a harmless and tolerated act. The subject of wildlife crime should be offensively addressed, with a close cooperation of relevant stakeholders.

Target IV.1.1. Implement robust monitoring to transparently document turnover rates of resident animals

Crucial backbone to address the difficult topic are data indicating illegal killing. Each carcass found has to be thoroughly examined. However as these cases are rare indirect evidence is very important. Here robust monitoring can give considerable insight determining the turnover rates of resident animals.

Conservation Action IV.1.1.a Robust monitoring focusing of territorial animals, especially on reproducing females

Actors: responsible administration, contracted parties/experts

Timeline: every year

Indicator: Number of recorded/not recorded/missing animals

Lynx are territorial species and try to establish their own, sex specifically exclusive home range. Usually having established the territory at the age of 2 to 3 years they occupy it for 5 to 10 years and defend it against other lynx of the same sex. In case of death, this now vacant territory is resettled pretty soon by dispersing subadults or adults seeking a territory. The speed rate of this resettlement, the so-called "turn over" of adult resident animals is an indirect but very distinct index for mortality rates linked strongly to illegal killing.

Conservation Action IV.1.1.b Document lynx found dead and analyse mortality causes

Actors: responsible administration, contracted parties/experts

Timeline: every year

Indicator: number of lynx found dead and related causes of mortality

Every lynx found dead should be thoroughly examined using standardized protocols and procedures [see Conservation action I.1.3.f]. Applying forensic examinations should be mandatory.

Target IV.1.2. Create and increase awareness within investigation and justice units

On important issue is raising awareness for illegal killing of strictly protected species within investigation and justice bodies.

Conservation Action IV.1.2.a Regular information exchange on regional/national level

Actors: responsible administration, contracted parties/experts

Timeline: every year

Indicator: regular exchange of information

The topic of lynx mortality related to illegal killing should regularly be presented and discussed with the relevant investigation and justice bodies (e.g. police officers, state attorneys and judges).

Conservation Action IV.1.2.b Regular workshops on population level to present given cases and improve work flow

Actors: responsible administration, contracted parties/experts

Timeline: every second year

Indicator: common workshop

During the workshops on population level given cases should be presented and discussed.

Conservation Action IV.1.2.c Regular internal educational/training courses on wildlife crime and forensic investigation of wildlife crime for relevant bodies (police, state attorneys, prosecutors, judges) on country level

Actors: responsible administration, contracted parties/experts

Timeline: every year

Indicator: common workshop

Regular educational and training courses will help to optimize procedures in wildlife crime investigations. Moreover, the issue of wildlife crime should be incorporated into the respective apprenticeships and educational courses. A close cooperation between national, federal and regional level should be installed.

Conservation Action IV.1.2.d Regular public information about illegal trade and killing of protected species (use lynx as a key species)

Actors: responsible administration, contracted parties/experts, NGOs

Timeline: every year, when needed/appropriate

Indicator: Information (concerning lynx) summed up and published

Information about illegal trade and killing of protected species should be made public, concerning lynx best linked to the yearly status report on population level.

Target IV.1.3. Improve and secure professional investigation methods and procedures

In case of possible illegal killing of lynx, to find and secure proof in the field is usually very difficult. Therefore, methods and procedures to obtain in situ evidence of illegal killing have to be thoroughly trained and further developed. Moreover, if coat pattern of the carcass is still visible, investigation units should have an easy option to identify the individual animal. A sufficient number of people should be trained in each country who can act fast and professionally in the field. Regular control of taxidermist and keepers of stuffed animals should accompany these efforts.

Conservation Action IV.1.3.a Create/improve common standard procedures when finding a dead lynx or parts of it

Actors: responsible administration, police, forensic experts

Timeline: 2020

Indicator: Common protocol with mandatory forensics

When finding a dead lynx, common standard procedures are to be applied throughout the whole BBA area to get comparable data. A sound forensic examination should be mandatory.

[refer to Conservation action I.1.3e for details on captures and all animals found dead]

Conservation Action IV.1.3.b Easy to use data file for comparing coat patterns / lynx genetics for fast individual assignment

Actors: responsible administration, contracted parties/experts, police

Timeline: 2020

Indicator: number of checked seized lynx carcasses

An easy to use data files should be prepared. Lynx experts should help police/custom officers/other investigation units with checking the identity of the seized lynx furs and/or bodies, which can be identified based on lynx coat patterns. When the regular genetic survey is implemented under I.2.2b, the data gathered could be used for confirmation of genetic origin of the seized lynx furs and/or bodies as well. For this purpose, a long-term cooperation with one experienced genetic Lab, focusing on Eurasian lynx genetics, especially BBA population, should be established.

Conservation Action IV.1.3.c Form special investigation unit/action group for wildlife crime (illegal killing, illegal trade)

Actors: custom office, police, environmental inspectorates, experts, forensic specialists

Timeline: 2025

Indicator: National and transboundary action groups are established

By selecting and intensively training given persons, special investigation units or actions groups should be formed on national and transboundary level.

Conservation Action IV.1.3.d Regular control of taxidermists

Actors: responsible administrations

Timeline: every year

Indicator: number of inspection protocols

Responsible administration units should regularly check taxidermists concerning legal possession and handling or strictly protected species.

Conservation Action IV.1.3.e Regular control of CITES permits

Actors: responsible administrations

Timeline: every year

Indicator: number of inspection protocols

Responsible administration units should regularly check owners of protected species/parts of them for valid CITES permits.

Target IV.1.4. Provide sufficient capacities and ensure severe penalties

To ensure a profound investigation in cases of possible illegal lynx killings, sufficient capacities have to be provided. The possibilities to act are strongly linked to the severeness of the given legal penalties.

Conservation Action IV.1.4.a Keep investigation pressure high

Actors: responsible administration; police

Timeline: in every given case

Indicator: detection rate, legal trials

In possible cases of illegal killing police forces should keep investigation pressure high to clearly stress the importance of addressing the wildlife crime issue.

Conservation Action IV.1.4.b Consider public relevance/high public interest and make cases public

Actors: responsible administration; police; experts, stakeholder groups,

Timeline: in every given case

Indicator: cases known in public

Illegal killing of a protected species, especially a charismatic species like the lynx, may rouse interest and concern in the broad public. It is therefore necessary to draw public attention to illegal killing, which is the main threat for lynx and should become socially unacceptable. Thus, the cases of lynx illegal killing should be made public, transparently discussed and condemned.

Conservation Action IV.1.4.c Application of serious penalties (e.g. lifelong withdrawal of weapon and/or hunting license/fine/prison)

Actors: responsible administration; courts

Timeline: in every given case

Indicator: sentences/convictions in legal trials

To deter from illegal killing penalties should be serious, i.e. at least lifelong withdrawal of weapon and/or hunting license, high fine or a prison sentence, depending on the legal system of each country. Important penalty is withdrawal of the hunting and weapon licence for lifetime, which could be help to prevent illegal killing. For this, however it is necessary to change the hunting and/or weapons holding laws.

Conservation Action IV.1.4.d Establish procedures how to increase seriousness of the crime because of possible investigation tool used (financial social value of lynx, high public concern)

Actors: responsible administration

Timeline: 2021-2022

Indicator: severeness of penalties/convictions in legal trials

Financial social value of lynx should be derived from ecological value of the individual and – if relevant - any costs of release/translocation/reintroduction measures of the single lynx individual.
[Refer to *Conservation Action IV.1.4.c]*

Target IV.1.5. Train and establish professional wildlife rangers and volunteers

To prevent or at least making illegal actions more difficult, volunteer and professional wildlife rangers should regularly be present in the field. Professional wildlife rangers should be independent and have legal authority for any conspicuous/possibly illegal activities in the forest. In Central Europe various implementations exists, like game wardens, ranger, forest services or hunting supervisors.

Conservation Action IV.1.5.a Train and establish independent state employees (ranger/game or conservation wardens/hunting supervisors) and volunteers

Actors: responsible administration

Timeline: permanently

Indicator: given area is under surveillance/patrolled regularly

People officially mandated being out in the woods should be specially trained for the complex issue of wildlife crime. Where not present yet, implementation of such "eyes in the woods" should be discussed and implemented.

Conservation Action IV.1.5.b Consider and conduct undercover/sting operations to prevent illegal killing

Actors: police forces

Timeline: apply if appropriate

Indicator: number of undercover operations

To foresee and prevent illegal actions sting operations could help to deter intended actions. In order to ensure that the evidence is valid during court procedures, the operations must be implemented according to legal framework of the given country.

Target IV.1.6. Raise political and public awareness towards illegal killing

Usually in central Europe wildlife crime and illegal killing of strictly protected species is often seen as a problem far away, mainly linked to the larger mammals living in Africa being poached for meet, trophies and other values. The fact that illegal killing of wildlife occurs in front of our houses should be made public to raise awareness and to earnestly address the issue.

Conservation Action IV.1.6.a Publish lynx mortality and turnover rates

Actors: responsible administration

Timeline: yearly

Indicator: part of yearly status report

Within the yearly population status report the known mortality cases and turnover rates will be summed up. These data will continuously be used for scientific population assessment like PVAs to estimate negative impact on population growth.

Conservation Action IV.1.6.b Inform general public about specific cases to raise awareness

Actors: responsible administration

Timeline: in every given case

Indicator: cases are known in public

The yearly assessment report should be published online, in lectures and common media work, so that the data on mortality are known and well explained in context.

Conservation Action IV.1.6.c Encourage and enable interest groups to address illegal actions

Actors: responsible administration; NGOs

Timeline: apply if appropriate

Indicator: information exchange - workshops – common projects

Various interest groups and NGOs deal with the matter of illegal killing and poaching of wildlife. Regular information exchange, discussions and common workshops/projects should foster cooperation making preventive approaches more effective.

Objective IV.2. Detect/prevent illegal releases

Releases of lynx into the wild are not allowed without permission of the responsible authorities. However, in the past there have been cases of single animals, which escaped or were intentionally released from zoos or private enclosures. Recently, the tendency to keep lynx as an impressive pet rises, especially in the Czech Republic, creating higher risk of such escapes/releases.

Target IV.2.1. Get overview about lynx kept in enclosures

Most importantly, responsible administrations need to have an overview where lynx are kept in captivity. Of course, official institutions like zoos or game parcs are listed and known anyway – however private lynx keeping should be addressed more intensively.

Conservation Action IV.2.1.a Register and list all known lynx keepers (public, private) in the BBA countries

Actors: responsible administration; zoos and wildlife keeping associations

Timeline: 2021-2025

Indicator: Existing list on BBA countries level

All known and detected lynx keepers in BBA countries are to be registered and listed. Of course, conditions and capability of keeping such an animal have to be checked and documented.

Conservation Action IV.2.1.b Document number, age, sex origin and identification features of lynx in enclosures (e.g. coat pattern/genetics, transponders)

Actors: zoos and wildlife keeping associations; responsible administrations

Timeline: 2025, continuously updated

Indicator: Lynx in captivity are individually tagged

All lynx held in captivity in BBA countries should be registered. These recorded animals should be individually tagged, using the means of transponders, genetic profile and standardized coat pattern documentation.

Conservation Action IV.2.1.c Regulate and control private lynx keeping in captivity

Actors: responsible administration

Timeline: as soon as possible

Indicator: No private lynx keeping (temporally exception: rescue for release-actions)

Requirements for private lynx keeping should be very strict. Lynx breeding should be forbidden for private owners. In the long-term, lynx keeping generally should be forbidden for private owners with possible exception of keepers participating in official national/international rescue or reintroduction programmes.

Conservation Action IV.2.1.d Removal of accidentally escaped lynx

Actors: owners; zoos and wildlife keeping associations; responsible administrations

Timeline: in every given case

Indicator: list of given cases

If an animal accidentally escapes, the owner has to announce it to the responsible authority and should put as much effort as possible in recapturing the lynx, best in cooperation with professionals.

Target IV.2.2. Regular check of lynx stock in captivity

Lynx stock kept in captivity needs to be checked regularly to know changes in numbers, sex/age compositions and whereabouts of the given animal.

Conservation Action IV.2.2.a Check lynx stock in captivity

Actors: responsible administration in cooperation with zoos and wildlife keeping associations

Timeline: yearly

Indicator: List of current stock and gains/losses

Target IV.2.3. Detect illegal releases

To detect illegal releases or accidental escapes hints about conspicuous behaviour should be taken serious and pursued by responsible administrations.

Conservation Action IV.2.3.a Define and assess possible problematic/conspicuous behavior

Actors: experts; responsible administration

Timeline: 2021

Indicator: Existing protocol on population level

Cases of animals with unusual behaviour, esp. suspected of having escaped from captivity, should be individually assessed by BBA expert group. Animals which are conspicuous, should be closely monitored further on [see *Conservation action IV.2.3b].*

For the BBA population a specific protocol to clearly define conspicuous behaviour is necessary in order to document “unusual” traits in the field.

Conservation Action IV.2.3.b Monitor conspicuous animals intensively

Actors: responsible administration; experts, contracted parties

Timeline: in every given case

Indicator: Apply appropriate method (e.g. radiotracking, cameratraps)

If hints about conspicuous behaviour occur, monitoring has to be intensified, using non-invasive or – if appropriate – invasive methods.

Conservation Action IV.2.3.c Capture, identify and possibly remove conspicuous animals

Actors: responsible administration

Timeline: in every given case

Indicator: captured animal

If appropriate or necessary conspicuous animals should be captured and thoroughly examined. Dependant of the results the animal should be closer monitored (e.g. by radiotracking) or – if clear evidence about captive origin or serious disease has been documented – removed out of the wild.

Conservation Action IV.2.3.d Investigate known/plausible cases of intentional illegal releases

Actors: responsible administration

Timeline: in every given case

Indicator: legal charges and trials

If evidence of illegal release can be found, the case should be reported as an offence to the responsible investigation body.

9. Related Tables

Common Vision:

"To restore and maintain, in co-existence with people, a viable lynx population within the Greater Bohemian Ecosystem connected with other metapopulations in Central Europe"

This implies two main parallel approaches, one focusing on the large cat itself, the other on the human dimension.

1) The long-term survival of lynx within the BBA population is secured
2) The species "Lynx" is respected as an integral part of the native fauna and the natural heritage of Central Europe

Goals:

GOAL I:	Lynx returns to and stays in an Favourable Conservation Status
GOAL II:	Sustain and enhance landscape permeability for lynx
GOAL III:	Keep and raise acceptance for the lynx
GOAL IV:	Prevent illegal actions by law enforcement

GOAL I: Lynx returns to and stays in an Favourable Conservation Status					
Objective I.1.	Targets 1.1 - 1.6	Related Conservation Actions	Actors	Timeline	Indicator
BBA population is in FCS	T1 Reach Minimum Population Size (165 family groups / 85 mature males)	Robust monitoring to detect lynx family groups, number of mature/independant animals and recorded kittens	responsible administration; contracted parties/experts	every year (2020-2025)	Rising number of family groups per Lynx Year; number of mature/ independent animals and kittens, documented in a yearly status report
		Establish facility/rescue station for motherless/orphaned/injured lynx on population level	responsible administration	2021	facility built and in use
		Establish procedures and common protocols so rescue facility can be used by all three countries	responsible administration in all three countries	2021	Facility can be used by all three countries; procedures/protocols are trilateraly implemented
		Develop common protocols for capture, care and release of animals	responsible administration in all three countries	2021	protocols are trilaterally implemented
		Care and release of motherless/orphaned/injured animals	responsible administration; contracted parties/experts	if suitable / necessary	Number of cared for and released animals
		Replacement of illegally killed animals with genetically apt animals in suitable areas in cooperation with/including stakeholders	responsible administration; contracted parties/experts	If suitable /necessary	number of replaced animals
		Translocation of animals to foster given distribution patches/create new stepping stones	responsible administration;	If suitable /necessary	number of translocated animals, increase of

			contracted parties/experts		permantly occupied lynx range
		Reinforcement of given distribution patches/stepping stones	responsible administration; contracted parties/experts	If suitable /necessary	Stabilization of permanently occupied lynx range
		Reintroductions („new animals in new areas“)	responsible administration; contracted parties/experts	If suitable /necessary	Apply if suitable or necessary to generate lynx range expansion
	T2 Assess genetic status	Common protocols for collection, storing and analyzing of genetic samples	responsible administration; contracted parties/experts; genetic labs	2022	Common protocols on population level
		Regular assessment of genetic status	responsible administration; contracted parties	every 5 years	Collection of sufficient samples to guarantee successful and comparable analysis of 100 samples to assess inbreeding coefficient/heterogenity
	T3 Secure genetic and physical health	Monitor health of the population	responsible administration; contracted parties/experts	in every given case	number of individuals
		Care and release of motherless/orphaned/injured animals	responsible administration;	if suitable / necessary	% of successfully released animals

			contracted parties/experts		compared to the total sum of animals cared for
		Sporadic exchange of animals between areas or populations (e.g. motherless animals)	responsible administration; contracted parties	If suitable /necessary	Number of exchanged animals
		Replacement of illegally killed animals with genetically suitable animals	responsible administration; contracted parties/experts	if illegal killing happens	Number of replaced animals
		Common protocols for examinations of animals (alive or dead)	responsible administration; contracted parties/experts	2021	Protocols for capture and findings of dead animals (pathology, forensics)
		Analyse known mortality cases from the protocols in the yearly status report	responsible administration; contracted parties/experts	every year	cases and results are integrated into the yearly status report
		Remove/replace „problematic“ animals	responsible administration; contracted parties	In every given case	Number of discussed and performed cases
	T4 Assess population status/dynamics	Assess population parameters (natality, mortality, emigration, immigration) on population level per lynx year	responsible administration; contracted parties/experts	every year	status report contains population parameters
	T5 Ensure steady enlargement of distribution into suitable habitat within BBA area	Monitor distribution along population edges to detect natural expansion	responsible administration; contracted parties/experts	every year	Documentation of expansion of lynx distribution (in km², focus on new family groups)

		Apply active measures to support or create new distribution patches/ stepping stones (see extensively T1)	responsible administration; contracted parties/experts	If suitable /necessary	steady expansion of lynx range / new distribution patches (give % of increase per time interval)
	T6 Improve methods and help with specific research	Develop identification tool for coat patterns	experts	until 2025	Tool available
		Conduct further analysis to improve population viability assessment	experts	2020-2025	Methods and data base improved
		Improve genetic analysis with focus on individual kinship and pedigrees	experts	2020-2025	Robust genetic pedigrees availalbe
		Analyse and improve dispersal data	experts	2020-2025	Given data analysed
		Organize and/or prepare input to (scientific) conferences, symposiums and workshops	responsible administration; experts	every year, attached to the expert group meeting preparing LyMBo	Take turns between the three countries

GOAL I: Lynx returns to and stays in an Favourable Conservation Status					
Objective I.2.	Targets 2.1 – 2.3	Related Conservation Actions	Actors	Timeline	Indicator
Robust and efficient monitoring on population level	T1 Implement and continue standardized demographic monitoring on population level	Focus on use of camera traps with individual recognization of lynx	responsible administration	every year	implemented camera traps across the BBA population area
	T2 Regularly analyse and present results	Stepwise analyses of data on regional, national and population level	responsible administration; contracted parties/experts	every year	data analyses; preparation of assessment report (based on LY 01.05.-30.04.)
		Assess population status on a yearly interval (use period of „Lynx Year“: 01.05-30.04.)	responsible administration; contracted parties/experts	every year	assessment report issued in January as a basis for LyMBo meeting
		Yearly evaluation of status report	LyMBo	2020 - 2025	Meeting in February; protocol/minutes
		Assess population trend	LyMBo	every year, looking back the last 3 years	3 years assessment report prepared

	T3 Provide sufficient resources	Provide resources for monitoring implementation, data handling and analyses	Authorities-adminstrations responsible for the monitoring of strictly protected species	every year	yearly status report

GOAL II: Sustain and enhance landscape permeabilty for lynx					
Objective II.1.	Targets 1.1 - 1.3	Related Conservation Actions	Actors	Timeline	Indicator
Maintain and restore habitat structure, function and connectivity within BBA area	T1 Stop/counteract small scale deterioration/ encroachment of prime lynx habitat	Provide lynx data for spatial planning	responsible administration; contracted parties/experts	every year	Data layer (GIS shape) available according to monitoring report
		Ensure that the spatial planning processes prevent habitat loss and maintain or increase lynx habitat connectivity	Responsible administration; contracted parties/experts	Every year	stable or better fragmentation index
		(Fully or temporally) protect key reproduction and/or resting sites (e.g. from logging, leisure activities, hunting)	responsible administration	If suitable /necessary	area increasing (km²), e.g. protected forest or wildlife reserves, number of contracts with private landowners
		Direct tourism and leisure activities (e.g. hiking, snow shoe walking, geo caching) on certain routes (stay-on-trail-philosophy)	responsible administration	If suitable /necessary	Length of mandatory/recommended use of trails (km)
		Conserve/regenerate prime lynx (and roe deer) habitat outside the forest („shrublands“)	responsible administration	If suitable /necessary	suitable area increasing (km²)
	T2 Reduce traffic mortality (related to population size and expansion)	Define critical crossing locations on fine-scale within BBA area	responsible administration; contracted parties/experts	from 2021 onwards	regularly updated maps of critical crossings within BBA area (locations, numbers)
		Improve crossing possibilities	responsible administration	2021-2025	Number of improved crossing possibilities

					(green bridges, underpasses)
		Install traffic signs and/or wildlife detection systems at specific critical locations	responsible administration	2021-2025	Percentage of marked critical crossings in relation to total critical crossings identified
		create specific information campaign for wildlife crossings with lynx as a possible flagship species	responsible administration; contracted parties/experts	2021	Implementation of information campaign
	T3 Protect lynx habitats and corridors in spatial planning	Implement environmental impact assessment (EIA) for planned infrastructure in lynx habitat and corridors	responsible administration	In every given case	Lynx habitat demands integrated in EIA
		Conduct transnational EIA for big projects influencing whole population, e. g. infrastruction projects	responsible administration, considering all affected countries (CZ, AT, DE, SK, PL…)	In every given case	Lynx habitat demands integrated in EIA

GOAL II: Sustain and enhance landscape permeabilty for lynx					
Objective II.2.	Targets 2.1 – 2.3	Related Conservation Actions	Actors	Timeline	Indicator
Secure and improve connectivity to other lynx populations	T1 Analyse, define and ensure protection ofkey areas and possible corridors to other (meta)populations	Create/assess/improve regional or national concepts on wildlife corridors	responsible administration; contracted parties/experts	2020-2021	Concepts available
		Implement environmental impact assessment (EIA) for planned infrastructure in lynx habitat and corridors	responsible administration	In every given case	Lynx habitat demands integrated in EIA
		Merge regional and national wildlife corridor concepts on population level, using the CELTIC-concept	responsible administration; contracted parties/experts	2021-2022	GIS map layer with gradual habitat and corridor quality
		Conduct transnational EIA for big projects influencing whole population, e. g. infrastruction projects	responsible administration, considering all affected countries (CZ, AT, DE, SK, PL…)	In every given case	Lynx habitat demands integrated in EIA
		Improve existing approaches by habitat and corridor modelling	responsible administration; contracted parties/experts	If necessary	GIS map layer with gradual habitat and corridor quality;
	T2 Secure and improve sufficient connectivity within the given corridors	Provide lynx data for spatial planning	responsible administration; contracted parties/experts	2022	GIS map layer with lynx data

		Improve and/or build fauna passages with linkage to the adjacent backcountry/existing corridors at the most problematic crossings	responsible administration; contracted parties/experts	2020-2025	Number of improved/new fauna passages
		Monitor wildlife crossings on fauna passages	responsible administration; contracted parties/experts	when appropriate	Data on wildlife (lynx) detected at fauna passage
	T3 Assisted exchange of single individuals to prevent/counteract inbreeding	Build one rescue facility for motherless/injured lynx within the BBA area	Responsible administration	2020-2021	Rescue facility built
		Agreement between BBA countries for easy use of the crossborder facility	Responsible administrations	2021	Agreement signed
		Agreement between countries hosting animals of Carpathian origin for exchange of animals	Responsible administrations	2021	Agreement signed
		Exchange of individuals between lynx populations hosting animals of Carpathian origin	responsible administration; contracted parties/experts	If suitable /necessary	Number of exchanged animals

GOAL III: Keep and raise acceptance for the lynx					
Objective III.1.	Targets 1.1. – 1.4.	Related Conservation Actions	Actors	Timeline	Indicator
Raise awareness and knowledge about lynx and create broad communication capacities	T1 Provide fact-based information to broad public on a regular basis	Online presentation of up-to-date information	responsible administration; contracted parties/experts	after each lynx year	Presentation of key results from population based assessment report
		Prepare and offer presentations on regional level	responsible administration; contracted parties/experts	each year	Number of presentations on regional level
		Put together information for multipliers working with the public and for journalists (consider the „best messenger"-principle)	responsible administration; contracted parties/experts	each year	summarized information package available
	T2 Provide target group specific information	Online target group specific newsletters	contracted parties/experts	twice a year (winter/summer)	Summer issue: monitoring results Winter issue: related topics
		Provide target-group specific information events	responsible administration; contracted parties/experts; NGOs	2020	Bunch of information tools (updated presentation, flyer, broschure …)
	T3 Ensure regular communicatio	Organize regional symposium to present and discuss lynx issues	contracted parties/experts	continuously when possible/needed	Symposium with written output

		Perform regular transboundary stakeholder visits	GOs, NGOs, experts	continuously when possible/needed	Number of events
		Celebrate the International lynx day by organizing public events, meetings and conservations actions	responsible administration; contracted parties/experts; NGOs	Each year on 11th of June	number of events
	T4 Implement education and training	Develop and promote educational lectures for pupils and students	GOs, NGOs, experts	2021	Lectures are developped
		Integrate lynx and related issues into the official curriculum for hunters and foresters education, standardized on regional level	GOs, NGOs, experts	2021-2022	Lynx topic is integrated in the official curricula

GOAL III: Keep and raise acceptance for the lynx					
Objective III.2.	Targets 2.1. - 2.4	Related Conservation Actions	Actors	Timeline	Indicator
Build up mutual trust through integration and participation	T1 Engage local people into the standardized lynx monitoring	Involve local people (hunters, foresters, nature conservationists) in the lynx monitoring using camera traps and tracking surveys	responsible administration; contracted parties/experts;	continuously	Number of people integrated in the lynx monitoring
		Apply and adapt the developed standardized methods for data collection/analysis done by contracted persons/volunteers	responsible administration; contracted parties/experts;	2020	Standardized protocols
	T2 Sustain and enhance the network of cooperating people	Regular information and discussion meetings about monitoring results and possible improvements	responsible administration; contracted parties/experts; NGOs	each year	Number of meetings
		Develop an incentive system for the documented lynx presence at regional or local level	NGOs	2021	Suitable incentive system installed
	T3 Establish regional round tables/ consultative groups	Invite key players to form a regional consultive group with regular and moderated meetings	responsible administration; contracted parties/experts; NGOs	2021-2022	Regional consultative groups are formed
		Use meetings for fact based information exchange and discussion concerning all aspects of lynx conservation	responsible administration; contracted parties/experts; NGOs	continuously	Regular meetings at least twice a year

	T4 Prepare and adopt guidelines for monitoring of main prey species	Develop standardized methods for collecting and handling/analysis of prey species data	responsible administration; contracted parties/experts; NGOs	2021-2022	Standardized protocols andprocedures
		Conduct regular assessment of main prey species	responsible administration; contracted parties/experts; NGOs	Regular, best on a yearly base	Data on ungulates are available

GOAL III: Keep and raise acceptance for the lynx					
Objective III.3.	Targets 3.1 – 3.4	Related Conservation Actions	Actors	Timeline	Indicator
Address, prevent and mitigate possible conflicts	T1 Dealing with conspicuous animals	Develop criteria of intervention	responsible administration; contracted parties/experts	2021	Criteria are set
		Provide standardized procedures for dealing with orphaned/motherless/ injured animals on a population level	responsible administration; contracted parties/experts	2021	Procedures implemented
	T2 Secure sustainable compensation system for livestock and farmed deer predation	Provide general and sustainable governmental compensation system	responsible administration	2020	Compensation system installed
		Maintain and improve procedures to investigate, thoroughly document and compensate possible depredation on lifestock	responsible administration	2020	Procedures implemented and running smoothly
	T3 Improve damage prevention	Provide tools like electric fencing / lifestock guarding dogs to sheepbreeders	responsible administration; contracted parties	When appropriate	Implemented prevention measures
		Electric upgrade for game enclosures	responsible administration; contracted parties	When appropriate	Implemented prevention measures
		Secure mechanisms for the advice on and assistance in implementing	responsible administration; contracted parties	2021	Mechanisms are secured

		damage prevention measures by institutions in charge			
		Implement better control of deer farming	responsible administration	2025	Control mechanisms are secured
	T4 Apply integral ungulate and forest management in lynx conservation	form national- or regionwise working group specially addressing the issue of game management/hunting policy when large predators have returned or are returning	responsible administrations, experts, stakeholder groups	2021-2022	Working groups installed
		Implement standardized methods for ungulate monitoring and common data handling/analysis procedures	responsible administrations, experts; universities; stakeholder groups	2022-2023	Ungulate monitoring procedures implemented
		Implement standardized methods for assessing forest regeneration	responsible administrations, experts; stakeholder groups	2021-2022	Standardized methods to assess forest regrowth applied
		Design and implement pilot studies to address holistic approaches concering lynx,roe deer and forest regeneration	responsible administrations, experts; stakeholder groups	from 2021 on	Pilot studies launched

GOAL III: Keep and raise acceptance for the lynx					
Objective III.4.	Targets 4.1 – 4.3	Related Conservation Actions	Actors	Timeline	Indicator
Promote economic benefits from coexisting with large carnivores and generate incentives around lynx presence	T1 Introduce lynx as a flagship species for sustainablecareful land use/ ecotourism („Land of the large cat“)	Select and implement model projects where local people use lynx presence to form outstanding reputation/ generate income (lynx room, excursions, farming/hunting on lynx territory)	responsible administrations, experts; stakeholder groups	from 2021 on	Number of model win-win projects launched
	T2 Reward monitoring contributions	Progressive reward/payments for lynx pictures (e.g. family group, new animal, known animal), yearly documentation the longer the more!)	NGOs	from 2021 on	Payments in € linked to monitoring contribution
	T3 Consider lynx presence into ungulate hunting policy	more flexibility in fulfilling hunting bags if lynx reproduction is proven and forest regeneration is satisfying	responsible administrations, experts; stakeholder groups	from 2021 on	Numbers of hunting grounds using this flexibility

GOAL IV: Prevent illegal killing and other illegal actions					
Objective IV.1.	Targets 1.1 – 1.6.	Related Conservation Actions	Actors	Timeline	Indicator
Decrease/prevent illegal killing	T1 Implement robust monitoring to transparently document turnover rates of resident animals	Robust monitoring focusing of territorial animals, especially on reproducing females	responsible administration; contracted parties/experts	Every year	Number of recorded/not recorded/missing animals („turnover rates“)
		Document lynx found dead and analyse mortality causes	responsible administration; contracted parties/experts	Every year	Number of lynx found dead and related causes of mortality
	T2 Create and increase awareness within investigation and justice units	Regular information exchange on regional/national level	responsible administration; contracted parties/experts	Every year	regular exchange of information
		Regular workshops on population level to present given cases and improve work flow	responsible administration; contracted parties/experts	Every second year	Common workshop
		Regular internal educational/training courses on wildlife crime and forensic investigation of wildlife crime for relevant bodies (police, state attorneys, prosecutors, judges) on country level	responsible administration; contracted parties/experts;	Every year	common workshop
		Regular public information about illegal trade and killing of	responsible administration;	Every year, when needed/appropriate	Information (concerning lynx)

		protected species (use lynx as a key species)	contracted parties/experts; NGOs		summed up and published
	T3 Improve and secure professional investigation methods and procedures	Create/improve common standard procedures when finding a dead lynx or parts of it	responsible administration; police, (forensic) experts	2020	Common protocol with mandatory forensics
		Easy to use data file for comparing coat patterns / lynx genetics for fast individual assignment	responsible administration; contracted parties/experts; police	2020	image folder R and L of all lynx ever recorded
		Form special investigation unit/action group for wildlife crime (illegal killing, illegal trade)	custom office, police, environmental inspectorates, experts, forensic specialists	2020-2021	National and transboundary action groups are installed
		Regular control of taxidermists	responsible administration	Every year	Inspection protocols
		Regular control of CITES permits	responsible administration	Every year	Inspection protocols
	T4 Provide sufficient capacities and ensure severe penalties	Keep investigation pressure high	responsible administration; police	In every given case	Detection rate, legal trials
		Consider public relevance/high public interest and make cases public	responsible administration; police; experts, stakeholder groups	In every given case	Cases known in public

		Application of serious penalties (e.g. lifelong withdrawal of weapon/hunting license/fine/prison)	responsible administration; courts	In every given case	Sentences/convictions in legal trials
		Establish procedures how to increase seriousness of the crime because of possible investigation tool used (financial social value of lynx, high public concern)	Responsible administration	2021-2022	Severeness of penalties/convictions in legal trials
	T5 Train and establish professional rangers and volunteers	Train and establish independent state employes (ranger/game wardens/hunting supervisors) and volunteers	responsible administration	permanently	given area is under surveillance/patrolled regularly
		Consider and conduct undercover/sting operations	police forces	apply if approriate	Number of undercover operations
	T6 Raise political and public awareness towards illegal killing	Publish lynx mortality and turnover rates	responsible administration	yearly	part of assessment report
		Inform general public about specific cases to raise awareness	responsible administration	In every given case	cases are known in public
		encourage and enable interest groups to address illegal actions	responsible administration (GOs – NGOs)	apply if approriate	Cooperations – common projects

GOAL IV: Prevent illegal actions					
Objective IV.2.	Targets 2.1. – 2.3.	Related Conservation Actions	Actors	Timeline	Indicator
Detect/prevent illegal releases	T1 Get overview about lynx kept in enclosures	Register and list known lynx keepers (public, private)	responsible administration; zoos and wildlife keeping associations	2020-2021	Existing list on population level
		Document number and composition of lynx in enclosures (coat pattern/genetics, transponders)	zoos and wildlife keeping associations; responsible administrations	2021	Lynx in captivity are individually tagged
		Regulate and control lynx keeping in captivity for private owners	responsible administration	asap	No private lynx keeping (temporally exception: rescue for release-actions)
		Removal of accidentally escaped lynx	owners; zoos and wildlife keeping associations; responsible administrations	In every given case	List given cases
	T2 Regular check of lynx stock in captivity	Check lynx stock in captivity	zoos and wildlife keeping associations; responsible administrations	yearly	List of stock and gains/losses
	T3 Detect illegal releases	Define and assess possible problematic/conspicuous behavior	Experts; responsible administration	2021	Existing protocol on population level
		Monitor conspicuous animals intensively	Responsible administration	In every given case	Apply appropriate method (e.g. radiotracking, cameratraps)

		Capture, identify and possibly remove conspicuous animals	Responsible administration	In every given case	Captured animal
		Investigate known/plausible cases of intentional illgeal releases	Responsible administration	In every given case	Legal charges and trials

10. Endorsement of the Conservation Strategy

The Conservation Strategy has been developed from countries sharing the Bohemian-Bavarian-Austrian lynx population with the precious advice from other nations sharing lynx populations like Slovenia, Italy, Switzerland and Slovakia. The Conservation Strategy itself serves as a technical guideline for implementing conservation actions for the species to head for a favourable conservation status in a transboundary and transnational context.

Based on a specially designed Memorandum of understanding, the three countries Czech Republic, Bavaria and upper Austria sharing the population commit themselves towards the long-term goal of a favourable conservation status for the species. To approach this ambitious goal step by step, countries can pick from a wide variety of conservation actions being in line with European conservation standards and national legislation.

Due to Covid19-travel and meeting restrictions, the Memorandum of Understanding “Memorandum of Understanding on lynx conservation and future cooperation in implementation of the strategy of lynx conservation in Bohemian – Bavarian – Upper Austrian region” (see Annex) has been signed stepwise by the main responsible ministers of environment/chief of administration.

11. Implementation and Evaluation of the Conservation Strategy

The respective authorities in charge are responsible for the implementation of the BBA Lynx Conservation Strategy. National and regional bodies will choose from the wide variety of conservation actions presented, based on the results of the yearly monitoring report. As a prerequisite for any evaluation, the countries sharing the BBA lynx population have to guarantee the robust monitoring in the field, the maintenance of the database, data analyses and technical advice as the crucial backbone to thoroughly describe distribution, status and trend of BBA lynx population. Only thus the evaluation and necessary/possible adjustments of conservation actions within and across the three countries will be achieved.

For regularly present and discuss the status of the species and conservation actions applied, a transboundary round table will be formed, the so-called “Lynx Management Board” (“LyMBo”). The board (or core group) comprises of representatives of the responsible national/regional authorities and invited experts. NGOs and key stakeholders should be regularly involved by forming a thematic working group or be and invited to LyMBo meetings on specific demands and topics.

The monitoring interval of the lynx year (01.05. until 30.04. of the next year) gives the basic time span to work with. Regional, national and transboundary collection and analyses of data needs considerable time, esp. the comparison of lynx pictures to determine minimum population numbers. Therefore the monitoring report of the past lynx year will be available in December/January.

This technical report will serve as the fundament for the discussions and evaluations of the LyMBo meeting, which will take place in the first quarter of the year. This specific lynx management board will regularly discuss and evaluate the process of implementation based on the yearly monitoring report on population level.

Within the LyMBo, the question about the need for further development or changes of the Strategy should be regularly addressed and discussed. This demand could arise from major changes in the given environment and habitat of lynx, specific problems of the species like strong inbreeding/health problems or adapted conservation/management approaches arising from new methods developed for species conservation.

The first major evaluation of the complete BBA lynx conservation strategy should take place in 2025, based on the given yearly monitoring reports for the BBA population and the mandatory national FFH-reporting for the period 2017-2024.

12. Annex

12.1. Memorandum of Understanding

The Eurasian lynx is a highly endangered species, protected under national laws and the EU Habitat Directive. The main threats for lynx survival are illegal killing, happening due to lack of acceptance by key stakeholders, road mortality and habitat fragmentation hindering migration. The challenge in lynx conservation is to integrate lynx monitoring, conservation and management into a common strategy on transnational level.

Interreg Central Europe project CE 1001 3Lynx (Population based (transnational) monitoring, management and stakeholder involvement for the Eurasian Lynx affecting 3 Lynx Populations in the Central Europe Area) was focused on conservation of three small areas of lynx occurance. Target populations are very small in numbers, they were reinstalled by reintroduction from only a few individuals, and they are shared among neighbouring countries. As the animals do not acknowledge state borders, the project established transnational approaches to their protection.

One of the small populations is shared between Czechia (Bohemia), Bavaria and Austria (so called BBA population). Based on the results of the project, the Ministry of Environment of the Czech Republic, the Bavarian State Government and the Government of Upper Austria commit themselves to common goals and fulfilment of the Habitat Directive obligation, and declare following regarding conservation of BBA lynx population:

Memorandum of Understanding on lynx conservation and future cooperation in implementation of the strategy of lynx conservation in Bohemian - Bavarian - Upper Austrian region

In Europe Eurasian Lynx (*Lynx lynx*) is listed as a strictly protected species. Being extirpated some 150 years ago the species slowly recovers due to several attempts of reintroductions. However, the status of the species in Central Europe is still far from a favourable conservation status, the conservation goal set by the FFH directive.

Lynx is threatened by various factors: continous building of infrastructure – paired with increasing habitat deterioration - causes rising numbers of traffic casualities and continuous landscape fragmentation. Illegal killing is spread, due to archaic dislike of large predators and percieved competition regarding roe deer hunting.

The Bohemian-Bavarian-Austrian (BBA) population has been founded about 35 years ago, being still small in numbers and spatially restricted to the border region of the Czech Republic, Bavaria and Upper Austria. Lynx is a species with large spatial demands, averaging territories of 100 km² for females and 250 km² for males. Therefore conservation guidelines recommend a population level conservation approach, which means not only refering to national or regional confinements but looking at given continuous spatial units suitable for the species. Therefore there is

a need for transnational cooperation in lynx conservarvation and this memorandum of understanding reflects the need.

Article 1 - Vision

With the document on hand Czech Republic, Bavaria and Upper Austria present such a population level based conservation approach for the lynx. The three governments stress the importance that lynx should return into the landscape as part of the natural heritage and earnestly pursue the following vision:

"*to restore and maintain, in co-existence with people, a viable lynx population within the Bohemian-Bavarian-Austrian border region connected with other metapopulations in Central Europe*"

To proceed towards this vision, the three countries focus their joint efforts on the following four major issues:

- Lynx are spread all over suitable habitat within the BBA area,
- Lynx reach sufficient numbers within the BBA area,
- BBA lynx population is connected with other lynx sub-populations to form a functioning metapopulation, and
- Lynx is accepted and respected by humans as an integral part of the natural heritage of Central Europe.

Article 2 - Goals

This Conservation strategy for the BBA lynx population translates the overall vision into practical goals, different objectives and specific targets. Then the strategy defines and lists related conservations actions, actors, time lines and measurable indicators.

Within this Lynx Conservation Strategy we explicitely pursue the following four goals:

I. Longterm survival of the species – lynx should return to and stay in an Favourable Conservation Status which implies sufficient lynx numbers and spatial coverage of the area
II. Sustain and enhance landscape permeability within and around the BBA area to secure regular genetic exchange
III. To keep and raise acceptance for the species within our society, providing robust information, using regular communication and intensive participation
IV. To apply strict law enforcement to prevent illegal actions

For each of these four goals a set of related conservations actions is listed which the contracting parties could chose from to commonly head for a favourable conservations status for the BBA lynx population.

Article 3 – Conservation strategy

The BBA conservation strategy serves as a transboundary technical guideline for the protection, conservation and management of the lynx for responsible government and administrative bodies. Moreover it invites experts, interest groups and broad public to join forces in guiding lynx towards a longterm survival in Central Europe.

The three governments of Czech Republic, Bavaria and Upper Austria implement this document in daily negotiations and specific implementation of actions, especially adressing nature conservation, hunting and forestry issues. The task will be to continuously work on and improve the situation concerning lynx‘ status and its habitat with the given main prey species. The conservation strategy should be reevaluated based on expert recommendation.

Article 4 – transboundary lynx management board

A transboundary Lynx Management Board („LyMBo“) should meet once a year and is escorting the implementation and further development of the BBA lynx conservation strategy.

Final conclusion

Ministry of Environment of the Czech Republic, Government of Bavaria and Government of Upper Austria declare their willingness to incorporate the mentioned ideas into their environmental policies and cooperate furthermore on conservation of lynx in the transborder area.

Prague

Richard Brabec

Minister of Environment of the Czech Republic

Munchen

Thorsten Glauber

Minister of Bavarian State Ministry of the Environment and Consumer Protection

Linz

Dr. Manfred Haimbuchner

Deputy Governor of Upper Austria

12.2. Glossary

In this chapter we list and explain/define some technical terms and abbreviations used.

EIA: Environmental Impact assessment

Ecotype: specially adapted individuals/part of population due to long adaptation in specific environments

FCS (Favourable Conservation Status):
Based on the population dynamics of a species, the conservation status in considered to be favourable, if

- it can be assumed that the species forms and will continue to form a viable element of the natural habitat to which it belongs,
- that the natural range of this species is neither decreasing nor is it likely to decrease in the foreseeable future,
- and it is likely that a sufficiently large habitat will remain to ensure long-term survival of populations of this species.

LFA: Logical Framework Approach

Lynx Year:
Beginning with 1st of may and ending with 30th of april of the next year, a lynx year reflects the biological lynx life cicle starting with the birth of the kittens and ending with the separation from the mother in late winter the following year.

Metapopulation: some smaller population units which have limited exchange with eachother

SEA: Strategic Environmental Assessment

SWOT analysis:
stands for 'Strengths, Weaknesses, Opportunities and Threats'. It is a method of analysis used in companies to identify its internal strengths and weaknesses, as well as its external opportunities and threats.

12.3. References

Bayerisches Staatsministerium für Umwelt, Gesundheit und Verbraucherschutz (StMUV) (2008). Managementplan Luchse in Bayern. München, 16 pages.

Belotti E., Weder N., Bufka L., Kaldhusdal A., Küchenhoff H., Seibold H., et al. (2015). Patterns of lynx predation at the interface between protected areas and mulit-use landscapes in central Europe.

Breitenmoser U., Breitenmoser-Würsten C. (2008). Der Luchs. Ein Großraubtier in der Kulturlandschaft. Salm Verlag. Wohlen, Bern. ISBN 978-3-7262-1414-2.

Breitenmoser U., Breitenmoser-Würsten C., Okarma H., Kaphegyi T., Kaphegyi-Wallmann U., Müller U. (2000). Action plan for the conservation of the Eurasian Lynx in Europe. Nature and environment, No. 112. Council of Europe Publishing.

Breitenmoser U., Breitenmoser-Würsten C., Von Arx M., Zimmermann F., Ryser A., Angst C., Molinari-Jobin A., Molinari P., Linnell J., Siegenthaler A., Weber J.-M. (2006). Guidelines for the monitoring of lynx. KORA Bericht Nr. 33 e.

Boitani, L., Alvarez F., Anders O., Andren H., Avanzinelli, E., Balys, V., Blanco, J.C., Breitenmoser, U., Chapron, G., Ciucci, P., Dutsov, A., Groff, C., Huber, D., Ionescu, O., Knauer, F., Kojola, I., Kubala, J., Kutal, M., Linnell, J., Majic, A., Mannil, P., Manz, R., Marucco, F., Melovski, D., Molinari, A., Norberg, H., Nowak, S., Ozolins, J., Palazon, S., Potocnik, H., Quenette, P.-Y., Reinhardt, I., Rigg, R., Selva, N., Sergiel, A., Shkvyria, M., Swenson, J., Trajce, A., Von Arx, M., Wölfl, M., Wotschikowsky, U. and Zlatanova; D. (2015). Key actions for Large Carnivore populations in Europe. Instute of Applied Ecology (Rome, Italy). Report to DEG Environment, European Commission, Bruxelles. Contract No. 07.0307/2013/654446/SER/B3: 119 pp.

Červený J., Bufka L. (1996). Lynx (lynx lynx) in south-western bohemia. Acta Sc. Nat. Brno. 30(3): 16-33.

Chapron G., Kaczensky P., Linnell J., von Arx M., Huber D. et al. (2014). Recovery of large carnivores in Europe's modern human-dominated landscapes. Science 346, 1517. doi: 10.1126/science.1257553

Council of Europe. (2019). Recommendation No. 204 of the Standing Committee, adopted on 6th of December 2019, on the Conservation of the Eurasian Lynx (Lynx lynx) in Continental Europe. Straßburg, 2 pages.

Engleder, T., Mináriková, T., Volfová, J., Watzl, J., Watzl, B., Gerngross, P., & Belotti, E. (2019). First breeding record of a 1-year-old female Eurasian lynx. European journal of wildlife research, 65(1), 17.

European Economic Community. (1992). Flora-Fauna-Habitats Directive (92/43/EEC).

Frankham R., Bradshaw C., Brook B. (2014). Genetics in conservation management: Revised recommendations for the 50/500 rules, Red List criteria and population viability analyses: Biol. Cons. 170: 56-63.

Gervasi V., Nilsen E., Odden J., Bouyer Y., Linnell J. (2013). The spatio-temporal distribution of wild and domestic ungulates modulates lynx kill rates in a multi-use landscape. J. Zool., Lond. 292: 175-183.

Heurich M., Schultz-Naumburg J., Piacenza N., Magg N., Cerveny J., Engleder T., Herdtfelder M., Sladova, M. & Kramer-Schadt, s. (2018). Illegal hunting as a major driver of the source-sink dynamics of a reintroduced lynx population in Central Europe. Biological Conservation 224 (2018): 355-365.

IUCN Cat Specialist Group. (2015). How to save the Cat. Cat conservation compendium – a practical guideline for strategic and project planning in cat conservation. Cat News Nr.9, 36 pp.

Jedrzejewski W., Schmidt K., Miłkowski l., Jedrzejewska B., Okarma H. (1993). Foraging by lynx and its role in ungulate mortality: the local (Białowieza Forest) and the Palaearctic viewpoints. Acta theriol. 38 (4): 385-403.

Kacensky P. Chapron G., von Arx M., Huber D., Andren H, Linnell J. (Eds.). (2013a). Status, management and distribution of large carnivores – bear, lynx, wolf & wolverine – in Europe. Part I. Europe summaries. A Large Carnivore Initiative for Europe Report prepared for the European Commission (contract N°070307/2012/629085/SER/B3). 72 Seiten.

Kaczensky P., Kluth G., Knauer F., Rauer G., Reinhardt I., Wotschikowsky U (2009). Monitoring von Großraubtieren in Deutschland. BfN Skripten 251, xxx pages.

Kramer-Schadt S. (2004). Wohin läuft der Luchs in Bayern? Lebensraum, Ausbreitungswege und Populationdynamik anhand eines Simulationsmodells. In: Wölfl M., Leibl F., Wagner M. (Eds.): Naturschutz in Niederbayern, Luchsmanagement in Europa. Heft 4, 11/2004.

Kvam T. (1990). Reproduction in the European lynx (Lynx lynx). Norwegian Institute for Nature Research. Mammalian Ecology Research Group, Trondheim, Norway. 36 pp.

Linnell J., Salvatori V. & Boitani L. (2008). Guidelines for population level management plans for large carnivores in Europe. A Large Carnivore Initiative for Europe report prepared for the European commission (contract 070501/2005/424162/MAR/B2): 85 pp.

Meli, M.L., Cattori V., Martınez, F., Lopez G., Vargas A., Palomares F., Lopez-Bao J.V., Hofmann-Lehmann R. , Lutz H. (2010). Feline leukemia virus infection: A threat for the survival of the critically endangered Iberian lynx (Lynx pardinus). Veterinary Immunology and Immunopathology 134: 61-67.

Melis, C., Jędrzejewska, B., Apollonio, M., Bartoń, K. A., Jędrzejewski, W., Linnell, J. D. & Delehan, I. (2009). Predation has a greater impact in less productive environments: variation in roe deer, Capreolus capreolus, population density across Europe. Global ecology and biogeography, 18(6), 724-734.

Mináriková T., Wölfl S., Belotti E. et al. (2019). Lynx Monitoring Report for Bohemian-Bavarian-Austrian lynx population for Lynx year 2017. 17 pp. Report prepared within the 3Lynx Project, funded by Interreg Central Europe.

Mintzberg H. (1994). The Rise and Fall of Strategic Planning. The Free Press, New York.

Molinari-Jobin A., Kery M., Marboutin E., Molinari P., Koren I., Fuxjäger C., Breitenmoser-Würsten C., Wölfl S., Fasel M., Kos I., Wölfl M., Breitenmoser U. (2012). Monitoring in the presence of species misidentification: the case of the Eurasian lynx in the Alps. Anim. Conserv. 15, 266–273.

Molinari-Jobin A., Molinari P., Breitenmoser-Würsten C., Wölfl M., Stanisa C., Fasel M., Stahl P., Vandel J.-M., Rotelli L., Kaczensky P., Huber T., Adamic M., Koren I. & Breitenmoser U. (2003). The Pan-Alpine Conservation Strategy for the Lynx. Council of Europe, Nature and Environment Series No. 130, 69 pp.

Nilsen E., Brøseth H.,·Odden J., Linnell J. D. (2010). The cost of maturing early in a solitary carnivore. Oecologia 164 (4):943–948. DOI 10.1007/s00442-010-1713-2.

Nilsen E., Linnell J., Odden J.D., Samelius G., Andrén H. (2012). Patterns of variation in reproductive parameters in Eurasian lynx (Lynx lynx). Acta Theriologica, 57 (3), 217-223. DOI 10.1007/s13364-011-0066-5.

Okarma H., Jedrzejewski W., Schmidt K., Kowalczyk R., Jedrzejewska B. (1997). Predation of Eurasian lynx on roe deer and red deer in Bialowieza Primeval Forest, Poland. Acta theriol. 42 (2): 203-224.

Poledníková, K., Bufka, L., Wölfl, S., Wölfl, M., Engleder, T., Gahbauer, M., Heurich, M., Schwaiger, M., Mináriková, T., Poledník, L., Belotti, E., Strnad, M., Červený, J. (2015). Demography and Population viability analysis of the Bohemian-Bavarian-Austrian lynx population. 37 pp. Project Report of the Trans Lynx Project.

Reinhardt I., Kaczensky P., Knauer F., Rauer G., Kluth G., Wölfl S., Huckschlag D., Wotschikowsky U. (2015). Monitoring von Wolf, Luchs und Bär in Deutschland. 94 Seiten.

Romportl, D. (2015). Lynx habitat and dispersal models. 11pp. Project Report of the Trans Lynx Project.

Sindičić M., Polanc P., Gomercic T., Jelencic M., Huber D., Trontelj P. Skrbinsek T. (2013). Genetic data confirm critical status of the reintroduced Dinaric population of Eurasian lynx. Conservation genetics, 14 (5), 1009-1018. DOI 10.1007/s10592-013-0491-x.

Sidorovich, Vadim (2019). Rapid decline in the local population of lynx in Naliboki Forest, NW Belarus: density-dependent regulation or disease? [online] https://sidorovich.blog/2019/12/24/rapid-decline-in-the-local-population-of-lynx-in-naliboki-forest-nw-belarus-density-dependent-regulation-or-disease/ [02.12.2020]

Schmidt K., Jedrzejewski W., Okarma H. (1997). Spatial organization and social relations in the Eurasian lynx population in Bialowieza Primeval Forest, Poland. Acta theriol. 42, 289-312.

Schmidt, K. (1998. Maternal behaviour and juvenile dispersal in the Eurasian lynx. Acta theriol. 43(4):391-408.

Schnidrig R., Nienhuis, C., Imhof, R. Bürki R. & Breitenmoser U. (Eds). 2016. Lynx in the Alps: Recommendation for an internationally coordinated management. Report of the RowAlps Project (Recovery of Wildlife in the Alps) in the framework of the WISO (Wildlife and Society) Platform of the Alpine Convention. KORA/BAFU Switzerland. KORA report 71, 70 pp.

Thüler K. 2002. Spatial and temporal distribution of coat patterns of Eurasian lynx (Lynx lynx) in two re-introduced populations in Switzerland. KORA Bericht Nr. 13e. KORA, Bern, 34 S.

Volfova J., Toman L. (2018). Návrat rysa ostrovida na Sumavu ve 2. Polovine 20. Stoleti´. In: Vlastinedhy sbornik muzea Sumavy. ISBN 978-80-88013-66-2.

Weingarth K., Heibl C., Knauer F., et al. (2012). First estimation of Eurasian lynx (Lynx lynx) abundance and density using digital cameras and capture-recapture techniques in a German national park. Animal Biodiversity and Conservation 35.2, pp 197-207.

Werdelin L., Olsson L. (1997). How the leopard got its spots: a phylogenetic view of the evolution of felid coat patterns. Biological Journal of the Linnean Society. 62:383-400. 10.1111/j.1095-8312. (1997. tb01632.x.

Wölfl M. (2005). Fachkonzept “Der Luchs in Bayern – Ausgangssituation, Grundlagen und Perspektiven. Bayerisches Landesamt für Umwelt, Augsburg, Luchs. 105 pages.

Wölfl M., Bufka L., Cervený J., Koubek P., Heurich M., Habel H., Huber T. & Poost W. (2001). Distribution and status of lynx in the border region between Czech Republic, Germany and Austria. Acta theriologica,46(2), 181-194.

Wölfl S., Schwaiger M., Sandrini J. (2009). Luchsmonitoring mittels Fotofallen im Bayerischen Wald, Wintereinsatz 2009. Im Auftrag des Bayerischen Landesamtes für Umwelt, 51 Seiten.

Wölfl S., Schwaiger M. (2010b). Luchsmonitoring mittels Fotofallen im Bayerischen Wald, Wintereinsatz 2010. Im Auftrag des Bayerischen Landesamtes für Umwelt, 42 Seiten.

Wölfl S., Schwaiger M. (2012). Luchsmonitoring mittels Fotofallen. Systematischer Fotofalleneinsatz im Bayerischen Wald von September bis Dezember 2012. Im Auftrag des Bayerischen Landesamtes für Umwelt, 44 Seiten.

Wölfl S., Mináriková T., Poledník L., Bufka L., Wölfl M., Engleder T. et al. (2015a). Status and distribution of the transboundary lynx population of Czech Republic, Bavaria and Austria in the lynx year 2013. 22 pp. Project Report of the Trans Lynx Project.

Wölfl S., Mináriková T., Poledník L., Bufka L., Wölfl M., Engleder T. et al. (2015b). Status and distribution of the transboundary lynx population of Czech Republic, Bavaria and Austria in the lynx year 2014. 12 pp. Project Report of the Trans Lynx Project.

Wölfl S., Mináriková T., Belotti E., Engleder T., Schwaiger M., et al. (2020). Lynx Monitoring of the Bohemian-Bavarian-Austrian lynx population in 2018/2019. Report prepared within the 3Lynx project, funded by INTERREG Central Europe.

Wölfl S., Anders O., Middelhoff t.L., Hohmann U., Back M., Idelberger S., Krebühl J., Ohm J., Prüssing A., Herdtfelder M., Böcker F., Erretkamps J., Kopaniak L., Wölfl M., Jokisch S., Hucht-Ciorga I., Teubner J., Trost M., Zschille J., Jeß E., Steinberg C. (in press). Status des Luchses in Deutschland. Natur und Landschaft, Bonn.

Yom-Tov, Y., Kjellander, P., Yom-Tov, S., Mortensen, P., & Andrén, H. (2010). Body size in the Eurasian lynx in Sweden: dependence on prey availability. Polar Biology, 33(4), 505-513

Zimmermann F., Breitenmoser-Würsten C., Breitenmoser U. (2005). Natal dispersal of Eurasian lynx (*Lynx*